WHEN ONE LEADS, OTHERS MUST FOLLOW: THE IMPORTANCE OF BEHAVIORAL SYNCHRONY IN TEAMS

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ABSTRACT

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In this dissertation, I evaluate the importance of behavioral synchrony – specifically, team members following when others lead – as a primary driver of team success. Previous empirical research suggests that teams whose members engage in leading behaviors perform better, and points to the value of team members sharing in the fulfillment of leadership. Trending followership theories and qualitative research indicate that whether team members engage in following behaviors, and whether they share in the fulfillment of followership responsibilities, are equally vital for team success. Building on conceptualizations of leadership and followership as parallel, mutually interdependent processes that jointly determine team outcomes, I investigate how and why they must occur in synchrony. Drawing from published literature in social and organizational sciences, I suggest that synchrony moderates the relationship between leadership and team performance and the relationship between followership and team performance such that relationships are stronger if team members behave more synchronously with regard to leadership and followership. I embed these research questions within an input-process-outcome framework while also examining the predictors and consequences of behavioral synchrony across multiple events. Hypotheses were tested using behavioral data from teams engaging in high-fidelity emergency medical simulations. Trained research assistants coded videos of these teams, then an algorithm was applied to coded video data to determine how synchronously each team's members worked together throughout every event. Regression analyses were used to test a

reduced model positing that three key personal characteristics combine to influence team performance (average expertise, similarity in expertise, and similarity in psychological collectivism); that leadership sharing mediates the relationship between these characteristics and team performance; and that either followership sharing or synchrony moderates the relationship between leadership sharing and team performance. I discovered that average expertise and average psychological collectivism among team members were the most predictive personal characteristics. Neither shared followership nor synchrony moderated the relationship between shared leadership and team performance. Synchrony did predict team performance above-and-beyond personal characteristics, however. Ancillary analyses that focus on individuals' patterns of behavior were conducted to further inform the questions under study – results of which indicate a need for future research to focus on the importance of following behaviors, the flexibility with which team members fluctuate between different roles throughout a task, and the balance of behaviors among team members. Limitations of this study, as well as implications for research and practice, are provided.

This work is dedicated to my husband, Josh,
who has supported and tolerated me throughout this process;
and to my wonderful parents, Cathryn and Andrew,
who have always pushed me to excel in the best and gentlest of ways –
for which I am eternally grateful.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Over the past few decades, it has become common for organizations to structure work around teams rather than individuals. In parallel form, scientists and practitioners have shifted focus toward understanding and enhancing the ways in which people collaborate. Leadership has been identified as a particularly essential, if not the most essential, element in this equation (Zaccaro, Rittman, & Marks, 2001); teams perform best when members engage in activities like assigning tasks, providing guidance and feedback, monitoring others' efforts, and clarifying the team's goals and strategies (Day, 2012). Traditionally, these activities are fulfilled by someone holding the formal role of a team's manager or supervisor ("traditional," "hierarchical," or "vertical" models of leadership, Avolio, Walumbwa, & Weber, 2009). However, many work teams operate without a formal leader – either because team members are self-managed or because their leader is unable to be present at every moment of the work day. In these teams, instead of a manager or supervisor acting as the sole proprietor of leadership, team members share in fulfilling leadership duties. In other words, team members naturally fluctuate into and out of informal leader-like roles over time (Friedrich, Vessey, Schuelke, Ruark, & Mumford, 2009; Small & Rentsch, 2010). This natural, informal process that occurs when multiple team members engage in leader behaviors is often referred to as "shared leadership" (Pearce & Conger, 2003; Wang, Waldman, & Zhang, 2014).

Team success depends not only on members leading one another but also on members following one another (Carsten, Uhl-Bien, West, Patera, & McGregor, 2010; Kupers & Weibler, 2008). Assigning tasks to teammates is not helpful unless those teammates accept and complete their work; directing others is useless unless one's instructions are heard, supported, and

pursued; and so on. Leadership and followership can thus be conceptualized as parallel, interrelated, and complementary behavioral processes (DeRue, 2011; Van Vugt, 2006). If leaders do not lead, followers cannot follow; if followers do not follow, leaders cannot lead. The ultimate worth of either process depends on the other.

