ABSTRACT

Title of dissertation: TIMING IT RIGHT: TEMPORAL CONTINGENCIES AND CASCADING EFFECTS OF LEADERSHIP IN ACTION TEAMS

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Despite widespread recognition of the influential role of time in teams, these temporal components have been insufficiently integrated in existing models of team leadership. Current approaches to team leadership emphasize the importance of using different behaviors under different circumstances (e.g., contingency theories of leadership), but assume these contingencies to be static, when in reality, they fluctuate over the course of achieving a single collective task. The purpose of this dissertation is to develop and empirically test a temporal contingency theory of leadership in action teams, in part because action teams must manage shifting task goals, task intensity, and team development needs over the course of performing a single collective task. Drawing on temporal theories relevant to action teams, such as Marks, Mathieu, and Zaccaro's (2001) transition-action phase framework, McGrath's (1991) task cycle theory, and theories of team development (e.g., Kozlowski, Gully, Nason, & Smith, 1999), I examine ways in which the internal environment of the team shifts dramatically between preparatory and executionary periods. I then compare and contrast three forms of leader behavior shown

to be relevant and effective in action teams – directing, coaching, and relating – and argue that each leads to effective functioning differently in each phase. Specifically, I propose that coaching behaviors increase team functioning early on during a phase of task preparation and that this relationship is enhanced when coaching is used in combination with relating behaviors, whereas directive behaviors increase team functioning later on during a phase of task execution. I further propose that leader behaviors occurring early on initiate preparatory, teamwork processes that endure over time and exert cascading influences on subsequent executionary, teamwork processes. Using live, time-sensitive observation methodology, I test these propositions in a sample of 58 surgical team episodes. Key findings are largely consistent with the proposed relationships in my model and lend support to existing theories that integrate the role of time with team leadership theory, challenge comparatively static team leadership and contingency leadership theories to incorporate a more fine-grained approach to understanding temporal dynamics affecting teams, and yield practical implications around time-sensitive leader training.

TIMING IT RIGHT: TEMPORAL CONTINGENCIES AND CASCADING EFFECTS OF LEADERSHIP IN ACTION TEAMS

by

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CHAPTER 1: INTRODUCTION

"Group researchers are increasingly recognizing that when a leadership intervention is made can be as important as the content of that intervention or how skillfully it is delivered." (Hackman & Katz, 2010: 1238)

Teams come in a wide range of shapes and sizes to accomplish an equally wide range of purposes (Sundstrom, 1999). From self-managing teams to cockpit crews to professional sports teams, the ubiquitous popularity of teams lies in their potential to achieve tasks that could not otherwise be achieved by isolated individuals. The secret of effective teams is teamwork – the process by which team members transform their collective inputs (knowledge, skills, and task roles) into a cohesive team outcome (Hackman, 1987; Mathieu, Maynard, Rapp, & Gilson, 2008). For many teams, lapses in teamwork may result in process inefficiencies, such as delays and lost profits. In other teams, however, failures in teamwork can be catastrophic.

Take for instance "action teams" (e.g., surgical teams, aircraft crews, combat teams). The high levels of team member task specialization, requirements for coordination, and need for active adaptation to unpredictable elements (Kozlowski, Gully, McHugh, Salas, & Cannon-Bowers, 1996) render such teams heavily dependent on teamwork to produce high reliability outcomes. Any deviation from the gold standard could mean the difference between life and death (Kozlowski et al., 1996; Sundstrom, DeMeuse, & Futrell, 1990), and few teams walk this tightrope more routinely than surgical teams. As a sobering example, the majority of preventable incidences in the operating room was found to stem not from deficiencies in technical skill, but rather poor

communication and coordination among health providers (Helmreich, 2000; Institute of Medicine, 1999; Sutcliffe, Lewton, & Rosenthal, 2004).

The key to promoting effective teamwork – in surgical teams and other high reliability, action team contexts – lies in understanding team leadership (Kunzle, Kolbe, & Grote, 2010). In the case of hierarchically-differentiated action teams, team leadership describes the behavior of the formal, internal leader of the team (e.g., the surgeon, captain, or commander; Kozlowski et al., 1996). How the leader chooses to carry his or her influence over team members is a question of consequence – behaving in one way may draw out less powerful team members to engage in the team task, while behaving another way may cause team members to withdraw and silence concerns about patient safety. Indeed, a number of studies attest to the robust leader effect in action teams (reviewed in Kunzle et al., 2010). To compare and contrast the approach of my dissertation to existing work on leadership in surgical teams, I briefly review four team leadership studies that are set in the surgical and health care team context.

Using qualitative interview data from 16 surgical teams, Edmondson (2003) found that team leader coaching behaviors (defined as leader behaviors that create an open environment, lead discussion, and advocate teamwork) increased team members' willingness to speak up, which in turn enabled successful team learning and implementation of a new surgical technique. In a survey study of neonatal intensive care units, Nembhard and Edmondson (2006) found that leader inclusiveness (defined as words and deeds of the leader that indicated an invitation and appreciation for others' contributions) positively influenced lower status team members' perceptions of psychological safety, which in turn increased engagement in learning. In a qualitative

investigation of trauma teams, Klein, Ziegert, Knight, and Xiao (2006) examined how team leaders dynamically cycled between different, sometimes opposing leadership behaviors depending on the situation associated with a case. Interviews with 33 members of trauma teams revealed that team leaders engaged in direct intervention, delegation with monitoring, and teaching behaviors depending on the experience level of the team and the critical state of the patient.

Also using a sample of trauma teams, Yun, Faraj, and Sims (2005) examined how team leadership behaviors influence team effectiveness. Using interviews, observations, and scenario methodology, Yun et al. (2005) found that team leaders' directive behaviors (defined as leader behaviors that provided detailed instructions to team members without inviting their questions or input) and empowering behaviors (defined as leader behaviors that encouraged team members to actively participate in decision making and task management) were more or less effective depending on three contingencies – the severity of patient trauma (high or low), the level of team experience (high or low), and the goal (quality health care or learning opportunities). Yun et al. (2005) showed that when quality health care was the goal, directive leadership was more effective when the patient was severely injured and/or the team was inexperienced, whereas empowering leadership was more effective when the patient was not severely injured, the team was experienced, or when an inexperienced team treated a non-severely injured patient. When learning opportunities was the goal, however, empowering leadership was consistently shown to be more effective than directive leadership.

Taken together, these studies indicate that team leadership effects are robust in surgical team settings, and that the impact of team leadership on team functioning is

subject to contingencies relating to the content of leader behavior exhibited, the task, the team, and the goal. These contingencies, however, have been conceptualized as largely static entities that vary across distinct "performance events" – defined as distinguishable periods of goal-directed team work activity, such as a flight or surgical case. In reality, however, action teams face unique challenges associated with cycling task demands, unpredictable and novel task elements, and evolving developmental needs, all *within* the span of a single performance event (Kozlowski et al., 1996). The dynamism within performance events calls for more fine-grained, temporally sensitive, and equally dynamic models of team leadership. It also demands theory with regards to not only *which* leader behaviors matter in this context but also *when* those behaviors should be enacted. Without considering leadership as a temporally dynamic phenomenon, researchers and practitioners alike may hold inaccurate expectations that the same leader behavior will be equally effective regardless of when it is enacted during the span of a performance event.

1.1 Temporal Factors in the Study of Team Leadership

More broadly, accounting for temporal factors in the study of team leadership is essential because temporal factors *matter* in teams (Gersick, 1988, 1989; Moreland & Levine, 1988; Kelly, 1988; McGrath, 1991) and in organizational phenomena in general (Ancona, Goodman, Lawrence, & Tushman, 2001). Indeed, numerous organizational scholars have attested to the importance of time, such as the development of teams over the life cycle of the team (Gersick, 1988, 1989; Kozlowski et al., 1999; Tuckman, 1965), as well as the changing nature and pace of teamwork as teams progress through distinct task cycles (Kozlowski et al., 1996; Marks et al., 2001). Despite the prominence of

temporal factors in team phenomena, however, inclusion of this temporal component in frameworks of team leadership is surprisingly sparse – an omission that limits both the theoretical integrity and real world applicability of such models (Kozlowski et al., 1996).

The omission of temporal factors in theories of team leadership also limits our understanding of how dynamic leader behavior truly is in team settings. A notably common theme in team leadership research is the tendency to theorize about and examine singular forms of leadership in stasis (e.g., Edmondson, 2003; Nembhard & Edmondson, 2006). Even when multiple forms of leadership are considered, the tendency has been to pit the effects of one form of leadership against the other in an either-or, contrasting rather than integrative manner (e.g., DeRue, Barnes, & Morgeson, 2010; Klein, Knight, Ziegert, Lim, & Saltz, 2011; Klein et al., 2006; Yun et al., 2005). These approaches are problematic because, in reality, leaders rarely enact a single form of leadership behavior throughout an entire episode. Rather, they cycle through multiple forms of *opposing* leadership behaviors over time and in fact may be more effective when they do so (Gebert, Boerner, & Kearney, 2010).

The most compelling reason for integrating temporal considerations into theories of team leadership is that team leadership impact may depend on when those behaviors are enacted. In other words, there may be truth behind to the adage that leading well means doing the right thing *and* doing it at the right time (Wageman, Fisher, & Hackman, 2009). Several pioneering works on timing and team leadership provide strong theoretical arguments that it is functional for leaders to enact certain leadership behaviors at specific times in the performance episode (e.g., Hackman & Wageman, 2005; Kozlowski et al., 1996; Morgeson, DeRue, & Karam, 2010).

While I applaud these theoretical works, each theory only partially considers the full scope of temporal dynamics operating in action teams. For instance, Kozlowski et al. (1996) considers a combination of theories relating to team skill development and team task cycles, Hackman and Wageman (2005) adopts a team development perspective, and Morgeson et al. (2010) takes a largely episodic view. Compounded by the fact that each theory is anchored to a distinct set of leader behaviors, together, these theories create a dizzying number of possibilities regarding what and when leaders should do – a consequence that is difficult to make sense of and near possible to implement. In short, there is a need for an integrative theory that considers the collective impact of temporal factors, especially given research showing that the pacing of temporal factors tends to synchronize and unfold together over time (Ancona & Chong, 1996; George & Jones, 2000; McGrath, Kelly, & Machatka, 1984; McGrath & Rotchbard, 1983). In addition, theories of time and team leadership should also provide guidance as to how earlier events impact the unfolding of events later on. For instance, how do leader behaviors enacted (or not enacted) early on set teamwork processes in motion that then impact how team members work together downstream? These questions of practical and theoretical importance (and their associated answers) are hinted at but not explicitly explored in prior theories integrating time and leadership.

Finally, existing efforts to integrate temporal factors and team leadership have thus far been strictly theoretical, and many ideas generated by these theories remain to be empirically tested. At this stage of theory development, empirical testing in relevant field settings is needed to move temporal theories of team leadership along the continuum from being "nascent" to "intermediate" to "mature" (Edmondson & McManus, 2007).

Capturing team leadership over time has unfortunately been constrained by the use of study designs that focus on a narrow range of team leadership behaviors occurring at a single point in time (McGrath, 1991). Thus, to advance a theory of time and team leadership, there is a need to employ empirical techniques that capture the wax and wane of leadership behaviors throughout a temporally significant episode of time (Futoran, Kelly, & McGrath, 1989; McGrath, 1991; Weingart, 1997).

1.2 Purpose and Intended Contributions

The purpose of this study is to develop and test an integrated theory of team leadership and timing in action teams. My approach to building this theory is as follows. Drawing on temporal theories relevant to action teams, such as Marks et al.'s (2001) transition-action phase framework, McGrath's (1991) task cycle theory, and theories of team development (e.g., Kozlowski et al., 1999), I examine ways in which the internal environment of the team shifts dramatically between preparatory periods associated with lower task intensity and more acute developmental needs, and executionary periods associated with higher task intensity and less acute developmental needs. Then, drawing from task versus relations oriented meta-categories of leadership, I compare and contrast three forms of leader behavior shown to be relevant and effective in action teams – directing, coaching, and relating.

Against this theoretical backdrop, I propose from a functional leadership perspective that different leader behaviors are needed at different points in time, not only to facilitate critical team processes that occur contemporaneously, but also to indirectly facilitate subsequent team processes. Specifically, I hypothesize that coaching behaviors increase team functioning early on during a phase of task preparation (and that this

relationship is enhanced when coaching behaviors are used in combination with relating behaviors), and that directive behaviors increase team functioning later on during a phase of task execution. Furthermore, I hypothesize that leader behaviors occurring early on exert cascading influences on subsequent processes by initiating preparatory teamwork processes that provide a shared schema and roadmap for action. I test these propositions in a sample of 58 surgical team episodes using live, time-sensitive observation methodology designed to capture quantitative as well as qualitative aspects of leader and team behavior over the course of each performance episode.

Importantly, although the theoretical arguments and empirics of this study are housed within the context of surgical teams, aspects of the theoretical framework I propose here are applicable to other team contexts. Direct applicability may be stronger for teams that share characteristics of action teams (Hollenbeck, Beersma, & Schouten, 2012): a) team members are specialists in distributed roles and must work intensively together to achieve a common goal, b) status and authority is differentiated along a hierarchy, in which one team member serves as a formal internal team leader and drives the direction of the task and proximally interacts with other team members, and c) the team task can be identified as a distinguishable performance episode and team membership is not stable across performance events.

Direct applicability may also be stronger for teams whose tasks follow a clear temporal structure in which a period of transition (i.e., planning and preparation) is followed by a period of action (i.e., execution of prior agreed upon plans) within a performance episode. For instance, the theory I present here might apply better to project teams – a setting in which leadership effects are robust, team members are highly

specialized, teamwork activities during the project follows a clear transition-action phase framework, and teams disband after the completion of a project (e.g., Farh, Lee, & Farh, 2010; Ford & Sullivan, 2004; Gersick, 1988, 1989; Sundstrom, 1999) – than to teams that conform less to such leadership, task, and temporal structures (e.g., management teams, production teams, or service teams). Nonetheless, the notion of temporal factors operating over the course of a performance episode, and thus the need to use different leadership behaviors at different points in time to facilitate effectiveness, is generalizable to a multitude of organizational settings that are affected by both internal and external timelines and developmental trajectories (Ancona et al., 2001).

To summarize, this study makes the following theoretical contributions to the existing team leadership literature. By accounting for temporal factors in the team leadership process, I contribute to a growing body of literature on the contingencies of leadership, with a specific focus on temporal contingencies unfolding within the bounds of a single performance episode. In doing so, I address calls to integrate the role of time into organizational and team research in general (Ancona et al., 2001; Cohen & Bailey, 1997; Kozlowski & Bell, 2003; McGrath, 1991) and into models of team leadership in particular. My dissertation also extends the work of existing, temporally-sensitive team leadership theories (e.g., Hackman & Wageman, 2005; Kozlowski et al., 1996; Morgeson et al., 2010) by integrating across multiple temporal influences in teams and examining how leadership actions taken earlier on can cascade forward to influence later outcomes that matter for effectiveness. Relatedly, I make an important empirical contribution by testing a temporally-based model of team leadership in a field sample of surgical teams. To overcome the empirical constraints of the existing static-analytic methodological

approaches to measuring team and team leadership processes, I employ observational coding techniques suggested by McGrath (1991) in which team leaders' and team members' behaviors are recorded at the micro level with regards to their type, source, and time of enactment over entire performance episodes.

This study also promises to offer several contributions to practice. An important purpose in developing models of team leadership is to help guide improvements in the quality and effectiveness of team leadership, for instance, through leadership training initiatives. Most current approaches to leadership training lack consideration for temporal factors. For instance, traditional interventions tend to focus on training generic leadership skills thought to be applicable to all situations (reviewed in Day, 2000), and more contingency-aware leadership interventions emphasize the need to adjust leadership behavior depending on the context across teams and tasks (e.g., Fiedler, 1996). However, a time-sensitive model of team leadership – if supported – demands greater consideration for and awareness of the way temporal factors unfold *within* a single performance episode, as well as the need to equip leaders to recognize and respond to these shifting contingencies with the appropriate leadership behaviors.

Testing my theoretical model in a sample of surgical teams also provides context-specific practical implications, especially given the widespread documentation of the consequences of poor teamwork for patient safety in collaborative health care settings (Helmreich, 2000; Institute of Medicine, 2004; Sutcliffe et al., 2004). The findings of this study may inform practice with regards to when and what team leaders and team members can do to facilitate team effectiveness, an area of growing awareness in the medical literature (Donchin et al., 1995; Edmondson, 2003; Klein et al., 2006; Kosnik,

2002; Kunzle et al., 2010; Nembhard & Edmondson, 2006; Tschan, Semmer, Gautschi, Hunziker, Spychiger, & Marsch, 2006; Yun et al., 2005).

1.3 Chapter Outline

In Chapter 2, I discuss the conceptual frameworks guiding my dissertation model. Chapter 2 is organized into six sections. In sections 2.1 through 2.3, I begin by defining action teams, acknowledging that the unique features associated with this context form the criteria for "effectiveness" and pinpoint the specific teamwork processes, temporal factors, and team leadership behaviors that are most relevant for impacting those outcomes. Specifically, in section 2.3, I review the existing literature on team processes and highlight my rationale for focusing on transition and action processes (as defined by Marks et al., 2001) as the key mediating mechanisms by which team leadership actions influence outcomes.

In section 2.4, I review the literature on temporal theories relating to teams and integrate across them to determine the unique team needs and processes housed within early versus later phases of the performance episode. Specifically, using Marks et al.'s (2001) framework of transition and action phases, I discuss ways in which task goals, task intensity, and team development needs collectively shift across the transition-action boundary, thus presenting the team with unique challenges in each phase of the performance episode. In section 2.5, I review the literature on team leadership and provide rationale for why I focus on directing, coaching, and relating behaviors in my model. In section 2.6, I draw on a functional leadership perspective to provide arguments and hypotheses for when each of these leader behaviors are likely to promote key teamwork processes in the transition versus action phases of the performance episode.