This perspective is consistent with constructionist theories of leadership that view followership as "a relational interaction through which leadership is co-created in combined acts of leading and following" and "a social process necessarily intertwined with leadership" (Uhl-Bien, Riggio, Lowe, & Carsten, 2014, p. 89). Constructionist theories are particularly relevant for teams without formal leaders, whose members naturally fluctuate into and out of informal leader-like roles throughout a task, because they provide a lens through which to consider leadership and followership as simultaneous processes fulfilled by different team members at different moments.

Many scholars have accepted and described related ideas about followers playing crucial roles as "co-producers" who recognize, facilitate, and grant legitimacy to leaders (active followership; e.g., Fairhurst & Uhl-Bien, 2012; Shamir, 2007). However, empirical studies of leadership tend to measure and model the leadership process without including its followership counterpart (Chemers, 2000; Gooty, Connelly, Griffith, & Gupta, 2010). This is a problem lamented across most areas of leadership research; it is not exclusive to the team context. A crucial piece of the puzzle is missing in those designs: A team's effectiveness depends not only on members functioning as leaders at a given moment but also on others actively supporting leaders as followers.

Throughout this presentation I pursue theories of constructionist leadership and active followership, namely by focusing on the importance of leadership and followership occurring in

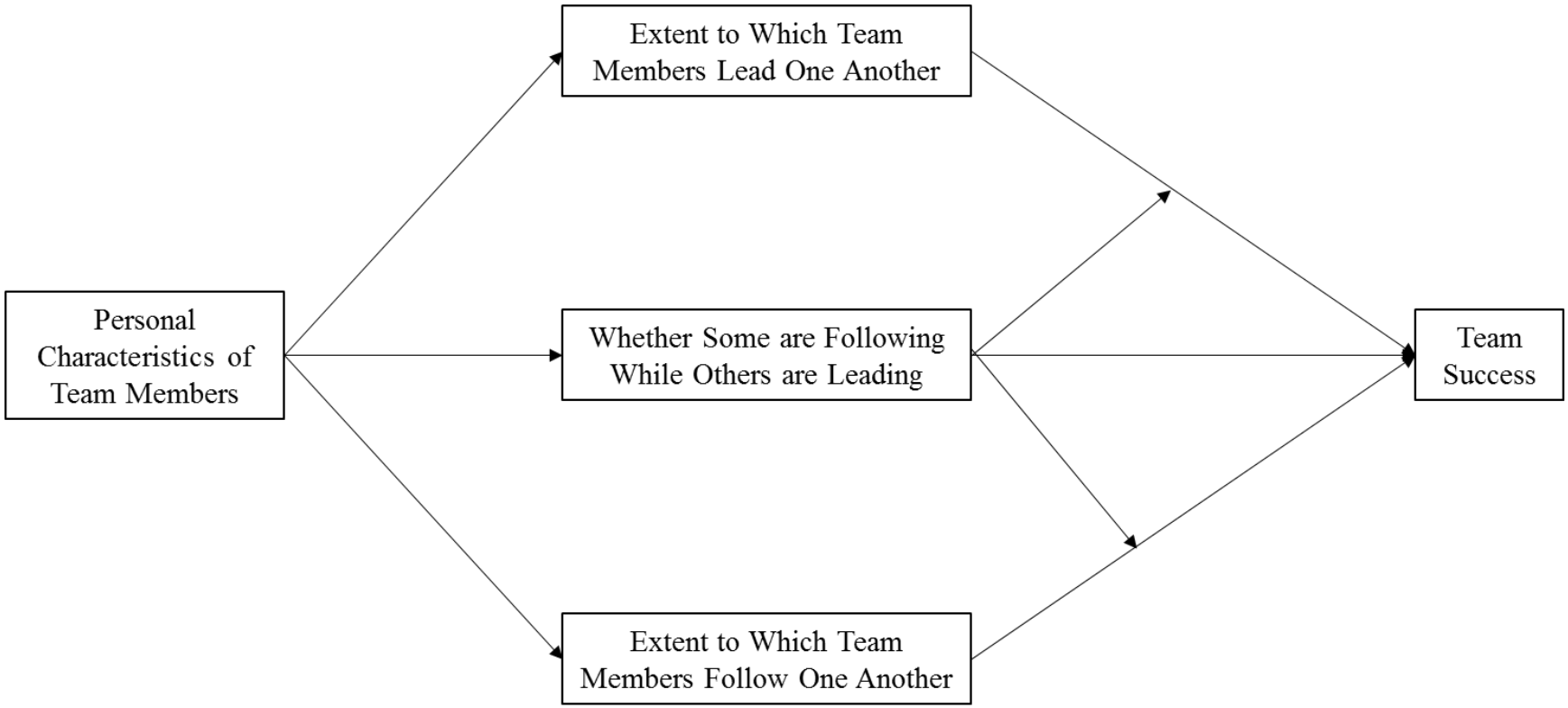
parallel, or in "synchrony." I examine synchrony as a potential moderator of the relationship between leadership and team performance as well as the relationship between followership and team performance, arguing that either relationship is dependent on the extent to which team members are following while others lead (and vice versa). In addition, I investigate the potential value of individual differences for predicting synchrony. If synchrony is a key driver of team success, then team selection/composition practices may benefit from being able to predict it using team members' personal characteristics.

Figure 1 provides an introduction to these relationships, which will be described in greater detail later. This initial figure depicts the basic ways in which key variables are hypothesized to affect one another: The individual differences or personal characteristics associated with team members, the extent to which team members lead and follow one another, whether leading and following behaviors happen synchronously, and team performance. The order of relationships follows the input-process-outcome framework popular in team effectiveness research: Team members' personal characteristics (inputs) affect the ways in which they behave (process). Those behaviors drive team success (outcomes). As shown in the figure, team success occurs only if team members engage in certain desired behaviors – leading and following – and if they do so synchronously.

In the sections that follow, I will first review literatures informing each of the aforementioned research questions to support specific hypotheses. Next, I will describe the method used to collect and prepare data for hypothesis testing. My research design centers on emergency medical simulations in which team members work together to resuscitate a patient. Individual difference data were collected via surveys. Behavioral observation and video coding were used to record leadership, followership, and team performance data. Synchrony metrics

were calculated using a moving window approach to characterize and summarize time series. All measures and figures, including coding schemes and my complete model, are provided throughout this document. Analyses will be described and interpreted with regard to limitations and recommendations for future research and practice.

Figure 1. Introductory Model of Proposed Relationships



Shared Leadership and Team Performance

Leadership is defined as a process of social influence through which one person facilitates the achievement of a shared goal or the completion of a common task (Bass & Stogdill, 1990; Yukl, 2006). A common finding in organizational science is that teams require leadership in order to be successful (Burke, Stagl, Klein, Goodwin, Salas, & Halpin, 2006; Judge & Piccolo, 2004). Given this, many scholars have studied and clarified the specific types of leading behaviors that drive team success. Bass (2008) provides a thorough history of such typologies, beginning with early approaches that focused on identifying a handful of key task-oriented leading behaviors like setting objectives, organizing a team, and persuading others. In the 1980s and 1990s, more complex approaches capturing dozens of behaviors emerged. The academic understanding of leadership had also widened by this time, resulting in definitions and typologies that included people-oriented behaviors like fostering a positive, cohesive team atmosphere and encouraging team members who are frustrated. Perspectives of leadership that take into account people-oriented behaviors (sometimes referred to as relationship-, social-, or relations-oriented) as well as task-oriented behaviors are now common.