In Chapter 3, I describe the empirical details of my study, beginning in section 3.1 with a description of the setting and context of my data collection. In section 3.2, I describe how I developed and piloted the measures for this study, and in section 3.3, I describe the actual sample and procedure I used to collect the data for testing my hypotheses. In section 3.4, I explain my rationale for including versus excluding certain cases from my analyses. In section 3.5, I present the actual measures used in the study, and in section 3.6, I provide supporting evidence for the validity of these measures from triangulating multiple sources. In section 3.7, I describe the control variables I measured and included in the analyses.

In Chapter 4, I present my analytical approach and the results of these analyses. In section 4.1, I provide the descriptive statistics of the core variables included in the study, highlighting bivariate relationships between my core and control variables, as well as correlations associated with the relationships I hypothesized. In section 4.2, I present the results of hypothesis testing. In Chapter 5, I provide an overview and interpretation of the main findings of the study. Specifically, in section 5.1, I summarize the findings of the study, and in sections 5.2 and 5.3, I highlight the key theoretical and practical implications of those findings in light of the existing work on team leadership and effective leadership in action teams. In section 5.4, I review the limitations associated with the design of my study and suggest future directions for research that would clarify and extend the contributions of the present study. Finally, in section 5.5, I end with concluding statements regarding what it takes to lead well in complex, dynamic social settings.

CHAPTER 2: THEORY DEVELOPMENT AND HYPOTHESES

2.1 Action Teams Defined

Given the diversity of team types and settings, numerous taxonomies have developed over the years in an attempt to make sense of the variation (e.g., Cohen & Bailey, 1997; Devine, Clayton, Philips, Dunford, & Melner, 1999; Sundstrom et al., 1990). One of the earliest taxonomies was provided by Sundstrom et al. (1990), who categorized teams into six types: management teams, project teams, production teams, service teams, parallel teams, and action and performance teams. Within this typology, action teams are defined by Sundstrom et al. as "highly skilled specialist teams" that have "elaborate, specialized roles for members" and cooperate in "brief performance events that require improvisation in unpredictable outcomes" (p. 121). Highlighting the ephemeral nature of the membership of these teams, action teams have also been referred to as "crews" whose team members are "organized for a shift…rather than permanent assignments that carry over from day to day" (Morey et al., 2002: 1555).

Some action teams, such as military units, cockpit crews, and surgical teams, also follow a strict status hierarchy, where a single internal leader (e.g., the commander, captain, or surgeon) emerges at the top of the hierarchy and wields disproportionate influence over other team members on the basis of his or her professional expertise, social status, and central role in directing task activities (Edmondson, 2003; Nembhard & Edmondson, 2006). Some action teams can also be differentiated based on the high stakes and urgent nature of their tasks. Capturing this life or death element, trauma surgery teams have been described as "extreme action teams" – teams in which "highly skilled members cooperate to perform urgent, unpredictable, interdependent, and highly

consequential tasks while simultaneously coping with frequent changes in team composition and training their teams' novice members" (Klein et al., 2006: 590).

The action teams of interest in this theory can be described as having all of these components: a) they are composed of specialists who are experts in their respective roles and must work interdependently to achieve a common goal, b) they have a differentiated status hierarchy in which leadership influence emanates from a single individual in a top-down fashion, c) they work on a high stakes, urgent team tasks that occur in distinguishable performance events, and d) team membership does not carry forward across performance events. These dimensions correspond more or less to a recent, integrative taxonomy provided by Hollenbeck et al. (2012), which consists of three core continuums by which teams can be categorized: a) skill differentiation, b) authority differentiation, and c) temporal stability. Accordingly, the action teams this theory describes can be characterized as being high on skill differentiation and authority differentiation, but low on temporal stability.

2.2 Team Effectiveness in Action Teams

Definitions of effective team functioning vary widely across studies, contexts, and methods. In a recent review of the literature on team effectiveness, Mathieu et al. (2008) highlighted three meta-categories of criteria: outcome performance, performance behaviors, and attitudes. Performance outcomes refer to the final evaluation of the team's collective efforts or output (e.g., supervisor ratings of innovativeness, dollar sales, external customer satisfaction evaluations), whereas performance behaviors refer to the actions that lead to the achievement of team goals (e.g., learning, feedback seeking, experimentation). Mathieu et al. (2008) also described team effectiveness as attitudinal

outcomes, such as team members' affective reactions to working together and team viability, or team members' willingness to remain with the team.

The discussion around features of action teams in section 2.1 provides helpful guidelines for determining what does and does not reflect effective team functioning in action teams. In light of the constant rotating membership of such teams, for instance, attitudinal outcomes such as affect and viability become less relevant. The high stakes work of action teams, on the other hand, places supreme importance on performance outcomes. For instance, in the case of surgical teams, the most critical performance outcome is whether the surgical procedure saved or harmed a life. Performance outcomes, however, are elusive and are often influenced by factors outside of the team's control. As a most obvious example, a perfectly performed surgery may not save the life of a patient in already critical condition. Alternatively, a dysfunctional surgical team might still save a life for a patient that is otherwise healthy. In other words, ultimate performance outcomes do not always reliably reflect how well a team functions (Kozlowski & Ilgen, 2006).

The preferred alternative is to adopt the performance behavior view of team effectiveness, in which effective team functioning is reflected by the team's enactment of specific teamwork behaviors (Burke, Stagl, Klein, Goodwin, Salas, & Halpin, 2006). Some scholars even go as far as to consider performance behaviors *as performance* itself. Kozlowski and Ilgen (2006), for instance, posit that "what teams do – their actions to strive toward goals, resolve task demands, coordinate effort, and adapt to the unexpected – constitute team performance" (p. 49). In the context of action teams, where performance outcomes are often subject to unpredictable factors, performance behaviors

have been recognized as both indicators and mechanisms of effectiveness. Sundstrom (1999) writes that "a hallmark of action teams is the requirement for coordination among specialized roles" in which the supreme performance behavior *is* the synchronization one's own performance with those of counterparts (p. 21). Similarly, Kozlowski et al. (1996) discusses action team effectiveness as a function of team members' integration of individual tasks, roles, and goals to meet coordination demands and adapt coordination patterns to shifting situational contingencies. To summarize, effectiveness in action teams hinges on the team's enactment of critical teamwork behaviors – but what is the content and nature of these behaviors?

2.3 Team Processes in Action Teams

Performance behaviors such as coordinating, communicating, and monitoring are referred to as "team processes," defined as the interactions and interpersonal behaviors among team members that transform resources into valued outputs (Gladstein, 1984; Hackman & Morris, 1975; McGrath, 1964). Team processes differ from "taskwork" behaviors, defined as a team's interactions with tasks, tools, machines, and systems (Bowers, Braun, & Morgan, 1997; McIntyre & Salas, 1995) or what team members do to carry out their work. Whereas taskwork behaviors derive directly from team members' individual role specifications, team processes describe *how* team members' direct, align, monitor, and integrate their respective taskwork activities to achieve collective goals (Marks et al., 2001). Team processes are also distinguished from emergent states, defined as team members' shared attitudes, values, cognitions, and motivations. Although emergent states may lead to team behaviors (e.g., shared satisfaction may promote cooperative behavior) and vice versa (e.g., cooperative behavior may promote shared

satisfaction), because they contribute less directly towards the achievement of performance outcomes relative to team processes (Marks et al., 2001), I do not focus on them here.

Team processes include behaviors that facilitate task accomplishment such as strategizing, cooperating, coordinating, communicating, planning, monitoring, and adapting, as well as behaviors that facilitate the social climate, such as conflict management, emotional regulation, and motivation. The list of narrow and broad team processes in both the task and interpersonal domain is expansive, and several researchers have advanced typologies or taxonomies to identify key groups of team processes (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995; Marks et al., 2001; Salas, Sims, & Burke, 2005). Among these, I adopt the taxonomy of team processes provided by Marks et al. (2001) for several reasons. First, Marks et al.'s taxonomy is sensitive to temporal shifts in the goals and activities of teams over the course of time, which in fact matches the temporal structure of action team tasks, and thus constitutes an appropriate framework on which to ground a theory of time and team leadership (Morgeson et al., 2010). Second, it represents a highly comprehensive taxonomy in that its categories subsume many narrow and broad dimensions of team behavior (LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). Finally, a number of empirical studies (including a meta-analysis) have lent support to the structure and predictive validity of Marks et al.'s taxonomy (LePine et al., 2008).

Marks et al. (2001) define team processes as "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing taskwork to achieve collective goals" (p. 357). They categorize these

processes under three labels – transition processes, action processes, and interpersonal processes – on the basis of when they are likely to occur in the course of a performance episode. Performance episodes are defined as recurring yet distinguishable periods of goal-directed team work activity during which performance accrues and feedback is available (Marks et al., 2001), such as a flight or surgical case. Within the frame of a single performance episode, Marks et al. (2001) further propose that teams engage in two distinct patterns of goal-directed activity – one that is characterized by preparatory activities and the other by task execution activities. Marks et al. term the period of time when the team is primarily focused on "the evaluation and/or planning activities to guide their accomplishment of a team goal or objective" as the *transition phase*, whereas the *action phase* refers to the period of time when "teams are engaged in acts that contribute directly to goal accomplishment (i.e., taskwork)" (p. 360). Because the proximal goals of the two phases are distinct (i.e., goals of preparation and evaluation versus goals of execution), Marks et al. (2001) referred to team processes in service of preparation as *transition processes* and team processes in service of execution as *action processes.*

Appropriately, transition processes consist of activities that facilitate preparation, such as mission analysis (identifying and evaluating team tasks to be done), goal specification (identifying and prioritizing team goals), and strategy formulation and planning (developing courses of action and contingency plans). Action processes consist of activities that facilitate execution, such as monitoring progress towards goals (communicating information regarding the team's progress), systems monitoring (tracking team resources and environmental factors), team monitoring and backup behavior (assisting other members in the performance of tasks), and coordination

(synchronizing or aligning the sequence and timing of activities). Marks et al. (2001) theorize that the two sets of processes should relate to each other in that transition processes provides the architecture for effective engagement in action processes. Further, although the duration of the transition and action phases may vary by the type of team or task, transition phases and processes always precede action phases and processes in the performance episode. Finally, a central premise of Marks et al.'s (2001) taxonomy is that teams are more effective when they engage in the appropriate processes at the appropriate time (i.e., transition processes during the transition phase, and action processes during the action phase).

Marks et al. (2001) also addresses non-task related processes, termed "interpersonal processes" that operate across both transition and action phases to address the social maintenance needs of the team. Interpersonal processes consist of behaviors that manage the team and team members' emotions, resolve conflict, and build and sustain motivation. Although not directly related to task accomplishment, interpersonal team processes help to establish desirable outcomes such as positive attitudes and team viability (Marks et al., 2001). Because the literature on action teams has focused primarily on the salutary effects of task-oriented performance behaviors for ultimate performance outcomes, and because interpersonal processes may be more relevant for the effectiveness of long-standing rather than temporary teams, I do not include interpersonal processes in the criterion space of my model.

2.4 Time in Action Teams

The tasks of action teams are necessarily episodic. Sundstrom (1999) characterizes action teams as being temporarily composed for the purpose of a performance event, after which the team disbands and a new team is formed for the next performance event. As reviewed in section 2.3, within each performance event, action teams shift between periods of preparatory versus execution activities (Marks et al., 2001). In addition to this shift, however, temporal theories relating to teams suggest that the team is under flux in several other ways. Research has shown that key temporal dimensions affecting teams include the team task cycle and team development perspectives (Kozlowski & Ilgen, 2006), which I review below.

Team Task Cycle Theory

Theories belonging to the team task cycle perspective emphasize the notion that teams cycle through a range of task and team goals during a performance episode. Marks et al.'s (2001) work on transition and action phase structures falls within this realm, as do a number of others, such as Gersick's (1988, 1989) research on punctuated equilibrium, McGrath's theory of time, interaction, and performance (1991), and Kozlowski's dynamic theory of action teams (1996).

Gersick's (1988, 1989) research on punctuated equilibrium illustrates how cycles of low and high task intensity can be relevant to non-action teams. In samples of project teams, Gersick (1988) observed that the first half of a team's allotted task completion time was spent on strategy development and settling interpersonal issues. At the midpoint, however, time urgency became salient, and teams launched into a flurry of task activities focused on task execution. In the language of task cycles, it would seem that

project teams – much like action teams – experience an extended period of low task intensity followed by a period of high task intensity until project completion.

McGrath's (1991) theory of time, interaction, and performance also suggested that teams cycle through four possible modes during a performance episode – project inception, problem solving, conflict resolution, and project execution. During these modes, teams could allocate their attention and resources to fulfilling three functions – the production function (e.g., project execution), member growth function (e.g., the development of members' skills), or group maintenance function (e.g., building and sustaining cohesion and a collective identity). McGrath theorized that as teams cycled through each mode and function, their experience of task intensity – the extent to which team members' cognitive and attentional resources were consumed with the task – would rise and fall. Specifically, teams experience high levels of task intensity when they focus on functions relating to task production. According to McGrath (1991), these periods of high task intensity are taxing on team members' attentional and cognitive capacities, whereas periods of low task intensity occurring before, after, and between spouts of high task intensity permit team members to allocate resources toward other team functions, such as member-support and team well-being. Thus, by implication, periods of low task intensity are comparatively more "versatile" in the range of activities that can be done efficiently at that time (McGrath, 1991).

Kozlowski et al.'s (1996) dynamic theory of action teams integrates earlier notions of varying task demands and task intensity with the unique challenges associated with action team work, such as the unexpected events that may unfold during goal striving. Indeed, dramatic, cyclical shifts in task intensity and pace are hallmark and

typical occurrences for action teams (Kozlowski et al., 1996). When teams encounter unexpected events or disrupted routines in the course of task execution (Morgeson & DeRue, 2006), team members must actively adapt their interconnected system of roles and tasks simply to maintain coordination (Kozlowski et al., 1996; Kozlowski et al., 1999), which in turn correspond to high levels of task demands and task intensity. Even in the absence of unexpected or novel events, the time constraints faced by action teams during routine task execution requires a level of coordination that consumes team members' cognitive and attentional capacities.

In summary, the team task cycle approach emphasizes that, among other things, task intensity represents a fluctuating aspect of the internal environment of the team over time. Task intensity rises and falls depending on the type of activity the team is engaged in at a particular point in time. Periods of execution (Gersick, 1988), task production (McGrath, 1991), or the occurrence of unexpected events (Kozlowski et al., 1996), are associated with higher levels of task intensity compared to other periods of the performance episode. Further, when task intensity is high, team members' cognitive and attentional resources are consumed with meeting demands for active coordination, thus reducing the team's bandwidth to attend to non-task and non-urgent matters.

A Team Development Perspective

In contrast to team task cycle theory, which primarily describes cycling shifts occurring within a single performance episode, team development theories chart the trajectory of how teams qualitatively evolve over the team's lifetime – from a collection of individuals to a cohesive performing unit to its dissolution (Gersick, 1988; Kozlowski et al., 1999; Morgan, Salas, & Glickman, 1993; Tuckman, 1965). Although models of

team development vary with regards to the content and nature of stages and phases teams must pass through in their developmental trajectory, most models converge upon a common theme – that is, as teams increase in their maturity, ambiguities around the team task and social climate reduce in strength. Newly formed teams, for instance, have been described to be full of uncertainty, with pressing questions pertaining to the team task, individual roles within the task, and how team members should relate to each other on an interpersonal level (e.g., Kozlowski et al., 1999). Over time as the team increases in maturity, however, these task and social ambiguities are assumed to be resolved and uncertainty is reduced.

Unless these task and social ambiguities are resolved, however, teams cannot effectively coalesce into a performing unit. Tuckman's (1965) forming, storming, norming, and performing stage sequence, for instance, implied that norms with regards to task roles and interpersonal interactions must be established as precursors to performing. Gersick's (1988) punctuated equilibrium model observed that the first half of a team's lifecycle is devoted to establishing effective task and social norms, whereas the second half of the team's lifecycle is wholly devoted to task performance. Kozlowski et al.'s (1999) team compilation model suggests that individual team members' social identities and task competencies must be adequately resolved before dyadic role negotiations can occur and the team can function together as a dynamic network of roles and responsibilities.

The theme of resolving task and interpersonal ambiguities, both at the individual, dyadic, and team levels, also resonates with the newcomer socialization and adaptation literature. When entering a new environment, newcomers focus first and foremost on

sorting out interpersonal issues relating to identification with the group and gaining acceptance, after which the newcomer is able to devote attention to acquiring task skills and performing task responsibilities (reviewed in Kozlowski et al., 1996). Applied to the team setting, one can think of the members of a newly formed team as a group of newcomers (Moreland & Levine, 1988). A consistent story emerges between the team development and newcomer socialization literatures – teams evolve over time such that nascent teams experience stronger needs for the establishment of task and interpersonal norms compared to mature teams, and the failure to establish task and interpersonal norms prevents teams from developing into effective performing units.

Although team development models typically describe the trajectories by which teams evolve over their lifespan, researchers generally acknowledge that various team member factors or task factors may cause even mature teams to revert to earlier stages of development. Membership changes, for instance, may require team members to re-establish task responsibilities and the social structure in order to integrate newcomers (Chen, 2005; Chen & Klimoski, 2003; Moreland & Levine, 1988) or adapt to team member turnover (Arrow & McGrath, 1995). Shifts in task demands may also force team members to re-establish how individual team members' task actions relate in the larger network of roles and expectations to achieve seamless coordination (Kozlowski et al., 1999; LePine, 2003). Thus, depending on the team context, characteristics of team development models may also be applied to short periods of time in the team's lifespan, such as a single performance episode.