Consider the following popular classification schemes. Carson and Tesluk (2007) differentiate leading behaviors that establish the team's purpose and direction (e.g., initiating and energizing teammates) from behaviors that help the team understand and structure their work to be effective (e.g., clarifying roles and responsibilities), behaviors that develop and maintain cohesion and prevent interpersonal difficulties (e.g., facilitating conflict resolution within the team), and behaviors that connect team members to external resources (e.g., solicits information and feedback from outside stakeholders). Hiller and colleagues (2006) discuss four slightly different categories of leading behaviors: Planning activities like organizing tasks so that work

flows smoothly and allocating resources; problem solving activities like diagnosing issues and developing solutions; support activities like showing patience towards teammates behaving courteously; and development activities like sharing one's expertise and providing training or feedback. Morgeson et al. (2010) describe fifteen categories of leading behaviors aligned with Marks, Mathieu, and Zaccaro's (2001) phase model of team effectiveness. This results in a system of classification that distinguishes planning-phase behaviors like mission definition, team composition, and goal setting from action-phase behaviors like managing boundaries, problem-solving, and providing social support. Fleishman (1991) suggests four categories – information search and structuring, information use in problem solving, managing personnel resources, and managing material resources – which break down into thirteen sub-categories like feedback and control, communicating information, and allocating materials. These sub-categories each contain more specific behaviors.

Although I have described just a few approaches to categorizing and distinguishing leading behaviors, there are many available in the organizational science literature. Most schemes can be simplified and reduced into the two broad components mentioned earlier: Task-oriented leading behaviors that focus on completing the team's work effectively and efficiently and people-oriented leading behaviors that focus on ensuring team members operate as a positive, motivated, and cohesive unit.

In addition to exploring what types of behaviors are fulfilled by leaders, researchers have also focused on which team members do – or *should* – engage in these leading behaviors. One option commonly discussed is *formal leadership* (also "vertical" or "traditional" or "classic"), which happens when someone engages in leading behaviors because his or her job description is officially a "leader" – example roles that fall into this category include most managers,

executives, and project champions. For example, managers are usually responsible for mentoring, providing feedback to, and structuring the work of their subordinates. When managers engage in these activities, they are fulfilling prescribed leadership responsibilities. Because these responsibilities are prescribed, they indicate formal leadership.

In studies of formal leadership, researchers seek to understand the traits, behaviors, and situational contingencies that cause leaders to be effective. To name a few examples, effective leaders tend to be experts in their team's task areas (Zaccaro, Kemp, & Bader, 2004), and they tend to be extraverted, conscientious, and open to new experiences (Judge, Bono, Ilies, & Gerhardt, 2002). They also tend to engage in task-oriented as well as relationship-oriented behaviors; they gather trust, respect, and rapport from teammates while also organizing and defining tasks on the team's behalf (Judge, Piccolo, & Ilies, 2004). Effective leaders also change their approaches or styles for interacting with others depending on situational factors like how favorable their relationship is with a particular subordinate, the ambiguity associated with the team's work, and how much recognized power they hold (Fiedler, 1964).

Another way in which leadership is carried out in teams is *plural leadership* (also "distributed" or "shared" or "collective"). Plural leadership research "examines leadership not as a property of individuals and their behaviors, but as a collective phenomenon that is distributed or shared among different people, potentially fluid, and constructed in interaction" (Denis, Langley, & Sergi, 2012, p. 212; Yammarino, Salas, Serban, Shirreffs, & Shuffler, 2012). Scholars studying plural leadership are typically concerned with predicting and tracking informal leadership emergence in teams as well as using leadership emergence to predict team effectiveness. All plural forms of leadership are process views in which team members interact to naturally determine who will engage in leader-like activities over time (Crevani, Lindren, &

Packendorff, 2010). Because any and all team members may carry out leadership activities, these studies often require an evaluation of the extent to which all team members engage in, and share, the fulfillment of leadership. Given that it occurs naturally and informally, plural leadership is frequently considered in contrast to vertical or traditional forms of leadership in which managers or supervisors lead as required by their normal job duties.

Moving forward, I refer to *leadership* when describing the process through which team members influence others by engaging in leading behaviors like asking for input, giving instructions, assigning roles, providing feedback, and fostering a positive atmosphere. Leadership can occur in a team regardless of whether a formal or informal role of "leader" is being fulfilled. I refer to *shared leadership* when describing the emergent, collaborative, and informal version of leadership that occurs when team members naturally and informally fluctuate into and out of leader-like roles in the absence of a formal leader. I use the term "shared leadership" rather than its many related terms – "plural leadership," "informal leadership," and "emergent leadership," to name a few – for two reasons. First, because its name and common definition encapsulates the collaborative, interactive process at the focus of this research. Second, because it is by far the most popular and consistent label used in organizational science when studying plural leadership in teams (Avolio, Walumbwa, & Weber, 2009; Baard, unpublished; Denis, Langley, & Sergi, 2012; Pearce & Conger, 2003).

If a team engages in shared leadership, its members naturally fluctuate into and out of informal leader-like roles, collectively ensuring that leadership occurs throughout a task, without any team members holding formal responsibilities as "leaders." The most commonly-cited definition for shared leadership comes from Pearce and Conger (2003), who believe it to be a "dynamic, interactive influence process among individuals in groups for which the objective is to

lead one another to the achievement of group or organizational goals or both" (p.1). Four aspects of shared leadership are clear in Pearce and Conger's definition, and are common across most if not all discussions of shared leadership (e.g., Day, 2012; Wang, Waldman, & Zhang, 2014). First, shared leadership is *dynamic* in that different team members take on leader-like roles over time. Even though one team member may have the expertise, confidence, and opportunity to lead in the beginning of a task, these factors may not be consistent throughout the task, as new issues or types of work become important. Different team members may fulfill leader-like roles over time, or may engage in different types of leadership simultaneously (Bergman, Rentsch, Small, Davenport, & Bergman, 2012). Second, shared leadership is *emergent*, or founded in mutually influential social interactions among team members. Team members behave interdependently; each one's behavior is influenced by fellow teammates' behaviors as they work together toward collective goals. In any situation where communication and interaction are required in this way, team characteristics like shared leadership may emerge. Third, shared leadership is *multidirectional*. While vertical/traditional forms of leadership are always targeted downward along a power or status spectrum, for example from manager to subordinate, shared leadership may be targeted downward or laterally from peer-to-peer. Fourth and finally, shared leadership is *goal-oriented*. Team members engage in leading behaviors because these behaviors enable the achievement of team goals or organizational goals or both.

Researchers have consistently linked shared leadership with enhanced team and organizational performance (Ensley, Hmieleski, & Pearce, 2006; Pearce & Sims, 2002; Vandewaerde, Voordeckers, Lambrechts, & Bammens, 2011; Zhang, Waldman, & Wang, 2012). A recent meta-analysis by Wang, Waldman, and Zhang (2014) reviewed 40 studies of shared leadership and team performance and noted a positive overall relationship (ρ = .34). Known

moderators of this relationship include task complexity and surface-level diversity. Shared leadership is a stronger predictor of team performance for teams whose members engage in more complex types of work, or work requiring greater specialized expertise (Yammarino, Salas, Serban, Shirreffs, & Shuffler, 2012), and for teams whose members are relatively similar with regard to age (Hoch, Pearce, & Welzel, 2010). Relationships between shared leadership and other team processes have also been supported. For example, while studying the impact of shared leadership in self-managed work teams, McIntyre and Foti (2013) discovered that teams whose members agreed about who did, and who did not, engage in leadership activities throughout a task also tended to show more similarity and accuracy in team mental models. Notably, these teams also demonstrated more favorable performance outcomes.

Thus, there is strong and consistent evidence for the importance of shared leadership as a key driver of team success. Although most research in this area has been survey-based and retrospective (Gockel & Werth, 2010), some studies have utilized more objective behavior-based metrics and showed similarly strong results. For example, Bergman and colleagues (2012) viewed and coded the behaviors of decision-making team members and operationalized shared leadership as the extent to which multiple team members engage in leading behaviors during the task. Using the coded behavior data, the authors conducted a cluster analysis on within-team patterns of leading behaviors to confirm that high-performing teams consisted of more members engaging in leadership throughout the task – specifically, initiating structure behaviors, consideration behaviors, envisioning behaviors, and spanning behaviors. This finding that replicates results of survey-based research through a less subjective lens.