For action teams, both shifts in membership and task demands commonly occur between performance episodes (Sundstrom, 1999), creating a need for team members'

task roles and the interpersonal norms of the team (such as the social climate) to be re-established and re-negotiated at the start of each episode. Specialized and structured team member roles that generalize across teams and tasks can lessen the need to start from scratch (Sundstrom, 1999). Indeed, cockpit crews of U.S. airlines are able to gather together only minutes before taking off because each team member has thoroughly mastered certain standardized routines of doing things. However, how roles are to be integrated within the larger network throughout the performance episode, as well as any additional task-related idiosyncrasies, need to be updated and clarified early on to avoid subsequent lapses in coordination (Kozlowski et al., 1996). Furthermore, interpersonal norms must be re-established at the start of each performance episode in order for team members to feel sufficiently committed to the team and task and for the team to develop into a cohesive functioning unit.

Integration of Temporal Factors

Taken together, dominant theories of temporal factors in teams suggest that several shifts in team needs and functioning occur within the span of a performance episode. The Marks et al. (2001) dual phase framework suggests that action teams progress through two distinct phases – transition, followed by action. Team task cycle theories suggest that shifts in task goals can create periods of low and high task intensity, which in turn influences shifts in the range of activities team members can reasonably enact throughout the performance episode. Team development theories suggest that team members' needs for clarification of task and social ambiguities are stronger at earlier rather than later points in the performance episode. What do these theories collectively

suggest about the shifts action teams are likely to experience as they progress through a performance episode?

As discussed previously in this section, the workflow of action teams is highly structured. Action teams follow a two-part structure akin to Marks et al.'s (2001) transition-action phase framework in which the team first strategizes and prepares, after which the team carries out and executes those strategies. The team task cycle perspective can be integrated into this framework, such that shifts from transition to action determine the levels of task intensity experienced by the team. Gersick (1988, 1989), McGrath (1991), and Kozlowski et al. (1996) acknowledge that activities associated with task execution and production (i.e., action processes in the action phase) have higher requirements for coordination, cognitive demand, and pacing. Unexpected events arising during task execution may require the team to adapt both their patterns of interaction and also their overall strategy for task execution (Kozlowski et al., 1999), thus further increasing the task intensity associated with the action phase. Comparatively, times of non-production, such as periods associated with task preparation (i.e., transition processes in the transition phase), are relatively more routine, relaxed in pace, and less cognitively demanding.

The team development perspective can also be integrated into the transition-action framework. Because the transition phase marks the point of team formation and typically spans the period of time between the start of the performance episode until the beginning of task execution (Marks et al., 2001), the uncertainty around task and interpersonal ambiguities are at their highest (Morgeson et al., 2010). Likewise, as teams gain greater familiarity with the task and each other over time, these uncertainties are resolved. Team

development needs around the task and social climate thus become less pronounced in the action phase.

In summary, integration across these temporal theories suggests that the transition phase is marked by a period of preparatory processes, lower task intensity, and higher team development needs. In contrast, the action phase is marked by executionary processes, higher task intensity, and lower team development needs. Cumulatively, these temporal factors cause the internal environment of the team to be qualitatively different in the transition versus action phases, as illustrated in Table 1.

2.5 Leadership in Action Teams

Leadership is well-established as a key variable influencing the functioning of teams, particularly with regards to setting team processes in motion (Burke et al., 2006; Day et al., 2004; Mathieu et al., 2008; Sundstrom, 1999; Zaccaro, Rittman, & Marks, 2001). This is especially true in action teams, in which a single individual exerts a disproportionate level of influence over other members by virtue of his or her elevated status in the team hierarchy and task expertise (Depret & Fiske, 1993; Kozlowski et al., 1996; Nembhard & Edmondson, 2006). To determine what types of team leader behaviors are most relevant and effective in the action team context, it is important to consider both general leadership theory as well as the unique aspects of the action team context (Kozlowski & Ilgen, 2006).

General leadership theory has evolved significantly over the past century (as reviewed in Bass, 1990). Notions of leadership began with “great man” theories in the 1900s, in which leadership ability was somehow vested within specific, elite individuals of superior character. The focus on abilities evolved into a quest in the 1940s to identify a

set of universal traits that were common to all leaders. When no consensus around traits was reached, leadership research became behaviorally focused. In the 1950s, scholars worked toward the goal of uncovering a set of behavioral patterns that resulted in effective outcomes. The behavioral approach to leadership has flourished into the present, with much of the current work on leadership revolving around identifying leader behaviors that increase effectiveness in various settings.

The behavioral perspective also represents the dominant approach to understanding leadership in teams, with the recognition that contingencies relating to the task, team, or context, may strengthen or weaken the impact of specific leader behaviors on outcomes (Burke et al., 2006). Team leadership behaviors generally belong to two meta-categories – task-focused (behaviors dealing with task accomplishment) and person-focused (behaviors facilitating team interaction and or team member development (Burke et al., 2006). This high-level dichotomy has echoed throughout other existing leadership classification systems – task oriented versus relations oriented (Fiedler, 1967), production focused versus relations focused (Blake & Moulton, 1964), and initiating structure versus consideration (Fleishman, 1953). While a number of leader behaviors are subsumed within the task- or person-focused categories of leadership, not all are relevant to the context of action teams. Below, I pinpoint three leader behaviors – directive, coaching, and relating – as being especially important for promoting effective team processes in action teams.

Of the task-focused leader behaviors, initiating structure – or directive leadership – has been explicitly featured in action team research as a form of leadership that facilitates effectiveness (Cooper & Wakelam, 1999; Klein et al., 2006; Parker, Yule, Flin,

& McKinley, 2011; Xiao, Seagull, MacKenzie, Ziegert, & Klein, 2003; Yun et al., 2005). Directive leadership involves setting clear expectations, providing specific instructions, and monitoring team members' progress within the leader's structured plan. Directive leaders not only define and structure their own role in the task plan but also the roles of others by assigning, coordinating, and correcting others' tasks and actions, all the while maintaining a centralized source of information and power in the leader (Bass, 1990). Directive leadership has been found to facilitate team processes in action teams because it inserts structure and dispels the uncertainty felt by team members about their task roles. This is especially important when the team encounters novel, unpredictable, or urgent events in the course of task accomplishment. Indeed, in a qualitative investigation of leadership in trauma teams (Klein et al., 2006) and in a scenario study involving trauma team members (Yun et al., 2005), leaders' direct interventions tended to be especially helpful for team functioning when the team was inexperienced and the patient's state was critical.

Person-focused leadership behaviors facilitate the development of team members and/or team relations (Burke et al., 2006). With regards to developing team members, coaching leadership is most relevant in action team settings (Parker et al., 2011). Coaching behavior involves instructing and providing relevant information and constructive feedback to develop team members' task skills and competencies (Kozlowski et al., 1996). I explicitly focus on task-oriented coaching (the development of team members' task competencies and task knowledge) as opposed to interpersonal coaching (the development of team members' interpersonal skills) based on prior research suggesting that interpersonal coaching does not relate strongly to team

performance (Hackman & Wageman, 2005). Because of this focus on task competencies, my conceptualization of coaching can also be considered a form of task-focused leadership behavior.

Coaching is considered an effective leadership behavior in action teams because novel task elements anticipated and encountered during the task require on-the-job skill development for team members. Coaching is also an effective means of helping team members grow along their own skill development trajectory (Kozlowski et al., 1996; Kozlowski et al., 1999). Indeed, both a qualitative (Klein et al., 2006) and quantitative (Yun et al., 2005) investigation of leadership in trauma teams revealed that leaders' instructional approaches were especially helpful for achieving members' learning and development goals. Edmondson (2003) also found that team leader coaching facilitated learning behaviors in a sample of cardiac surgery teams.

With regards to promoting team relations, consideration – or relating leadership – is described as leader behaviors that build close social relationships and cohesion in the team (Bass, 1990). Relating leader behaviors exhibit concern for team members' emotional needs, demonstrate appreciation and support for team members, and facilitate positive interpersonal connections between the leader and team members as well as among team members themselves. Although not explicitly task-focused, relating leadership can promote team functioning by establishing a social climate that increases psychological safety – a willingness to be vulnerable and take interpersonal risks with the group – among team members (Edmondson, 1999). Psychological safety, in turn, promotes team members' willingness to engage in critical team processes that, at times, can be interpersonally risky (Edmondson, 2003; Nembhard & Edmondson, 2006).

Psychological safety is especially needed to facilitate team processes in hierarchical settings where power distance barriers can cause team members to silently accomplish their individual tasks without engaging with the leader or team. Indeed, a qualitative study involving 16 surgical teams, Edmondson (2003) found that leaders who created an open environment and advocated for teamwork increased team members' willingness to speak up, which in turn enabled successful team learning. Also, in a survey study of neonatal intensive care units, Nembhard and Edmondson (2006) found that leader inclusiveness (defined as words and deeds of the leader that indicated an invitation and appreciation for others' contributions) positively influenced lower status members' perceptions of psychological safety, which in turn increased learning.

Although I focus on directive, coaching, and relating behaviors in my theoretical model, I acknowledge that other, related forms of task- and interpersonal-oriented leader behaviors exist and have been shown to lead to effectiveness in other team settings. I do not position directive, coaching, and relating behaviors as being separate from these broader, general forms of leadership, but rather argue that they represent specific elements of leadership that are most relevant to action teams. Transactional leadership, for instance, is a popular form of task-focused leadership, in which the leader provides rewards and withholds punishment from subordinates and/or team members who comply with role expectations (Burns, 1978). Based on this definition, transactional leadership subsumes the use of directive leader behaviors, where expectations around team members' contributions are outlined clearly by the leader. However, other aspects of transactional leadership are perhaps more relevant where leaders – like supervisors – act as gatekeepers of rewards and punishment. In action teams, however, the influence of

leaders stems primarily from their "expert power" as opposed to having "coercive power" (French & Raven, 1959). As such, directive forms of task-focused leadership are more relevant than transactional forms in the action team context.

Another popularized form leadership is transformational leadership, a set behaviors that move followers beyond self-interest through idealized influence, inspiration, intellectual stimulation, or individualized consideration (Bass, 1998) and transforms followers' motivational states to higher level needs, such as self-actualization (Burns, 1978). Although transformational leadership relates strongly to indicators of team effectiveness in many team settings (Burke et al., 2006), I do not include it in my model for several reasons. First, aspects of transformational leadership – such as individualized consideration and intellectual stimulation – capture similar behaviors to coaching or reflect approaches to coaching. Other aspects of transformational leadership, such as idealized influence and inspiration, are less relevant because the goals, missions, and tasks of action teams are highly structured (Kozlowski et al., 1996), with little need for embellishment, interpretation, or vision casting. Further, although leaders can certainly be charismatic, their influence on the team is tied to their task expertise rather than their charisma.

Similarly, empowering leadership refers to actions that emphasize the development of follower self-management and self-leadership skills, and are based in theories relating to behavioral self-management, social cognitive theory, cognitive behavior modification, and participative goal setting (Manz & Sims, 1976). Empowering leadership consists of two dimensions, one in which leaders delegate authority and responsibilities to team members, and one in which leaders develop team members so

that they are capable of self-management (i.e., coaching). I do not focus on the former because the skill and expertise distribution across roles in action teams does not allow the leader's authority and responsibilities to be fully delegated to other team members. For instance, the captain of the plane cannot delegate flying the plane to an airline steward. Similarly, only the surgeon can wield the knife. From their position of expertise, however, leaders can coach team members to develop their understanding of the task and their specific role responsibilities, which in turn facilitates their ability and effectiveness in carrying out those tasks.

In summary, within the dichotomized meta-categories of task-focused and person-focused leader behaviors, directing, coaching, and relating constitute three distinct forms of leader behavior that are most relevant for promoting effective functioning in action teams.

2.6 Temporal Contingencies of Team Leadership Impact

Having established directing, coaching, and relating as being generally facilitative of team processes, I now consider their impact with respect to temporal factors and their differential impact across phases of the performance episode. Indeed, given that team task goals, task intensity, and developmental needs shift dramatically from one phase to the other within a performance episode (recall Table 1, presented in section 2.4), we might expect that certain leader behaviors will be more important for stimulating transition processes in the transition phase, while others may be more important for stimulating action processes in the action phase.

Functional Leadership Theory

Functional leadership theory provides a helpful means to understanding why temporal contingencies may strengthen or weaken the impact of team leadership on team members' contributions. Functional leadership theory emerged from McGrath's insight that the leader's "main job is to do, or get done, whatever is not being adequately handled for group needs" (1962: 5). The central idea behind functional leadership theory is that the effectiveness of any range of leader behaviors depends on how "fitting" those behaviors are for meeting team needs at a particular point in time. The notion of functional leadership has received substantial theoretical attention (Burke et al., 2006; Day et al., 2004; Hackman & Walton, 1986; Morgeson et al., 2010; Zaccaro et al., 2001), and some empirical evidence supports its tenets (Morgeson, 2005; Morgeson & DeRue, 2006). Morgeson (2005), for instance, found that leader's preparatory guidance and coaching was most effective for teams who encountered novel events because coaching fulfilled the function of preparing the team to autonomously respond to the event. In contrast, leader's active coaching interventions (described as directive approaches that usurped team autonomy) were most effective for teams that encountered disruptive events, when team members were unable to manage the events on their own.

Functional leadership theory can also be extended to understand how leaders' behaviors impact outcomes at different points in time within the same performance episode. Specifically, taking into account temporal contingencies, I expect that the impact of team leader directive, coaching, and relating behavior on team members' contributions depend heavily on how they "fit" the internal context of the team in the transition versus action phase.

Predictors of Team Transition Processes

As summarized in section 2.1, the transition phase is marked by preparatory activities, lower task intensity, and stronger team developmental needs. Considering the functionality of the three leadership behaviors – directing, coaching, and relating – during the two temporal phases, I expect coaching and relating leadership to relate positively to team members' transition processes.

Because team members' needs for clarification of task ambiguities are stronger in the transition phase, coaching behaviors are likely to be particularly "functional." Through instruction and skill development, coaching provides team members with a more holistic understanding of the task, which in turn increases team members' understanding of *how* they can contribute and prepare successfully for the task (Kozlowski et al., 1996; Kozlowski et al., 1999). In doing so, coaching leadership enacted in the transition phase resolves team members' task ambiguities arising from developmental needs, which in turn reduces team members' uncertainty and increases their ability and motivation to participate in transition processes. Consistent with this, in their temporally relevant functional leadership theory, Morgeson et al. (2010) noted that team leadership behaviors reducing task ambiguity in the transition phase are likely to be particularly helpful in facilitating critical preparatory processes among team members.

Also from a team developmental perspective, Kozlowski et al. (1996) theorized that at early phases of development, team members are likely to be particularly focused and receptive to information provided by the team leader that increases their understanding of how to accomplish tasks or clarifies their formal role within the system. Similarly, in Hackman and Wageman's (2005) theory of team coaching, the authors

propose that coaching behaviors associated with getting team members acquainted to the task are most functionally applied early on in the task cycle because task orientation issues are most relevant to team members at that time. Although directive leadership behaviors also address team members' task ambiguities by providing structure, directive behaviors primarily centralize information and decision power within the team leader (DeRue et al., 2010), constraining team members' full understanding of the meaning or reasoning behind the directives. As such, the disambiguating function of directive leadership – and subsequently, its effectiveness in promoting team members' transition processes – is likely to be limited. Supporting this, Yun et al. (2005) found that empowering (coaching) leadership was considered more effective than directive leadership in facilitating team member learning when the team was less experienced (i.e., task developmental needs were stronger).

Paralleling heightened needs for clarification of task ambiguities, team members' needs for clarification of the social space are also strong in the transition phase. From a team development perspective, relating leader behaviors are likely to be particularly "functional" by establishing a positive social climate and helping to orient team members to each other on a relational level, thus resolving team members' interpersonal ambiguities. Consistent with this, Morgeson et al. (2010) noted that social climate supporting leader behaviors (akin to relating leadership) are particularly helpful in jumpstarting team member motivation and cohesion. Also from a developmental perspective, Kozlowski et al. (1996) advocated that leaders should engage in actions early on that explicitly define the social space, such as creating informal opportunities for open communication, modeling self-disclosure, and facilitating conversation regarding non-

work interactions. Kozlowski et al. (1996) highlighted that because such relational exchanges can sometimes be unnatural among unfamiliar team members, leader modeling of these behaviors is especially needed to help set the tone and facilitate the process among team members. Hackman and Wageman (2005) also affirmed the importance of engaging in relational aspects of coaching behavior early on because team members' needs for social orientation are strongest at that time.

From a task intensity perspective, both coaching and relating are likely to be most functional when they occur in the transition phase because they provide team members with developmental opportunities to shape their own task actions and orient team members to the social space *at a time when team members have the cognitive and attentional resources to do so*. As discussed previously, the transition phase is marked by a time of lower task intensity, which in turn, increases team members' resources to attend to matters that are non-urgent (Kozlowski et al., 1996), such as the development of team members or attending to social maintenance functions of the team (McGrath, 1991). The excess attentional resources afforded by lower task intensity in the transition phase are likely to render team members more attuned and responsive to team leaders' coaching and relating leadership. Indeed, Kozlowski et al. (1996) noted that team leader instructing functions are best employed during times of low task intensity because the effectiveness of such actions depend on team members having excess resources to build coherence on goals, strategies, and role expectations, and translate leader instruction into productive team processes. Similarly, Hackman and Wageman (2005) discussed a team's "readiness" to respond to leader interventions as being a function of, a) the degree to

which the issues addressed are on members' mind at the time of intervention, and b) the degree to which the team is not preoccupied with more pressing or compelling matters (p. 275). Therefore:

H1: Team leader coaching behavior is positively related to team transition processes.

H2: Team leader relating behavior is positively related to team transition processes.

In addition to exerting direct effects on team transition processes, there is reason to expect that the two leadership behaviors may interact in a synergistic manner, such that leaders who use high levels of coaching *and* relating behavior may achieve higher gains than either approach alone. Indeed, several leadership frameworks discuss the possible effectiveness of a "high-high" leader who combines a task and interpersonal approach in interactions with subordinates (e.g., Blake & Mouton, 1964; Fiedler, 1971; Hersey & Blanchard, 1977; House, 1971).

The situational leadership framework introduced by Hersey and Blanchard (1977), for instance, discuss a form of "selling" leadership in which the leader achieves a high task focus and high relationship. They argue that supplementing task with relational approaches increases followers' motivation and willingness to be influenced by the leader. Similarly, the "managerial grid" introduced by Blake and Mouton (1964) argued that maximum leadership effectiveness occurs only when the leader integrates both human and task requirements of the job. Leaders who are exclusively task-focused are seen to treat followers as "machines," lowering their commitment, growth, and motivation, whereas leaders who are exclusively person-focused are viewed as running a "country club" to the detriment of productivity (Bass, 1990).

The notion that relating leadership can promote the leader's influence over the team relates to Hollander's idiosyncrasy credits theory of leadership (Hollander, 1971). The theory suggests that leaders who earn many credits from followers early on are afforded greater latitude in exerting influence on the group. Idiosyncrasy credits – defined as "positive impressions of a person held by others" (Hollander, 1958) – can be earned when leaders develop positive relationships with the team. In other words, leaders who relate early on accumulate idiosyncrasy credits that actually *increase* the task influence they have over followers (Hollander & Julian, 1970). Thus, the effects of coaching on team members' engagement in transition processes may become magnified in the presence of relating leadership, because the group believes that whatever the leader suggests is in the best interest of the group (Hogg, 2001; van Knippenberg & Hogg, 2003).

Research on learning in action teams also points to a possible interaction effect between coaching and relating. Because of status hierarchy in action teams, low status team members are sometimes reluctant to engage in interpersonal risky behaviors, such as learning (Edmondson, 2003; Nembhard & Edmondson, 2006). This suggests that even if leaders engage in coaching – a behavior that is focused on developing team member's skills – team members may not enact learning process behaviors out of fear that they will be penalized if they make mistakes or expose their lack of knowledge or skill (Edmondson, 1999). Rather, a sense of psychological safety – or a shared sense of interpersonal trust among team members – is necessarily to promote learning in such settings. Relating leadership thus plays an important role in facilitating the salutary effects of coaching by providing a positive social climate in which team members can

safely engage in learning processes. Indeed, in a study involving cardiac surgery teams, Edmondson (2003) found that leaders who used a mixture of coaching and relating with the team promoted the greatest levels of team processes and learning. Thus:

H3: Team leader coaching and relating behavior interact such that the positive relationship between team leader coaching behavior and team transition processes is stronger when team leader relating behavior is higher.

Predictors of Team Action Processes

As summarized at the end of section 2.1, the action phase is characterized by task execution activities, higher task intensity, and weaker team development needs. In these circumstances, coaching and relating are less likely to facilitate team action processes, as the high task intensity associated with task execution stretch team members' resources just to maintain coordination (Kozlowski et al., 1996). In fact, heightened task intensity during the action phase may preclude team members from capitalizing on the team leader's developmental or relational attempts, rendering coaching or relating leadership to be less effective as team members' information processing capabilities and cognitive resources are consumed with task execution demands (Hackman & Wageman, 2005).

Under such circumstances, directive leader behaviors may be more functional. Especially when the action phase is punctuated by abrupt, novel, or unanticipated situational changes that team members are not equipped to address, Kozlowski et al. (1996) theorized that team leaders must engage in directive interventions to recover shared understanding and facilitate team survival. Directive approaches that simplify individual team members' tasks and provide specific and explicit direction can help to reduce information load on the team (Kozlowski et al., 1996) and subsequently increase

team members' ability to engage in team action processes. Indeed, Morgeson (2005) also found that active intervention attempts of external leaders (i.e., directive leadership) to regulate the team were perceived as more effective under disruptive conditions (i.e., high task intensity). Yun et al. (2005) found that directive leadership was considered by trauma teams to be more effective than empowering (or coaching) leadership in facilitating high quality healthcare when patient injuries were more severe (i.e., task intensity was higher). Tschan et al. (2006) found that directive leadership enhances performance when tasks were time sensitive. Thus:

H4: Team leader directing behavior is positively related to team action processes.

My theoretical arguments have thus far isolated leader behavior as primarily impacting team processes that occur contemporaneously in the same temporal phase. However, in reality, behaviors enacted early on are likely to have cascading effects, such as the spillover effect between team transition and team action processes. From a team development perspective, the way team members work together to combine their respective task inputs early on establishes a norm that determines how team members will work together for the rest of the performance episode. For instance, team members who openly share information about the task, actively coordinate task actions, and provide each other with updates are likely to continue in this fashion, even as task goals shift from preparation to execution. Indeed, Gersick (1989) found that project team members' initial interaction patterns endured throughout the first half of their task, and Ginnett (1993) also found that what happened during airline crews' pre-flight briefings shaped team members' behaviors thereafter.

Further, from a temporal team process perspective, a core tenet of Marks et al.'s (2001) dual-phase framework is that preparatory actions developed in the transition phase are implemented and carried out in the action phase. Thus, the implicit dependency between the two phases suggests that team members who generate more effective plans in transition are likely to execute those plans more effectively in action. As Hackman noted (2002), strong preparation prior to task engagement can be analogized to laying a solid foundation for a building. As Mathieu and Rapp (2009) aptly put it, "If teams lay down a solid foundation, they are poised to work effectively. If they fail to establish such a foundation, they are likely to encounter process losses later on" (p. 90).

This hierarchical order between transition and action is mirrored in the idea of goal generation followed by goal striving in Kanfer and Ackerman's (1989) theory of motivation. Relatedly, Chen and Kanfer's (2006) argued that goal generation processes create the architecture that energizes and guides more effective task action. Collective goal generation as a team process, in particular, is posited to facilitate the horizontal and vertical alignment of individual and team goals (Chen & Kanfer, 2006), essentially establishing the necessarily role structure needed to successfully coordinate the complex task goals of action teams (Kozlowski et al., 1996; Kozlowski et al., 1999). Lending empirical support to the relationship between preparatory and task engagement activities, LePine et al.'s (2008) meta-analysis found a positive, robust relationship between transition and action processes, and Mathieu and Rapp (2009) found that teams that developed higher quality performance strategies tended to achieved more positive performance trajectories. Thus, I hypothesize the following cascading hypothesis:

H5: Team transition processes are positively related to team action processes.

The broader implication associated with hypothesis 5, in conjunction with hypotheses 1, 2, and 3, is that leaders who engage in greater coaching, relating, and the combination of the two will set in motion team transition processes that in turn spillover into team action processes. This expectation is supported by team development theories suggesting teams can more effectively integrate each others' efforts toward a collective outcome when task and interpersonal ambiguities are resolved early on (Tuckman, 1965). Kozlowski et al. (1999) also notes that individual skills and interpersonal knowledge must first be developed and clarified as a foundation before more complex linkages among team members' roles can form and function as a performing team. In other words, when coaching and relating behaviors effectively resolve these task and interpersonal ambiguities in the transition phase, teams achieve better contemporaneous functioning (i.e., team transition processes) and subsequent functioning (i.e., team action processes) because of the enduring nature of patterns of team interaction established early on. Thus:

H6: The positive indirect relationship between team leader coaching behavior and team action processes is mediated by team transition processes.

H7: The positive indirect relationship between team leader relating behavior and team action processes is mediated by team transition processes.

H8: The moderating effect of team leader relating behavior on the relationship between team leader coaching behavior and team action processes is mediated by team transition processes.

A visual illustration of these proposed relationships is displayed in Figure 1.

CHAPTER 3: METHODOLOGY

3.1: Setting

Surgical teams constituted the ideal setting to test my theory because of the strong leadership effects in this context, as well as the clear transition then action phase temporal structure to which all teams conformed. The data used for this dissertation was collected as part of a larger collaborative effort between a healthcare consulting company and a hospital system located in the mid-Atlantic region of the United States. The purpose of the collaboration was to assess the impact of the Crew Resource Management Training program on the teamwork and communication of operating rooms teams, as well as on the larger culture and climate of the hospital system. The collaborative research project was approved by the hospital system's internal IRB (Institutional Review Board) process as well as by the IRB board of the University of Maryland (Appendix A). Data collected as part of this project involved assessing the culture and climate of the hospital system via a system-wide survey, assessing training outcomes, and conducting behavioral observations of a random sampling of surgical teams across the five hospitals. These behavioral observations provided opportunities to pilot measures for this study and constituted the data for testing my theory.

The hospital system was composed of five hospitals. Within each hospital, observations were made within the same day surgery unit (also referred to as the Main Operating Room Unit), as well as in the ambulatory surgical center, labor and delivery surgery unit, and obstetrics and gynecology surgery unit. The surgical teams observed were typically composed of four team members. The leader of the team is the *surgeon,* who determines the strategy of the procedure and performs the technical intricacies of the

operation. The *scrub nurse* organizes the relevant instruments and equipment to be used during the operation, maintains their sterility, and hands them to the surgeon to be used at the appropriate time. The *circulating nurse* documents details of the procedure and corresponds with external individuals for the exchange of information and resources. The *anesthesiologist* assesses the appropriate anesthetic to be given to the patient during the operation and monitors the patients' vital signs throughout the operation. In more complex cases, additional team members may be included. Cases in which multiple hands are needed to perform the procedure typically include a *surgical assist* who helps the surgeon by holding imaging devices or other positioning instruments in place during the operation. Teaching cases sometimes involve *residents* who perform parts of the operation while being coached and monitored by the surgeon. Orthopedic and spinal surgery cases in which medical screws, pins, or plates are implanted in the patient's body often involve *manufacturer representatives* who help to advise the surgeon on the type of equipment to be used.

3.2 Measure Development and Piloting

To test my theory in this setting, the observational method provided several distinct advantages. First and foremost, it allowed data to be collected in real time, capturing the ebb and flow of leadership and teamwork behaviors as they dynamically emerge over time. Second, it assessed the impact of leadership on teamwork behaviors as the phenomenon unfolded, rather than using team members' ratings after the fact that may be subject to hindsight or recall bias. Third, behavioral observation enabled data collection from a live, team setting with minimal intrusiveness. Relating to this point, surgical teams are frequently observed by external accreditation organizations, medical

instrumentation representatives, and medical students. Thus, although team members are aware that an observer is in the room, they have become accustomed to carrying out their task as if the observer was not there.

The study involved two phases of data collection. The first phase consisted of 80 pilot observations that occurred in July and August of 2010. The purpose of these pilot observations was to increase my familiarity and understanding of surgical procedures, routines, and medical jargon, as well as to observe the types of leader behaviors and team member interactions likely to be relevant in this context. In these observations, I dressed in surgical attire and typically stood 10 feet or so away from the patient, which allowed me to see and hear the interactions of all team members (see Figure 2).

In 20% of the pilot cases, a subject matter expert (SME) who was blind to the purpose of this study accompanied me to increase my understanding of the context and interpretation of behavior in the operating room. In his former career, the SME worked as an orthopedic surgeon and thus was well-versed in the context of the operating room. In his current career (and at the time of data collection), the SME worked as the keynote instructor of the Crew Resource Management program for the healthcare consulting company and thus was also knowledgeable about the teamwork behaviors necessary for effectiveness in the operating room. Coaching sessions would typically involve the SME and myself independently coding team behaviors, and then discussing our ratings afterwards to address any discrepancies or idiosyncratic frames of reference.

During the pilot phase, I developed three observational tools to capture leadership and team processes in this context. The first was an *interaction matrix* akin to Bales' (1950) interaction process analysis technique, in which each team members' behaviors

could be coded as they were verbalized. Using definitions of directing, coaching, and relating leader behavior determined a priori, the interaction matrix made it possible to capture how frequently surgeons engaged in each behavior over the course of the performance episode. Similarly, using definitions of transition and action processes, the observer could also code for how frequently team members engaged in those processes over the course of the performance episode. Ultimately, for each phase (transition and action), it was possible to determine the overall quantity of leader and teamwork behaviors enacted, as well as the rate that those behaviors occurred.

The second tool was a set of *teamwork checklists* capturing team members' use of teamwork behaviors that were critical for promoting high reliability and patient safety in surgical teams (adapted from Weaver et al., 2010). These behaviors corresponded well to the transition and action processes as defined by Marks et al. (2001), such as the content of the briefing in transition, or the use of feedback in action. Other behaviors were specific to the operating room context, such as the use of "red flag statements" during transition signals a heightened awareness to communicate concerns for patient safety, or the use of "check backs" during action to ensure that technical orders were heard correctly. Two forms of the teamwork checklist and their accompanying coding schemes were created for the transition and action phases, respectively. Both the content and coding of the checklists were iteratively improved through discussions with the SME over the course of the pilot observations.

The third tool was a short post-procedure questionnaire for team members, consisting of single item questions around characteristics of the team, the complexity of the case, evaluations of how well the team worked together at different points in the case,

and the surgeon's interaction with team members during the case. The purpose of the post-procedure questionnaire was to triangulate the observation data with team members' own impressions.

3.3 Sample and Procedure

Once the three-part observational protocol was finalized, data collection for the main study ensued in February of 2011 (during which 50 cases were observed) and June of 2011 (during which 33 cases were observed). The data for all 83 cases were recorded by a single observer (myself), among which 17 cases were recorded by two observers (myself and the same SME from the pilot phase, who was blind to the hypotheses of this study) for the purpose of establishing inter-rater agreement and reliability around the core measures in the observation protocol. These inter-rater indices are reported in the measures section.

Examples of the 83 cases that were observed included: cesarean sections, hysterectomies (removal of uterus), breast biopsies, cataract surgery, appendectomy (removal of appendix), cholecystectomy (removal of gall bladder), wound debridement (removal of dead or infected tissue), tonsillectomy (removal of tonsils), thyroidectomy (removal of thyroid), and inguinal hernia repair. Each of these cases followed a similar timeline as that shown in Figure 3. Just as in the pilot observations, each observation began with the observer introducing him or herself to the surgeon, nurses, and at times, the patient, prior to the case. A typical introduction was, "Hello! I'm from [healthcare consulting company name], and I'm here to observe how you all work together and communicate during the case. Would it be okay if I observed your next case?" Once permission to observe was granted, the observer would enter the operating room, find a

spot about 10 feet away from the patient that would allow him or her to observe unobtrusively, and begin filling out the observation protocol.

According to Marks et al.'s (2001) dual-phase temporal framework, the transition phase reflects the period of preparation that occurs prior to task execution in the action phase. My pilot observations revealed that team members used this time of preparation in a distributed manner. Some members prepared the instrumentation in the operating room; others transferred materials in and out of the room; yet others talked to the patient and verified their consent. In other words, the team does not fully come together and prepare for the procedure as a team until the surgeon arrives in the room. Thus, the beginning of the transition phase was marked as the time of surgeon arrival.

After surgeon arrival, the team continues to prepare for the case, which involved moving the patient into position for the procedure, anesthetizing the patient, verifying the instrumentation and implants to be used, and conducting a final briefing about the case and expectations for action. All these activities are representative of transition processes, and throughout this period of time, the observer would record the interactions among the team leader and team members using the interaction matrix. During the briefing, the observer would also rate the extent that team members covered the behavioral contents associated with the transition phase portion of the teamwork checklist.

Once everything was in place, team members take their respective positions around the patient and the room, and the procedure would begin. The start of the procedure was typically announced loudly by a team member, along the lines of, "We have incision!" Given that the procedure is the heart of the action phase – i.e., a period of the performance episode where team members work together to execute upon previously

agreed upon plans (Marks et al., 2001), skin incision also signified the start of the action phase. During the procedure, the surgeon and select team members work to cut to the location of the surgical procedure, execute the mission of the procedure (i.e., the crux), and then close up each layer of the wound. In a cesarean section, for instance, substantial time is spent cutting through the layers of the fascia to reach the uterus. The crux of the procedure, however, is actually opening the uterus, extracting the newborn, and handling the placenta and cord blood. Afterwards, time is spent sewing back layers of the uterus and fascia and ultimately the top layer of skin. Thus, depending on how complex or invasive the procedure is, the duration of the procedure could be elongated substantively.

Paralleling skin incision, wound close signified the tail end of the action phase, after which the team worked to prepare the patient for exiting the operating room. Between skin incision and wound close, the observer recorded the interactions among the team leader and team members using the interaction matrix, and also rated the extent that team members enacted the behavioral contents associated with the action phase portion of the teamwork checklist. Finally, as team members exited the room, the observer found an opportune time to ask as many team members as possible (including the surgeon) to fill out the short post-procedure questionnaire. As team members are often rushing off to tend to the next case or see the next patient, it was not always possible to get everyone's responses. Surgeons, in particular, sometimes left the room before the case was finished or refused to take the time to respond.

In summary, as seen in Figure 3, transition phase marked the time from when the surgeon entered the room until the moment of incision, and the action phase marked the time from when incision occurred until wound close. On average, transition phases lasted

anywhere from 1 minute to 62 minutes in duration, with a mean of 16 minutes and a standard deviation of 9 minutes. On average, action phases lasted anywhere from 5 minutes to 202 minutes in duration, with a mean of 49 minutes and a standard deviation of 39 minutes.

3.4 Final Sample

Although data was collected for 83 cases, only 66 were usable cases in which complete data was available for all measures discussed below. Incomplete data was due to a number of reasons, including a) the observer feeling faint and leaving halfway through the case, b) the observer was asked by the surgeon or another team member to leave halfway through the case, and c) there was no opportune time to ask the surgeon or other team members to answer the post-procedure questionnaire, which led to missing data. Of these 66, an additional 8 exceptionally short cases were selected to be removed from the analysis. These cases had an actual procedure time lasting less than 10 minutes, were non-invasive and sometimes non-surgical procedures altogether. Examples included exploring the esophagus with a camera, removing a small mass on the toe, manipulating a shoulder, removing a cyst from the eyelid, removing a tube, injecting botox, etc. Because these cases required much less team interdependence and coordination compared to surgical cases that were longer in duration and more invasive, these cases were excluded from the analyses. A final sample size of 58 cases was retained for analysis.

Table 2 compares the means and standard deviations of core variables across cases that were and were not included in the analyses. A one-way MANOVA test showed that there was no significant difference between included and excluded cases on the core variables, $F(1, 81) = 1.03$, $p = .42$; Wilk's $\lambda = 0.90$, partial $\varepsilon^2 = .10$. Furthermore, t-tests

comparing the means of variables in included versus excluded cases did not reach significance.

3.5 Measures

Directive Leadership

In following with traditional operationalizations, directive leadership was assessed as the extent to which leaders structured and monitored team members' task roles (Bass, 1990). Using the interaction matrix discussed above, I aggregated the frequency of directive behaviors within the transition phase and action phase, respectively. Further, because longer transition and action phases allowed for greater opportunity to engage in leader behaviors, I corrected for time duration by calculating the *rate* of leadership (i.e., frequency of leader behavior divided by phase duration in minutes). This rate measure thus reflected the intensity with which the leader engaged in a particular behavior.

Directive leadership in each phase was operationalized as the rate of specific commands initiated by the surgeon that directed or corrected team members' task actions. Examples in the transition phase included, "(To the anesthesiologist) Bring the bed up higher, please," and "(To the circulator) I want you to prep the patient's right leg only." Examples in the action phase included, "(To the surgical assist) Hold this here and don't move it until I tell you to," "(To the scrub) Don't give me those retractors – give me the other ones," "(To the circulator) Send this to mammo and tell them to call me with the results." Based on 17 cases with two observers, the inter-rater and reliability for the rate measure of directive leadership was high, thus lending confidence to the validity of the primary observer's assessment of directive leadership. For directive leadership in

transition, ICC(1) = .85, ICC(2) = .92, F (1, 15) = 12.39, $p < .01$. For directive leadership in action, ICC(1) = .84, ICC(2) = .91, F (1, 15) = 11.31, $p < .01$.

Coaching Leadership

Coaching leadership referred to leader behaviors that developed team members' task competencies and understanding through providing instruction, constructive feedback, and relevant information (DeRue et al., 2010). Like directive leadership, coaching leadership in each phase was operationalized as the rate of task-focused comments initiated by the surgeon in which he or she explained his/her actions to team members, or instructed or provided constructive feedback to team members. Examples in the transition phase included, "(To the anesthesiologist) This patient has had some prior scarring… getting in might take longer than I expected," and "(To the circulator) We think the operation will be a simple bladder cuff removal, but we might need to remove a lot more of the bladder if we find any cancer." Examples in the action phase included, "(To the surgical assist) That looks like a major artery there, so I'm going to cut around it just in case," "(To the scrub or surgical assist) The way you use this thing is, you hold here and press here when you want to cauterize." The inter-rater reliability for the rate measure of coaching leadership was high. For coaching leadership in transition, ICC(1) = .86, ICC(2) = .92, F (1, 15) = 13.06, $p < .01$. For coaching leadership in action, ICC(1) = .90, ICC(2) = .95, F (1, 15) = 18.52, $p < .01$.

Relating Leadership

Relating leadership referred to leader behaviors that exhibited concern for team members' emotional needs, demonstrated support for team members, and facilitated positive interpersonal relationships among team members (Bass, 1990). Relating

leadership in each phase was operationalized as the rate of personal comments and story-telling initiated by the surgeon that centered on building solidarity among team members and maintaining a positive emotional atmosphere. Examples included surgeons' expressions of appreciation for team members' efforts, use of humor and jokes, motivating comments to encourage team members, and personal comments to build rapport. Representative quotes for the transition phase were, "Good morning, everyone. Are we having fun yet?" and "So what is everyone doing for Valentine's day?" Examples for the action phase were, "I took my kid to audition for American Idol once, and she hated me for it," and "Nice job, everyone! I love working with this team!" The inter-rater reliability for the rate measure of relating leadership was high. For relating leadership in transition, ICC(1) = .51, ICC(2) = .67, F (1, 15) = 3.07, $p < .05$. For relating leadership in action, ICC(1) = .67, ICC(2) = .87, F (1, 15) = 7.76, $p < .01$.

Team Transition Processes

Team transition processes were defined as team members' task-focused teamwork behaviors that occur prior to and in preparation for the main task (Marks et al., 2001). Transition processes take on several forms, including mission analysis (identification and evaluation of team tasks), goal specification (identification and prioritization of team goals), and strategy formulation and planning (developing courses of action and contingency plans). As teamwork scholars have acknowledged (LePine et al., 2008), how these transition processes are carried out behaviorally may look very different depending on the nature of the task and the interactions required to complete it.

In the case of surgical teams, I operationalized transition processes using a combination of two measures. Following prior research that operationalized team

processes in the form of task communication (Morgan et al., 1993; Xiao et al., 2003), transition processes were operationalized as the rate of task-focused communication (e.g., questions, requests, directives, explanations, task feedback, voice, and updates) initiated by team members (not including the surgeon) in the transition phase. Examples quotes were, "What kind of pickups do you want for this case?" "The patient has a latex allergy, so you may need to change the gloves you're going to use," "Can you get a bottle of saline for me?" "Doctor, I think you draped the wrong eye!" The inter-rater reliability for the rate measure of transition processes was high, ICC(1) = .44, ICC(2) = .61, F (1, 15) = 2.59, $p < .05$.

In addition to the rate, transition processes were also operationalized as the team's use of transition behaviors on the checklist. Teams scored higher on the transition checklist if they engaged in the following over the course of two possible briefing points during the transition phase: a) the briefing was formally initiated, b) all team members were present, c) a standardized checklist was used during the briefing, d) introductions by name and role are made, and e) all team members review all relevant patient information, discuss strategy for proceeding, and verbally describe anticipated critical events (see Appendix B). The transition checklist explicitly corresponded to the World Health Organization's pre-incision surgical checklist (WHO, 2008), which has been advocated in the surgical community to minimize common and avoidable risks to patient safety. The team's score on the transition checklist thus represents the extent that teams engaged in behaviors critical for effectiveness during acute briefing points in the preparatory period of the performance episode. The inter-rater agreement and reliability for the transition checklist was high, $Rwg_{(j)} = .92$, ICC(1) = .86, ICC(2) = .93, F (1, 15) = 13.79, $p < .01$.

Transition processes were ultimately operationalized using a mixed measure composed of the mean of the standardized scores of the rate and checklist measures. While the rate dimension captured the intensity of transition processes throughout the transition phase, the checklist dimension captured the quality of those processes as communicated in the pre-induction and/or pre-incision briefings. Thus, as in the case with composite measures (reviewed in Mathieu et al., 2008), a mixed measure composed of indices that is sensitive to differences across teams provides a richer and broader coverage of the transition processes likely to represent effective functioning. Furthermore, for several reasons, I did not expect the two indicators to be significantly correlated (and in fact, they are correlated at .05 in this sample). First, the behavioral events targeted by the two measures are distinct. While the rate measure captures transition processes occurring throughout between the time of surgeon entry and incision (on average, lasting 16 minutes in duration), the checklist measure captures the interactions among team members during the formal briefings only (on average, lasting 31 seconds). In other words, the checklist assesses only one aspect (albeit an important part) of the entire transition process. Second, team members may engage in a high rate of transition processes outside of the briefing, and vice versa. Thus, despite the low correlation, the two measures were combined.

Team Action Processes

Team action processes were defined as team members' task-focused teamwork behaviors that occur during the main task. Action processes take on several forms, including monitoring progress towards goals (communicating information regarding the team's progress), systems monitoring (tracking team resources and environmental

factors), team monitoring and backup behavior (assisting other members in the performance of tasks), and coordination (synchronizing or aligning the sequence and timing of activities). In the surgical team context, action processes were operationalized using a combination of two measures – the rate of task-focused communication initiated by team members in the action phase, and the team's use of action behaviors on the checklist. Examples of quotes included in the rate measure were, "Just so you know, the bovie is on 135 – let me know if you want it higher," "The patient is waking up – can you hold on a second before going further?" "What kind of sutures do you need for closing up?" "We have .5 implants in the hall – let me know when you want me to get them." The inter-rater reliability for the rate measure of action processes was high, ICC(1) = .95, ICC(2) = .97, F (1, 15) = 38.44, $p < .01$.

Teams scored higher on the action checklist when the team's communication during the case consisted of, a) structured handoffs during membership substitutions, b) call outs that verbalized critical information to the team, c) check-backs to close the loop in communicating orders, d) first names when addressing issues, e) assertive language to address concerns, f) specialized language to signal critical situations, g) timely, specific, and considerate task feedback, h) explicit verbalization of changes in plans, i) delegation when appropriate, j) cross monitoring regarding the status of the patient and case, k) task assistance, l) integration and anticipation, and m) active coordination (see Appendix C). The action items corresponded well with action dimensions in Marks et al.'s (2001) taxonomy, as well as literature on teamwork behaviors known to promote high reliability and patient safety in surgical settings (Salas, Wilson, Murphy, King, & Salisbury, 2008; Salas et al., 2005). The team's score on the action checklist thus represents the extent that

teams engaged in behaviors critical for effectiveness in the executionary period of the performance episode. The inter-rater agreement and reliability for the action checklist was high, $Rwg_{(j)}$ = .94, ICC(1) = .78, ICC(2) = .88, F (1, 15) = 8.04, $p < .01$.

Paralleling transition processes, action processes were ultimately operationalized using a mixed measure composed of the mean of the standardized scores of the rate and checklist measures, thus capturing both the intensity of action processes occurring throughout the procedure, as well as the quality of those processes. For reasons discussed earlier, the two indicators need not be significantly correlated (and in fact, are correlated at -.10 in this sample). Although both refer to behaviors enacted during the action phase of the performance episode, greater intensity of action processes does not necessarily mean the behaviors used correspond to those listed in the checklist. Furthermore, norms in the operating room for implicit coordination may diminish the intensity of action processes, while not compromising the quality of the interactions that do take place. Because effective action in surgical teams is both a function of active communication exchanges and the use of specific communication techniques as outlined in the crew resource management literature (Salas et al., 2005), the two measures were combined to create an overarching indicator of team action processes.

3.6 Validation of Core Measures

To lend validity to the core observational measures above, I used triangulation with other indicators of leader and team member behavior, both rated by team members in the post-procedure questionnaire and by the observer during the case.

Team Members' Ratings

Team members responded to a set of one-item questions about the extent that the surgeon engaged in directive, coaching, and relating behaviors in the case. The item question assessing directive leadership was, "During the case, to what extent did the Surgeon guide, direct, and correct team members' task actions?" The item assessing coaching leadership was, "During the case, to what extent did the Surgeon inform and explain his/her plan of action to team members, coach or give constructive feedback, and invite and consider others' opinions?" The item assessing relating leadership was, "During the case, to what extent did the Surgeon express his/her appreciation and support for the team, use humor, and connect personally with team members?" Each item was rated on a scale anchored at 1 (not at all) to 5 (great extent). Team members also responded to a one-item question about the team's performance, "How would you rate your team's overall performance in this case?" (1 = poor, 5 = superior). On average, 2 members provided responses to the leadership and performance questions, demonstrating moderate levels of agreement and reliability (average Rwg = .74, ICC(1) = .20, ICC(2) = .32).

The correlations between core observational measures and team members' post-procedure responses are reported in Table 3. Because team members' assessments of leadership were of the leader's behavior throughout the entire case (without differentiation for whether these actions occurred in transition or action), I compared their assessments to the combined rate of directive behaviors exhibited across the transition and action phases. Interestingly, the overall rate operationalization of directive leadership was not significantly correlated with team members' ratings of directive

leadership. However, this correlation (r = .14) was in the positive direction. One possibility for the relatively weak correlation is members' differing perceptions and values around surgeon directive leadership. Some members saw surgeon directives as being the expected way in which surgeons should interact with team members, and thus did not perceive it as being explicitly "directive." For instance, they would comment, "Yes, the doctor told me what he wanted and when he wanted it, but that's normal, so I would say he wasn't directive." In other cases, members saw surgeon directives as a negative thing, commenting, "Well, the doctor didn't have to be directive, because we all knew what to do," even in cases where the surgeon verbalized many directives.

In contrast, the interpretations around coaching and relating were much more straightforward to team members as something that was positive and salient. For instance, one would comment, "Yes, she really likes to teach," or "He's just a really nice guy; it's always a pleasure working with him." The overall rate operationalization of coaching leadership was significantly related to team members' ratings of both coaching and directive leadership (r = .39 and r = .27 respectively). Although the stronger positive correlation was between the two ratings of coaching leadership, the significant correlation between observer rated coaching and team rated directive signaled their commonality as two different approaches to driving the task (Klein et al., 2006; Yun et al., 2005). Finally, relating leadership was significantly related to team members' ratings of both relating and coaching leadership (r = .44 and r = .28, respectively). The stronger positive correlation was between the two ratings of relating leadership, although the significant correlation between observer rated relating and team rated coaching may be due to their commonality as person-focused leadership behaviors (Burke et al., 2006; Edmondson,

2003). Taken together, these correlations provide evidence of convergent and discriminant validity for the leadership variables used in the analyses.

The correlations between core observational measures of transition and action processes also demonstrated significant correlations to team member rated performance (r = .21 and r = .23, respectively) but not surgeon rated performance (r = -.04 and r = .04, respectively). One possibility for this lack of correlation is that surgeon ratings of performance may have been focused on the technical outcome of the case, rather than how well members of the team worked together. Surgeons also varied in their evaluation of teamwork in the operating room. Some surgeons explicitly told me that they preferred less talking during the case and emphasized that greater implicit coordination signaled higher performance, whereas other surgeons saw the value of team processes as a means of keeping the patient safe. Taken together, these correlations provide some predictive validity for the team processes variables used in the analyses.

Observer Ratings

The observer provided a one-item overall rating of the effectiveness of each leader behavior and teamwork process in the transition and action phase. Because these one-item indicators were more highly correlated with each other within phase than across phases (r ranged from .18 to .57), they were not used in the operationalization of core variables. Nonetheless, they provided some utility for triangulation purposes. A representative item of leadership was, "How effective was the team leader's directing behaviors during the transition phase?" and a representative item of transition processes was, "How effective were team members' task contributions during the transition phase?" (1 = did it but ineffectively, or did not do it, 2 = did not do it, 3 = did it, 4 = did it,

somewhat effective, 5 = did it, very effective). The correlations between core measures and observer ratings of effective behavior are reported in Table 4a and 4b.

All correlations between each leadership and teamwork variable and its 1-item counterpart were positive, significant, and ranged from .25 to .64. In most cases, the correlations were the strongest within a particular row or column. For instance, the directive leadership variable in transition related more strongly to its 1-item counterpart (r = .64) than all other quality ratings (ranging from r = -.20 to .19). The directive leadership variable in transition also related more strongly to its 1-item counterpart than all other core variables (ranging from r = .01 to .44). One the whole, this pattern of correlations provided additional evidence of convergent and discriminant validity for the leadership and team process variables used in the analyses.

As additional indicators of (in)effectiveness, the observer provided counts of the number of times the team did not have something they needed, as well as the number of delays occurred in the procedure due to lapses of coordination. In light of Sundstrom's (1999) and others' emphasis on the importance of seamless coordination as the hallmark of effectiveness in action teams, and given widespread recognition that delays and traffic to get supplies during the procedure increase the risk of patient infection following surgery (Nichols, 2001), these indicators seemed appropriate. Transition processes did not correlate significantly with times missing and delays (r = .07 and r = .05, respectively), but action processes did (r = -.30 and r = -.37, respectively). Action processes also demonstrated the strongest negative correlations to these indicators of ineffectiveness compared to leader behaviors in both transition and action, suggesting that teamwork in the action phase mattered most for efficient coordination during the

procedure. Taken together, these correlations provided predictive validity for action processes as the ultimate dependent variable in the theoretical model.

Intercorrelations among Core Variables

The correlations between the three leadership types in the transition and action phases lend additional evidence of their discriminant and convergent validity (see Table 5). Directive, coaching, and relating demonstrated high distinctiveness from each other in the transition phase, with correlations ranging from -.02 to .18. The three leadership types related somewhat differently to each other in the action phase. The two task-oriented leadership behaviors – directing and coaching – were marginally positively correlated (r = .19), whereas directing and relating were significantly negatively correlated (r = -.30), and coaching and relating were uncorrelated (r = .00). This pattern of correlations suggests that leaders utilize the three leadership behaviors differently across phases, which I will elaborate upon in the discussion, but for the purposes of validation, provide strong evidence that the three leadership behaviors can be distinguished from each other. Support for convergent validity was demonstrated by significant positive correlations between like constructs across phases. The correlations between leadership behaviors across the two phases ranged from .26 to .44, and transition and action processes correlated at .42. Furthermore, the correlation between like constructs was stronger than correlations between constructs measured at the same time, providing evidence for convergent validity.

3.7 Control Variables

Case Complexity

I controlled for *case complexity* based on literature suggesting that the complexity of the team task increases overall needs for team member coordination and leader active intervention. For instance, Klein et al. (2006), Morgeson (2005), and Yun et al. (2005) found that the importance of active and directive approaches to leadership increased with the complexity of the task. LePine et al. (2008) also found that the complexity of the task influenced the relationship between transition and action processes and indices of effectiveness, largely due to the increased demands for coordination and interdependence among team members. Because the surgeon is most exposed to and knowledgeable about the technical intricacies of the procedure, case complexity was assessed using the surgeon's response to the following question in the post-procedure questionnaire, "How complex or unique was this operation/procedure relative to other operations/procedures you have been a part of?" (1 = far less complex, 5 = far more complex).

Team Familiarity

I also controlled for *team member familiarity* due to prior research demonstrating the strong connection between familiarity on team cohesion, the need to use explicit coordination tactics, and performance. For instance, greater experience working together with the same team members develops shared knowledge (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000), which in turn facilitates the use of implicit rather than explicit coordination. There is also evidence that greater familiarity increases productivity (Goodman & Shah, 1992) and performance (Harrison, Mohammed,

McGrath, Florey, & Vanderstoep, 2003). In a setting of action teams, a study involving airline crews found that greater familiarity increased the effectiveness of their communication and information exchange, which in turn, reduced error rates (Kanki & Foushee, 1989).

Although the membership of most surgical teams is temporary and confined to a single case, this rotational system creates some variance in the extent to which a proportion of the members of the team have worked together before. Hence, to gain a general sense of how familiar team members were based on prior work experiences, team members (including the surgeon) were asked in the post-procedure questionnaire, "How often have you worked with members of this team prior to this case?" (1 = never, 5 = very frequently). On average, 3 members provided responses to the leadership and performance questions, demonstrating moderate levels of agreement and reliability (average Rwg = .71, ICC(1) = .22, ICC(2) = .45).

Teaching Cases

I dummy coded for cases where residents or students were present (1 = non-teaching case, 2 = teaching case). Prior literature suggests that teaching cases may involve a higher degree of leader coaching because of the explicit focus on developing students' skills and understanding (Klein et al., 2006; Yun et al., 2005). Based on my own observations, the presence of students also increased the extent that team members engaged in teamwork processes, in order to involve the student in the case. Teaching cases were identified during introductions, where the resident or student would typically introduce themselves. Residents and students also have a routine of writing their names on the operating room white board, indicating their status as a resident or student with a

"-R" or "-S." In cases where it was unclear whether someone was a resident or student, the observer would verify the individual's status with a nurse in the room.

Wave of Observation

Due to the schedule of the crew resource management training initiative, 33 of the cases included in the final sample were observed in February of 2011, and 25 were observed in June of 2011. During the four months separating the two waves, a number of events occurred that may have created systematic differences in the core variables across the two time points. First, a follow up to the crew resource management training occurred during that time. The second wave of observation also occurred within the same month as hospital accreditation visits. Because I was blind to which individuals received the crew resource management training and because it was not clear when the accreditation visits took place, I could not explicitly code of these effects. Hence, I coded for the wave that each case was observed (1 = Wave 1, 2 = Wave 2). Importantly, the inter-rater agreement and reliability indices remained high across the two waves. The average ICC(1)s were .81 and .60, the average ICC(2)s were .89 and .71, and the average Rwgs were .95 and .96 for the first and second observational waves, respectively.

CHAPTER 4: ANALYSES AND RESULTS

4.1 Descriptive Statistics

Table 5 displays the descriptive statistics, internal reliability coefficients, and inter-correlations among the variables used in this study. There are several correlations worthy of note among the control variables, such as the significant negative correlation between team member familiarity and directive leadership in transition (r = -.42). This suggests that teams who have worked frequently together in the past elicit less direction from the leader, especially during preparation. Case complexity correlated negatively with relating leadership during action (r = -.25), suggesting that surgeons were less likely to engage in non-task related behaviors when cases were more complex and task intensive. The negative correlation between case complexity and teaching cases (r = -.26) is also not surprising, given surgeons' preference to have fully trained members on the team for more complex cases. Teaching cases correlated positively with relating leadership in transition (r = .25) and coaching leadership in action (r = .23), suggesting that surgeons tended to the interpersonal atmosphere more in transition and engaged in more teaching during the actual procedure when students were present.

As expected, wave of observation correlated positively with team members' transition and action processes (r = .43 and .52, respectively), given that these processes were the target of the crew resource management training that unfolded between wave 1 and wave 2 of observations. Further, certain surgeon behaviors correlated negatively with wave of observation, with less coaching in transition (r = -.40), less coaching in action (r = -.34), and less relating in action (r = -.23) occurring in wave 2. The shift in leader behavior across the two waves could potentially be due to the training (although many

surgeons refused to attend the training), but more likely, were due to the shift in how team members worked together pre- and post-intervention, as well as the natural diversity in the types of cases observed across the two waves.

The correlations between leadership behaviors and team processes at each phase were in the direction of the hypotheses. Coaching and relating in transition were positively but not significantly correlated with transition processes (r = .21 and .04, respectively). In contrast, directive in action correlated positively and significantly with action processes (r = .32), whereas coaching and relating in action did not (r = .04 and -.02, respectively). Transition processes also correlated positive and significantly with action processes (r = .42). Interestingly, coaching in transition exhibited a negative, significant correlation with action processes (r = -.27), suggesting the possibility that coaching early on reduces the need for the team to engage in as many action processes later on. This relationship did not reach significance in the regression analyses, however (see Table 7a and 7b).

4.2 Hypothesis Testing

All control variables and independent variables of interest were mean-centered prior to entering the regression analyses, and interaction terms were calculated using mean-centered terms.

Analyses Relating to Transition Processes

In the first three hypotheses, I predicted that coaching, relating, and the interaction between the two would positively relate to team transition processes. To test these hypotheses, I constructed an OLS regression equation in which all the control

variables were entered in the first step, all three leadership behaviors were entered simultaneously into the next step, followed by the interaction term (see Table 6).

The results show that of the three leadership behaviors, coaching leadership demonstrated a significant positive relationship with team transition processes (β = .48, Model 2), supporting hypothesis 1. Contrary to expectations, relating leadership did not relate to team transition processes (β = .07, Model 2). Thus, hypothesis 2 was not supported. The coaching and relating interaction term showed a significant, positive effect on team transition processes (β = .23, Model 3). The form of this interaction is shown in Figure 4, indicating that the positive relationship between coaching and team transition processes is strengthened in the presence of higher relating leadership.

The simple slope representing the relationship between coaching and transition processes was positive and significant at one standard deviation above the mean in relating leadership (β = .63) and non-significant at one standard deviation below the mean in relating leadership (β = .27). As predicted, leaders who engaged in high coaching *and* high relating achieved the highest levels of team transition processes, supporting hypothesis 3. Interestingly, the lowest levels of team processes were achieved when relating was high but coaching was low, suggesting that too much emphasis placed on developing the interpersonal climate of the team can distract from task preparatory processes. In summary, coaching in transition facilitated team transition processes, and this relationship is enhanced when coaching is used in combination with relating.

Analyses Relating to Action Processes

In the next two hypotheses, I predicted that directive leadership and transition processes would relate positively to action processes. To test these hypotheses, I entered

all control variables in the first step, the three leadership behaviors at each phase in the next two steps, and transition processes in the final step (see Table 7a and 7b). The results show that of the three leadership behaviors, directive leadership demonstrated a significant positive relationship with team action processes (β = .35, Model 3), supporting hypothesis 4. Directive leadership continued to demonstrate the only significant, positive relationship to team action processes, even after controlling for transition phase leadership behaviors (β = .32, Model 4), and transition team processes (β = .32, Model 5). Also of note is that leadership occurring in the transition phase did *not* carry over to impact team action processes. However, team transition processes did.

Transition processes contributed positively to team action processes above and beyond control variables (β = .25, Model 6) and leadership behaviors in both the transition and action phases (β = .32, Model 5), providing support for hypothesis 5. Unexpectedly, when controlling for transition phase leadership and transition processes, relating leadership in the action phase exhibited a significant, positive relationship to action processes (β = .35, Model 4; β = .38, Model 5). However, because the bivariate correlation between relating leadership in the action phase and action processes was non-significant (r = -.02) and because the relationship only reached significance in the presence of transition phase leadership and processes, this finding may have been due to suppression effects.

The integrative implication of hypotheses 1, 3, and 5 is that coaching and the interaction between coaching and relating in the transition phase indirectly relates to team action processes via team transition processes. To test hypothesis 6, I assessed the indirect effect of coaching on team action processes (via team transition processes) in

Mplus 5.21 (Muthen, & Muthen, 1998–2007). Linear regression with maximum likelihood estimates and re-sampling the data 2,000 times showed that the indirect effect of coaching on team action processes (via team transition processes) was positive and significant (B = .50, C. I. = .12, 1.22; α = .05), thus supporting hypothesis 6. Hypothesis 7 was not supported because relating did not relate positively to transition processes (i.e., hypothesis 2 was not supported).

To assess the mediated moderation effect of coaching and relating on team action processes via team transition processes (i.e., hypothesis 8), I used Edwards and Lambert's (2007) bootstrapping path analytic approach adapted for use in Mplus. This approach allowed me to assess mediated moderation without violating underlying statistical assumptions about the distribution of the data associated with other approaches, such as the Sobel test (Sobel, 1982). Results showed a significant, positive indirect effect of coaching on action processes (through transition processes) at higher levels of relating leadership (B = .68, C. I. = .18, 1.54; α = .05). Even at lower levels of relating leadership, the indirect effect was still positive and significant (B = .31, C. I. = .01, .99; α = .05). However, the difference between the two indirect effects was significant (B = .38, C. I. = .04, 1.23; α = .05), supporting hypothesis 8. In summary, integrative tests suggest that coaching indirectly facilitated team action processes (through team transition processes), and this was more likely when relating was also high in transition.[1]

[1] The results of these integrative tests were replicated using the Monte Carlo method for assessing mediation (Selig & Preacher, 2008).

4.3 Auxiliary Analyses

The auxiliary analyses examined whether any alternative interaction effects existed. Explicitly, I examined whether a) relating leadership interacted with directive leadership in the transition phase to predict transition processes, b) coaching and directing leadership interacted in the transition phase to predict transition processes, c) the three leadership behaviors interacted with each other in the action phase to predict action processes, and d) transition processes interacted with directive leadership in the action phase to predict action processes. None of these proposed interactions reached statistical significance. This suggests that the enhancive effect of relating leadership in predicting transition processes occurred only in combination with high coaching leadership, but not directive leadership. Further, these analyses also suggest that the benefits of directive leadership are isolated within the action phase, as directive leadership demonstrated no direct or interactive effects in the transition phase. Finally, the lack of an interaction effect between transition processes and directive leadership in the action phase suggests that the spillover effect of transition processes is limited to influencing action processes. In other words, transition processes did not influence the impact of leader behaviors in the action phase on action processes.

CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Summary of Findings

This study examined time as a contingency factor affecting the relationship between team leadership behaviors and critical action team processes. The findings of this study suggest that, although leaders who use directing, coaching, and relating behaviors generally promote team processes within a performance episode, the impact of each of these behaviors varies depending on when they are enacted. Of the three leader behaviors, leaders who engage in coaching behaviors in the transition phase most strongly facilitate team transition processes. Furthermore, this positive relationship is strengthened when leaders use high levels of both coaching and relating behaviors. Importantly, this enhancive effect of relating leadership occurred only in the transition phase and only in conjunction with coaching leadership. In the action phase, leaders who engage in directing behaviors are most effective in promoting action processes. Further, action processes are also facilitated by transition processes. Because leader coaching and relating set transition processes in motion, these early behaviors indirectly influence action processes via transition processes.

5.2 Theoretical Implications

First the foremost, this study's findings constitutes evidence that, in action teams, the content and timing of leadership actions matter for promoting team functioning across phases of a performance episode. Specifically, leaders do not (and *should not*) enact the same leadership behavior throughout a performance episode. Rather, leaders who synchronize their own leadership approaches to match the shifts in the internal environment of the team achieve better functioning in their teams. These findings are

consistent with a context-specific and temporal interpretation of functional leadership theory and also provide empirical support for prior theories highlighting temporal factors as a contingency of team leadership impact (e.g., Hackman & Wageman, 2005; Morgeson et al., 2010), and the Kozlowski et al. (1996) framework in particular because of its focus on team leadership in action teams.

These findings also highlight the merits of taking a dynamic and more fine-grained approach to understanding the contingencies of team leadership impact. Whereas existing contingency theories of leadership consider task and team characteristics as varying only *across* episodes and situations (e.g., Fiedler, 1964, 1967; Vroom & Yetton, 1973; Hersey & Blanchard, 1977; House, 1971), this study strongly suggests there is merit to considering these contingencies as evolving over time, even within the bounds of a single performance episode. To operate on the assumption that contingences, and by extension, leader behaviors, only meaningfully vary across rather than within episodes may lead to errant expectations that leadership behaviors will result in effectiveness, regardless of when they are enacted (Kozlowski et al., 1996). Rather, acknowledging that contingencies themselves evolve over time brings us one step closer to aligning theories of team leadership with teams in the real world and improves the applicability of our team leadership models to complex and dynamic situations.

This study's findings also extend the bounds of functional leadership theory as it is currently construed in relation to time. Functional leadership theory suggests that leadership interventions are most impactful when they address the needs of the team at that particular point in time. That point in time, however, must be put into context. Taking temporal factors into account also implicates that there is an ordered timeline, in

which events occurring early on necessarily influence how events unfold later on. This study's finding that coaching leadership, as well as the combination of high coaching and relating, promotes both contemporaneous *and* subsequent team processes illustrates this point. That is, the effectiveness of a leadership behavior is not only determined by how well it meets the needs of the team at that particular point in time, but is also compounded by how important those needs are in influencing subsequent team functioning.

Take for instance, the inherent dependency between transition and action phases of the performance episode. The failure to promote transition processes might not only lead to the development of faulty plans in the transition phase, but also, problematic execution in the action phase as a result of those faulty plans. Likewise, failure to dispel ambiguities and set effective norms for teamwork in motion early on in the team's developmental trajectory may lead to ineffective teamwork during a time where teamwork is perhaps most needed. In other words, the order of how events unfold in the timeline presents leaders with distinct windows of opportunity to intervene that have lasting consequences if missed.

Although this theory was developed in relation to action teams, the broader implication that team leadership impact to subject to temporal contingencies is likely to generalize to other organizational settings as well, given that organizational life is full of rhythms (Ancona et al., 2001) and the success of leaders lies in how well they manage those rhythms (Ancona & Chong, 1996; McGrath, 1984; McGrath & Rotchford, 1983). Depending on similarity to the action team context, the specific timeframes, phase boundaries, and behaviors identified in this study may not apply in another setting. Exploring how temporal contingencies of leadership might operate in other team contexts

is a priority for future research, not only for the sake of replication, but also because doing so may uncover nuances to a dynamic theory of leadership that were not manifested in action teams.

5.3 Practical Implications

What does it mean to lead well in a context where team task demands are in flux over time, hierarchical leadership influences are robust, and teamwork processes are critical for effectiveness? The findings of this study suggest that leadership must necessarily be dynamic and sensitive to temporal shifts in the team environment. Specifically, at preparatory phases of the performance episode, when task intensity is low and task and relational ambiguities are most salient, leaders should coach and relate. Doing so sets the team on a trajectory for success by facilitating both contemporaneous and subsequent effective team processes. However, as task demands increase in intensity during task execution, leaders should switch their focus from developing team members' skills and attending to the team's social climate to provide concrete, structured directives to ensure the team's functioning as a coordinated unit.

This switching between distinct leadership behaviors to match the shifting needs and motivational needs of the team over time requires leadership training interventions to focus not only on training the right types of behaviors, but also increasing leader awareness to temporal dynamics in their own team context so as to know *when to use those behaviors*. Notions of leader temporal sensitivity have been raised in the literature, such as the notion of "temporal leadership" (Mohammed & Nadkarni, 2011), which describes a leader's ability to sense and manage the diversity of temporal perspectives held by members of the team. Awareness of temporal factors may be one step in the right

direction. However, the findings of this study suggests that leaders must be attuned to how the team is evolving over time in terms of maturity, task demands, and task goals, and be able to shift his or her behaviors to meet new needs emerging at different times.

The findings of this study also provide some practical insight into the form of leadership needed in surgical teams. Surgeons often become surgeons on the basis of their technical skill, expertise, and training (Kunzle et al., 2010). Although there is an increasing awareness of the importance of non-technical skills in the operating room, such as leadership and teamwork (Parker et al., in press), surgeons – and by extension, the teams they lead and the patients they care for – may benefit from undergoing leadership training of the sort described above.

5.4 Limitations and Future Research

The greatest strength in the design of this study is its sensitivity to temporal factors affecting real teams working towards goals of high significance. In fact, observing team leadership unfold in actual surgical teams represents a stark deviation from the norm, as most temporal investigations relating to teams have been conducted in laboratory settings (as reviewed in Mathieu et al., 2008), with a few exceptions (e.g., Erikson & Dyer, 2004; Gersick, 1988). Live observation, while rich in its external validity, also has limitations.

One consequence is the inability to capture constructs that are not behaviorally manifested. Although temporal theories strongly suggest that task intensity is higher in the action phase and team developmental needs are stronger in the transition phase, I was not able to assess these directly. I was also unable to assess emergent states – such as team efficacy, trust, psychological safety, cohesion – which can function as critical

mechanisms by which leader behavior can impact outcomes (Burke et al., 2006). Although the setting of action teams suggests that performance behaviors in the form of transition and action processes are most facilitative of effectiveness, in other settings, emergent states are likely to play a role in reciprocally affecting these team processes (Marks et al., 2001). In future research, capturing team members' perceptions of task intensity, team developmental needs, and these emergent states in addition to team processes could potentially provide a more complex and comprehensive understanding of the mechanisms associated of the findings presented here.

Relatedly, because the data were collected by a single observer, this study's findings may be subject to observer biases. I tried to limit the potential effect of these biases on the data by using strictly defined coding schemes around identifying leader and team behaviors. Furthermore, on the 17 cases where overlapping observations were possible, the inter-rater agreement and reliability indices were high with a subject matter expert who was blind to the hypotheses. Nonetheless, it is important to replicate these findings in other settings using alternative methods, and in doing so, hopefully discover new sets of leader behavior and temporal contingencies affecting their impact. For instance, surgical teams for the most part are internally-focused, and thus, the pacing of phases is determined by the nature of the task (Kozlowski & Ilgen, 2006). Other teams, such as project teams, are more externally-focused and are subject to external timelines and standards that they must conform to (Ancona & Chong, 1996). Integrating notions of entrainment with the temporal contingencies identified in this theory may be a valuable avenue for future research.

Although the primary research question of this study was one around leader impact over time, the pattern of bivariate correlations among the three leadership behaviors allude to a promising direction for future research relating to leadership configurations and how they shift over time. During transition, directive leadership showed no correlation to coaching leadership, while both directing and coaching correlated positively to relating (r = .14 and .18, respectively). This pattern of correlations suggests that leaders either used directive or coaching approaches to help the team prepare for the task, but also tended to pair their choice of leadership style with relating. (Interestingly, as the findings of this study suggest, only the combination of high coaching and high relating facilitated transition processes.)

In the action phase, however, the pattern of correlations among the leadership behaviors shifts dramatically. Directing leadership showed a significant negative correlation with relating (r = -.30), but a positive correlation with coaching (r = .19), whereas coaching showed no correlation to relating. This suggest that leaders tend to adopt a mixture of directing and coaching approaches during action, but those who directed were less likely to relate. This is consistent with theory suggesting that periods of high task intensity and production focus require greater directive behavior from leaders and are less conducive for engaging in social maintenance activities (McGrath, 1991). The broader implication here is that leaders shift their behavioral configuration over time, which in turn leads to a number of unanswered questions. Is there such a thing as "adaptive leadership," the ability of leaders to dynamically undertake different leadership profiles in response to changes in the team environment? What facilitates their sensitivity and responsiveness, and how can we promote it? Is adaptive leadership a necessary skill

set for leaders operating in complex, dynamic, and unpredictable settings, such as those found in action teams?

Finally, because of the changing membership dynamics associated with action teams, this study focused on the temporal contingencies of leadership within an isolated performance episode, largely. However, in other team settings, rarely are performance episodes isolated occurrences. Episodic theories, for instance, posit that performance episodes flow into each other, and dynamics that unfold within one episode constitutes the input for the next (Marks et al., 2001; Ilgen, Hollenbeck, Johnson, & Jundt, 2005). In other words, as isolated episodes string together to form the lifespan of a team, additional temporal factors may be unfolding at a higher level. Thus, one interesting direction for future research is to conceptualize time as a broader phenomenon and examine how leader behavior must shift over a series of episodes (as well as within isolated episodes) to facilitate short term and long term effectiveness.

5.5 Conclusion

As teams encounter tasks of high complexity and dynamism, temporal shifts occurring within singular performance episodes require an equally dynamic understanding of team leadership, its impact, and the behaviors that are needed at different point in time to facilitate effectiveness. This study's findings represent initial empirical evidence that, as Hackman and Katz (2010) so elegantly stated, the timing of leader behaviors matters just as much as the content of those behaviors, and that leading well not only facilitates team effectiveness in the moment, but can also have a lasting impact on team functioning for the rest of the episode. These findings suggest that leaders may benefit from having a greater sensitivity to the temporal factors affecting their teams,

and that adaptive leadership skills may hold promise for achieving effective outcomes in today's increasingly complex, dynamic organizations.

Appendix A: University of Maryland IRB Approval Form

Initial Application Approval

To: Principal Investigator, Dr. Gilad Chen, Managment and Organization
Co-Investigator, Crystal Farh, Managment and Organization
From: James M. Hagberg
IRB Co-Chair
University of Maryland College Park
Re: IRB Protocol: 11-0176 - Temporal Contingencies of the Content and Impact of Team Leadership in Surgical Teams

Approval Date: March 28, 2011

Expiration Date: March 28, 2012

Application: Initial

Review Path: Expedited

The University of Maryland, College Park Institutional Review Board (IRB) Office approved your Initial IRB Application. This transaction was approved in accordance with the University's IRB policies and procedures and 45 CFR 46, the Federal Policy for the Protection of Human Subjects. Please reference the above-cited IRB Protocol number in any future communications with our office regarding this research.

The UMCP IRB is organized and operated according to guidelines of the United States Office for Human Research Protections and the United States Code of Federal Regulations and operates under Federal Wide Assurance No. FWA00005856.

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Appendix B: Transition Process Checklist and Coding Scheme

	Category	Scale	Criteria
1	**Briefing initiated**	3	Briefing initiated pre-induction and pre-incision
		2	Briefing initiated only pre-incision
		1	Briefing initiated only pre-induction
		0	Briefing not initated
2	**All team members present**	3	All members present for both pre-induction and pre-incision briefings
		2	All members present only for pre-incision briefing
		1	All members present only for pre-induction briefing
		0	Not all members present
3	**Use standardized checklist?**	3	Visual reference to checklist while conducting both pre-induction and pre-incision briefing
		2	Visual reference to checklist only while conducting pre-incision briefing
		1	Visual reference to checklist only while conducting pre-induction briefing
		0	No visual reference to checklist while conducting briefing
4	**Introductions** (Team member names given / new team members introduced as needed)	3	Some form of member introductions occur during pre-induction and pre-incision briefing
		2	Some form of member introductions occur during pre-incision briefing only
		1	Some form of member introductions occur during pre-induction briefing only
		0	No introductions made
5	**Surgeon** (procedure, positioning, antibiotics, blood products, diagnostic studies in room, equipment and supplies in room)	3	Actively participates, contributes, and listens during pre-induction and pre-incision briefings
		2	Actively participates, contributes, and listens during pre-incision briefing only
		1	Actively participates, contributes, and listens during pre-induction briefing only
		0	Does not actively participate, listen, or contribute
6	**Anesthesia** (antibiotics / Beta blockers given, allergies, lines, comorbidities that may impact the case, positioning concerns)	3	Actively participates, contributes, and listens during pre-induction and pre-incision briefings
		2	Actively participates, contributes, and listens during pre-incision briefing only
		1	Actively participates, contributes, and listens during pre-induction briefing only
		0	Does not actively participate, listen, or contribute.
7	**Circulator** (allergies, blood, implants in room, on back table verified and labeled, special services (flouro) available)	3	Actively participates, contributes, and listens during pre-induction and pre-incision briefings
		2	Actively participates, contributes, and listens during pre-incision briefing only
		1	Actively participates, contributes, and listens during pre-induction briefing only
		0	Does not actively participate, listen, or contribute

8	**Scrub** (surgical consent reviewed and procedure verified, DPC reviewed – all instrumentation equipment and supplies available, "hold" items in room/not opened)	3 2 1 0	Actively participates, contributes, and listens during pre-induction and pre-incision briefings Actively participates, contributes, and listens during pre-incision briefing only Actively participates, contributes, and listens during pre-induction briefing only Does not actively participate, listen, or contribute
9	**Physician Assistant / Surgical First Assist** (special positioning needs, special equipment / implants confirmed, mfg. rep. present – name)	3 2 1 0	Actively participates, contributes, and listens during pre-induction and pre-incision briefings Actively participates, contributes, and listens during pre-incision briefing only Actively participates, contributes, and listens during pre-induction briefing only Does not actively participate, listen, or contribute
10	**Contingency plans** (team discusses "what-if" complications or possible unexpected events)	3 2 1 0	Members alert each other to possible changes in the procedure during pre-induction and pre-incision briefings Members alert each other to possible changes in the procedure during pre-incision briefing only Members alert each other to possible changes in the procedure during pre-induction briefing only No discussion of contingencies
11	**Questions** ("Any final questions before we start from team members regarding the procedure?")	3 2 1 0	Invitation to ask further questions during pre-induction and pre-incision briefings Invitation to ask further questions during pre-incision briefing only Invitation to ask further questions during pre-induction briefing only No invitation to ask further questions
12	**Red flag statement by Surgeon** ("If anyone sees anything unsafe or not in the best interest of the patient, I expect you to speak up and bring it to our attention.")	3 2 1 0	Surgeon invites team members to speak up with concerns in pre-induction and pre-incision briefings Surgeon invites team members to speak up with concerns in pre-incision briefing only Surgeon invites team members to speak up with concerns in pre-induction briefing only No invitation to speak up
13	**Time Out** (surgical pause conducted prior to cut: Correct patient, procedure, surgical site?)	3 2 1 0	Team reviews correct patient, procedure, and surgical site during pre-induction and pre-incision briefings Team reviews correct patient, procedure, and surgical site during pre-incision briefing only Team reviews correct patient, procedure, and surgical site during pre-induction briefing only Team misses reviewing critical information about patient, procedure, or surgical site
14	**Expectations set** (set expectations of how team should function and established goals)	3 2 1 0	Team explicitly discusses expectations of roles or goals during pre-induction and pre-incision briefings Team explicitly discusses expectations of roles or goals during pre-incision briefing only Team explicitly discusses expectations of roles or goals during pre-induction briefing only No explicit discussion of expectations

15	**Patient involved**	3 2 1 0	Patient involved in confirming correct identity, procedure, and surgical site during pre-induction and pre-incision briefings Patient involved in confirming correct identity, procedure, and surgical site during pre-incision briefing only Patient involved in confirming correct identity, procedure, and surgical site during pre-induction briefing only Patient not involved in confirming correct identity, procedure, and surgical site
16	**Did any members check patient ID?**	3 2 1 0	Team members read out and verify ID number/name using two sources during pre-induction and pre-incision briefings Team members read out and verify ID number/name using two sources during pre-incision briefing only Team members read out and verify ID number/name using two sources during pre-induction briefing only Read out only one or no source of identification

Appendix C: Action Process Checklist and Coding Scheme

	Category	Scale	Criteria
1	**Handoffs** (Structured, responsibility established, acknowledgment)	5	All hand offs used structured communication (e.g., SBAR, checklist); surgeon updated
		4	All hand offs used structured communication (e.g., SBAR, checklist)
		3	Some form of verbal communication but not structured
		2	Non-verbal communication during switch
		1	No patient hand offs or confirmation with patient
		N/A	Did not occur because no team members were substituted during the case
2	**Call-out** (verbalized critical information to the entire team)	5	Getting attention of the whole team and giving them critical information
		3	Muttering without engagement of the entire team
		1	Opportunity for a call out was missed (e.g., did not announce, needed to be prompted)
		N/A	Did not occur because no critical incidents occurred
3	**Check-back** (used closed-loop communication)	5	Order repeated back number and specific item
		3	Acknowledgement of request
		1	No close loop
4	**Use of 1st names**	5	Everyone's addressing everyone by first name during request (as opposed to position)
		3	Just asks for something without mention of names
		1	Uses positional titles, "hey you's"
5	**Assertiveness** (team members are assertive with concerns and are acknowledged)	5	Very clear assertion of a concern and was effective
		3	Clear assertion of concern but not acknowledged
		1	No one asserted when they should have been
		N/A	Did not occur because no concerning incidents occurred
6	**C.U.S.** (team members use critical language to call attention to issues or situations)	5	Team members use critical language to call attention to issues or situations and are acknowledged
		3	Team members use some critical language with some success at being acknowledged
		1	Team members fail to use critical language when needed and are not acknowledged
		N/A	Did not occur because no concerning incidents occurred
7	**Feedback** (timely, specific, considerate, and directed toward improvement)	5	Task feedback is given in a timely, respectful, specific, and considerate manner
		3	Task feedback lacking specificity
		1	Task feedback is given in a non-constructive and blaming manner

8	**Verbalizes changes in plans** (audibly alerted team about changes in plan, course of action)	5 3 1 N/A	Surgeon or anesthesia updates, gets team's full attention, concern, problem, recommendation Curse (others acknowledge), start doing something different Plan change without telling anyone Did not occur because no changes in plans needed
9	**Delegation** (dynamically assigned roles and responsibilities as appropriate to situation)	5 3 1 N/A	Change course, responsibility, check with recipient's level of comfort Non specific delegation Missed opportunity for delegation (e.g., surgeon just walks away from the table) Did not occur because responsibilities were not delegated
10	**Cross monitoring** (status updated for patient, team, environment, goal and progress)	5 3 1	Team members constantly keep each other updated on their anticipated actions and needs Team members occasionally update each other Team members fail to update each other
11	**Task assistance** (requests assistance and resources as needed; offers assistance to others)	5 3 1	Team members freely and willingly request and offer task assistance to each other Team members request and offer task assistance to each other, only when needed Team members hesitant to request and grudgingly offer task assistance to each other
12	**Integration** (team members smoothly integrated their work efforts (i.e. anticipated others' needs))	5 3 1	Team members smoothly integrate their work actions by anticipating each others' actions or communicating updates Some breaks in coordination due to lack of anticipation or communication Delays in procedure caused by poor anticipation of actions or needs and failure to communicate expectations
13	**Coordinate** (coordinated activities with each other; re-established coordination when things went wrong)	5 3 1	Team members coordinated activities with each other and re-establish coordination when things went wrong Team members encounter some coordination problems but maintain control Team members encounter coordination problems and procedure is derailed or delayed

TABLE 1
Qualitative Differences across Phases

	Transition Phase	Action Phase
Task Goal	*Focus on preparation.* Transition processes constitute criteria for successful preparation.	*Focus on execution.* Action processes constitute criteria for successful execution.
Task Intensity	*Task intensity is lower.* More resources available to address non task-related and urgent issues.	*Task intensity is higher.* Fewer resources available to address non task-related and urgent issues.
Team Maturity	*Maturity is lower.* Greater need to establish task and social structures and resolve ambiguities.	*Maturity is higher.* Lesser need to establish task and social structures.

TABLE 2
T-test of Core Variable Means of Included versus Excluded Cases

Variable	Included Cases	Excluded Cases	t
Directive (Trans)	.29 (.27)	.30 (.35)	-.15
Coaching (Trans)	.25 (.22)	.25 (.21)	.01
Relating (Trans)	.59 (.58)	.56 (.49)	.26
Transition Processes	.08 (.72)	-.22 (.73)	1.87
Directive (Action)	.66 (.34)	.81 (.61)	-1.53
Coaching (Action)	.42 (.28)	.51 (.47)	-1.08
Relating (Action)	.52 (.47)	.76 (.85)	-1.63
Action Processes	.02 (.68)	-.08 (.85)	.56

Note. N included = 58; N excluded = 29. Standard deviations appear in the parentheses.

TABLE 3
Correlations between Core Variables and Team Member Ratings

	Variable	Directive (Team rating)	Coaching (Team rating)	Relating (Team rating)	Performance (Team Rating)	Performance (Surgeon Rating)
1	Directive (All)	.14	-.10	-.18	-.01	-.00
2	Coaching (All)	.27*	.39*	.06	.23*	.15
3	Relating (All)	.00	.28*	.44*	.17	.09
4	Transition Processes	-.37*	-.32*	.08	.21	-.04
5	Action Processes	-.09	-.02	.21	.23*	.04

Note. N = 58. This table shows the correlations between rate of leader behavior across the entire procedure and the mixed measure of team processes with team members' post-procedure ratings of team leadership and process effectiveness. Team members' ratings demonstrated moderate levels of agreement and reliability, with an average Rwg of .74, ICC(1) of .20, ICC(2) of .32.
*$p < .05$

TABLE 4a
Correlations between Core Variables and Observer Ratings of Quality in the Transition Phase

	Variable	Quality of Directive (Trans)	Quality of Coaching (Trans)	Quality of Relating (Trans)	Quality of Team Processes (Trans)
1	Directive (Trans)	**.64***	-.00	-.20	-.06
2	Coaching (Trans)	.06	**.46***	.26*	.09
3	Relating (Trans)	.01	.16	**.61***	.22
4	Transition Processes	.06	.18	.16	**.25***
5	Directive (Action)	.46*	.05	-.08	.23*
6	Coaching (Action)	.14	.44*	.36*	.14
7	Relating (Action)	.04	.23*	.35*	.21
8	Action Processes	.23*	.01	.04	.22

Note. N = 58. This table shows the correlations between leadership and teamwork operationalizations and observer ratings of behavior quality. Observer ratings consisted of a single item on a scale of 1 to 5 assessing how effectively each leadership or teamwork behavior was performed over a specific time period. Times materials missing was based on the number of times the team did not have something they needed. Cumulative delays were the number of seconds of delays caused by lapses of coordination.
*$p < .05$, one-tailed.

TABLE 4b
Correlations between Core Variables and Observer Ratings of Quality in the Action Phase

	Variable	Quality of Directive (Action)	Quality of Coaching (Action)	Quality of Relating (Action)	Quality of Team Processes (Action)	Times Materials Missing	Cumulative Delays (in seconds)
1	Directive (Trans)	.13	.01	-.02	.19	.04	-.04
2	Coaching (Trans)	.31*	.21*	.43*	.28*	.25*	.17
3	Relating (Trans)	.04	-.04	.32*	.17	-.14	-.13
4	Transition Processes	.24*	-.12	.18	.28*	**.07**	**.05**
5	Directive (Action)	**.26***	.12	-.04	.14	-.03	-.15
6	Coaching (Action)	.26*	**.50***	.27*	.21	-.04	-.09
7	Relating (Action)	.14	.06	**.52***	.20	.02	.05
8	Action Processes	.20	-.03	.10	**.38***	**-.30***	**-.37***

Note. N = 58. This table shows the correlations between leadership and teamwork operationalizations and observer ratings of behavior quality. Observer ratings consisted of a single item on a scale of 1 to 5 assessing how effectively each leadership or teamwork behavior was performed over a specific time period. Times materials missing was based on the number of times the team did not have something they needed. Cumulative delays was the number of seconds of delays caused by lapses of coordination.
*$p < .05$, one-tailed.

TABLE 5
Means, Standard Deviations, and Intercorrelations among Main Variables in Study

	Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1	Team Familiarity	4.19	.79	-											
2	Case Complexity	2.86	1.15	.04	-										
3	Teaching Case[a]	1.32	.47	-.03	-.26*	-									
4	Wave of Observation[b]	1.44	.50	-.23*	.08	-.13	-								
5	Directive (Trans)	.29	.27	-.42*	-.05	.18	.17	-							
6	Coaching (Trans)	.25	.22	-.03	.08	.03	-.40*	-.02	-						
7	Relating (Trans)	.59	.58	.16	-.00	.25*	-.20	.14	.18	-					
8	Transition Processes	.08	.72	.03	.08	-.15	.43*	.06	.21	.04	-				
9	Directive (Action)	.66	.34	-.17	.10	.02	.06	.42*	-.15	-.09	-.03	-			
10	Coaching (Action)	.42	.28	.23*	-.14	.23*	-.34*	.11	.44*	.24*	.06	.19	-		
11	Relating (Action)	.52	.47	.09	-.25*	.19	-.23*	-.11	.25*	.26*	-.07	-.30*	.00	-	
12	Action Processes	.02	.68	.08	.02	.06	.52*	.17	-.27*	-.06	.42*	.32*	.04	-.02	-

Note. N = 58. [a] 1 = Non teaching case, 2 = Teaching case; [b] 1 = Wave 1 of observation, 2 = Wave 2 of observation.
*$p < .05$, one-tailed.

TABLE 6
Predictors of Team Transition Processes

Variable	Team Transition Processes								
	Model 1			Model 2			Model 3		
	B	S.E.	B	B	S.E.	β	B	S.E.	β
Constant	-1.84*	.83		-3.19*	.83		-2.92*	.82	
Team Familiarity	.12	.11	.13	.19	.11	.21	.17	.11	.19
Case Complexity	.01	.08	.02	-.03	.07	-.04	-.06	.07	-.10
Teaching Case [a]	-.12	.20	-.08	-.16	.18	-.11	-.21	.18	-.14
Wave of Observation [b]	.64*	.18	.45*	.95*	.18	.67*	.92*	.18	.65*
Directive (Trans)				.15	.34	.06	.31	.34	.12
Coaching (Trans)				1.57*	.40	.48*	1.48*	.40	.45*
Relating (Trans)				.09	.15	.07	.06	.14	.05
Coaching x Relating							1.02*	.51	.23*
ΔR^2	--			.20*			.05*		
R^2	.21*			.41*			.46*		

Note. N = 58. [a] 1 = Non teaching case, 2 = Teaching case; [b] 1 = Wave 1 of observation, 2 = Wave 2 of observation.
*$p < .05$

TABLE 7a
Effects of Action Phase Leader Behavior on Team Action Processes

Variable	Team Action Processes								
	Model 1			Model 2			Model 3		
	B	S.E.	β	B	S.E.	β	B	S.E.	β
Constant	-3.04*	.73		-3.23*	.83		-3.84*	.71	
Team Familiarity	.19	.10	.22	.26*	.11	.30*	.21*	.10	.24*
Case Complexity	.00	.07	.00	.01	.07	.01	-.00	.06	-.00
Teaching Case [a]	.21	.17	.15	.18	.18	.12	.07	.16	.05
Wave of Observation [b]	.81*	.16	.59*	.75*	.18	.55*	.88*	.15	.65*
Directive (Trans)				.48	.34	.19			
Coaching (Trans)				-.10	.40	-.03			
Relating (Trans)				-.06	.15	-.05			
Directive (Action)							.71*	.23	.35*
Coaching (Action)							.32	.29	.13
Relating (Action)							.32	.17	.22
Transition Processes									
ΔR^2	--			.03			.14*		
R^2	.33*			.36*			.47*		

Note. N = 58. [a] 1 = Non teaching case, 2 = Teaching case; [b] 1 = Wave 1 of observation, 2 = Wave 2 of observation.
*$p < .05$

TABLE 7b
Effects of Action Phase Leader Behavior on Team Action Processes

Variable	Team Action Processes								
	Model 4			Model 5			Model 6		
	B	S.E.	β	B	S.E.	β	B	S.E.	B
Constant	-3.85*	.80		-2.89*	.85		-2.53*	.71	
Team Familiarity	.21	.11	.24	.15	.11	.17	.16	.10	.19
Case Complexity	.03	.07	.05	.04	.07	.06	-.01	.07	-.01
Teaching Case [a]	.12	.17	.08	.17	.16	.11	.22	.16	.16
Wave of Observation [b]	.85*	.17	.62*	.56*	.20	.41*	.65*	.17	.48*
Directive (Trans)	.08	.34	.03	.05	.33	.02			
Coaching (Trans)	-.31	.44	-.10	-.79	.46	-.25			
Relating (Trans)	-.07	.14	-.06	-.10	.13	-.09			
Directive (Action)	.65*	.26	.32*	.64*	.24	.32*			
Coaching (Action)	.45	.35	.18	.43	.33	.17			
Relating (Action)	.35*	.18	.24*	.38*	.17	.26*			
Transition Processes				.31*	.12	.32*	.23*	.11	.25*
ΔR^2	.02			.06*			.04*		
R^2	.49*			.55*			.37*		

Note. N = 58. [a] 1 = Non teaching case, 2 = Teaching case; [b] 1 = Wave 1 of observation, 2 = Wave 2 of observation.
*$p < .05$

FIGURE 1
Hypothesized Model

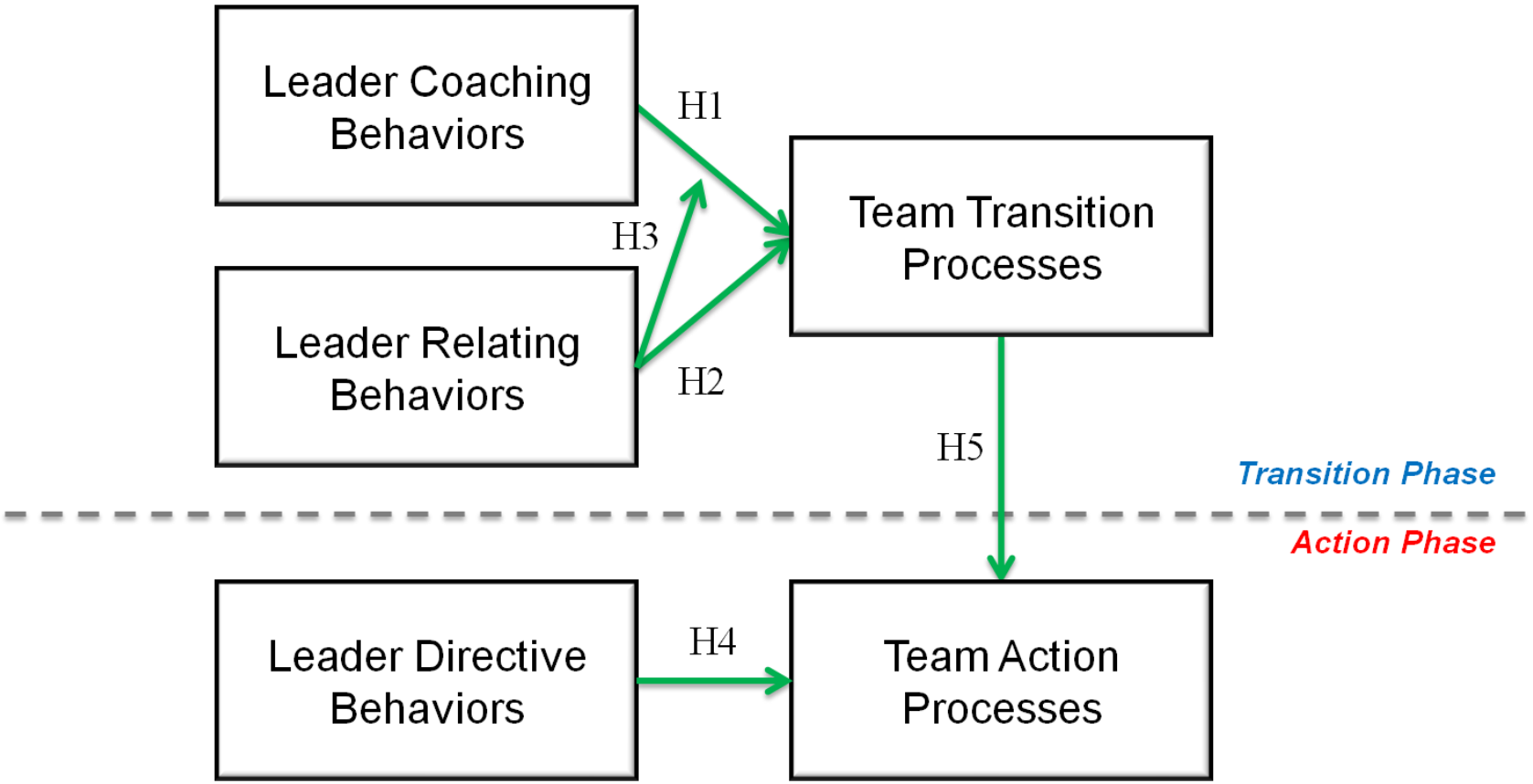
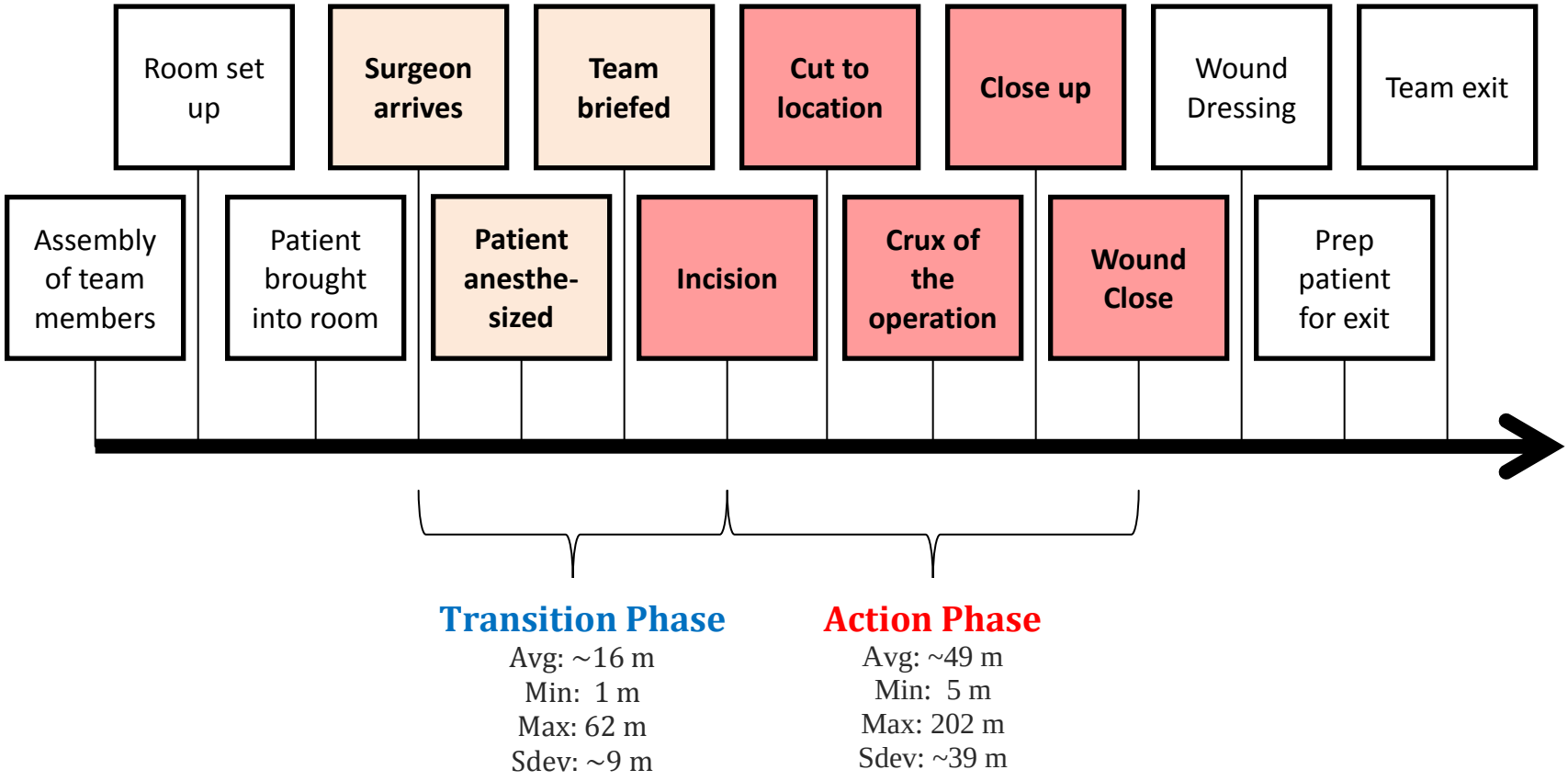


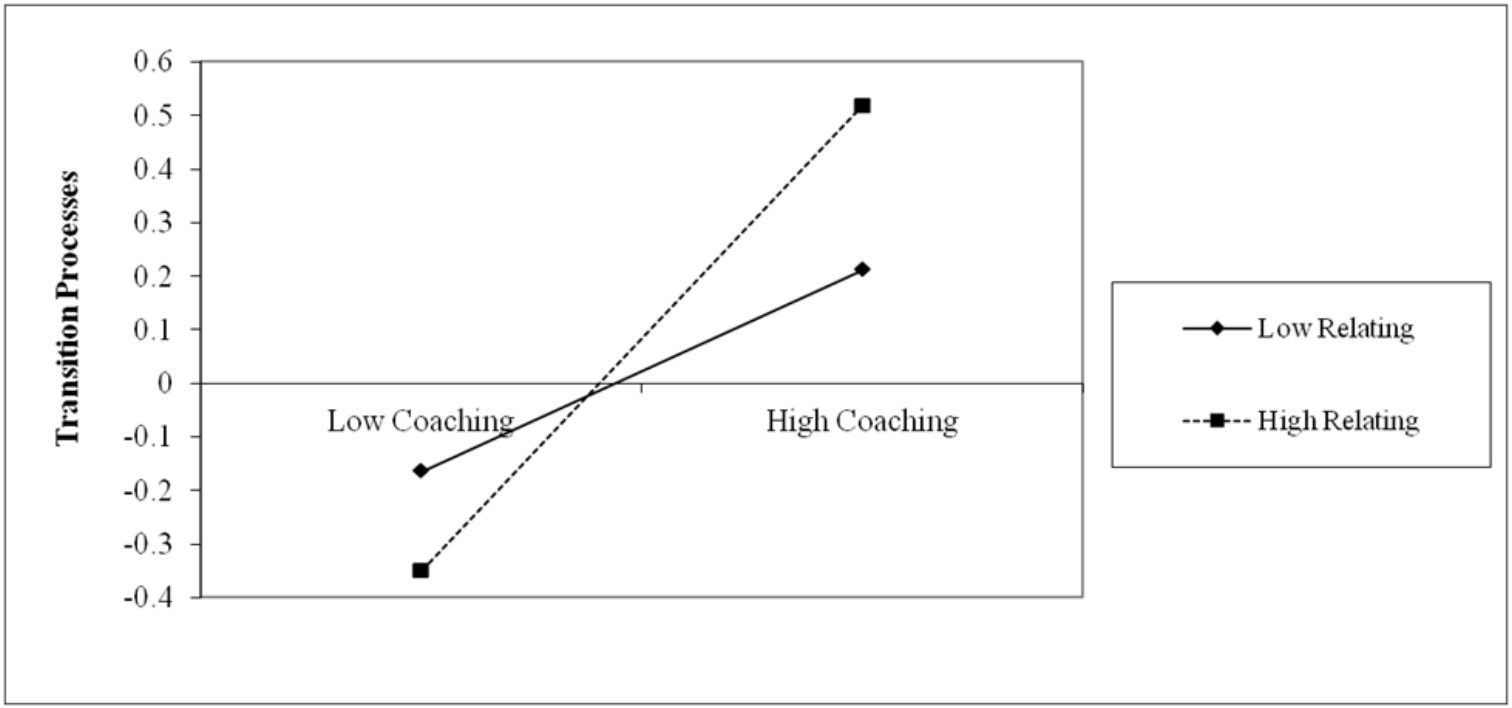
FIGURE 2
Illustration of Observer Position during a Typical Case

FIGURE 3
Timeline of Events in a Typical Surgical Episode



Note. Eight cases in which the length of core of the procedure (i.e., incision through crux) did not reach ten minutes were excluded from the analysis, based on the fact that these were non-invasive and sometimes non-surgical procedures. Examples included exploring the esophagus with a camera, removing a small mass on the toe, manipulating a shoulder, removing a cyst from the eyelid, removing a tube, etc.

FIGURE 4
Interaction Effect of Coaching and Relating Leadership



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