Taken together, prior results from shared leadership research suggest that teams in which more members engage in leadership throughout their work tend to perform better than teams in which fewer members engage in leadership or teams in which no members engage in leadership.

> Hypothesis 1. *Shared leadership and team performance will be positively related such that teams in which more members engage in leadership behaviors throughout a task tend to perform better than teams in which fewer members engage in leadership behaviors.*

Before moving forward, it is important to clarify the treatment of shared leadership in the current presentation. Implicit in some studies of this team process is an assumption that one team member engages in leading behaviors at a time. For example, a team member may lead if his or her skill and experience regarding the current tasks seem critical. When the team moves to a new task, another team member's background may prove a better fit for leading – and so he or she takes over the fulfillment of those behaviors (e.g. DeRue & Ashford, 2010). In other studies, scholars note that multiple team members may engage in leadership simultaneously. For example, in a qualitative study about how leadership can be shared and delegated in medical trauma teams, Klein and colleagues (2006) discovered that it was more common for two or three team members to be identified as leaders versus just one. In my dissertation, I allow for any pattern of shared leadership to occur – whether sequentially in that team members take turns leading, or simultaneously in that multiple team members can be leading at once. I take this perspective to remain open to different possibilities for how leadership might occur in real, informal teams.

In addition, when considering relationships between shared leadership and team performance, I pursue a functional approach. Originated by McGrath (1962), *functional leadership theory* emphasizes the importance of leaders engaging in whatever behaviors satisfy team needs and enable collective success. This may be accomplished by prompting and instructing their teammates about to complete their work, or it may be accomplished by stepping in to model how to complete those tasks oneself (Morgeson, DeRue, & Karam, 2010). Functional leadership theory can be applied to understand the effects of formal/individualized or informal/shared leadership processes on team outcomes (Burke, Stagl, Klein, Goodwin, Salas, & Halpin, 2006). As such, this flexible, behavior-based perspective suits the current study.

Shared Followership and Team Performance

Leadership research tends to rely much on the traits, behaviors, and situational influences of leaders and relatively little on those of followers. Typical models in this literature therefore lack a key potential determinant of team effectiveness: the followership process through which team members support and grant legitimacy to leaders' ideas, attempts, and influence. Because followers' actions allow their leaders and their teams to move forward, followers likely play equally important parts in team success – namely as active collaborators and co-producers of their team's fate (Meindl, 1995; Oc & Bashshur, 2013; Reicher, Haslam, & Hopkins, 2005).

In a review of the followership research literature, Crossman and Crossman (2011) note that a widely accepted definition of followership does not yet exist. They argue that scholars tend to describe followership either from the leader's perspective – for example, Bjugstad, Thach, Thompson, and Morris' (2006) definition of followership as "the ability to effectively follow the directives and support the efforts of a leader" (p.304) – or from the follower's perspective – for

example, Wortman's (1982) definition of followership as "the process of attaining one's individual goals by being influenced by a leader into participating in individual or group efforts" (p.373). In both cases, a leader is affecting a follower, but not vice versa; the follower is a receiver or conduit of leadership.

Consider *implicit leadership theory*, which suggests that followers hold unique schema that influence how they perceive, interact with, and evaluate their leaders (Eden & Leviatan, 1975; Lord, 1985; Phillips & Lord, 1981; Rush, Thomas, & Lord, 1977). This theory is founded on the idea that team members hold certain expectations for the characteristics of a leader. For example, many people expect leaders tend to be sensitive, smart, charismatic, and masculine (Lord, Foti, & De Vader, 1984). These expectations are based on previous experiences observing leaders. When someone holds these leader-like characteristics, those expectations are activated such that the person is considered as a leader by his or her teammates.

A related area of research focuses on *romance of leadership theory* – a variation of implicit leadership theory that defines leadership as a social psychological phenomenon occurring when followers over-attribute responsibility for team issues and outcomes to the leader and under-attribute responsibility to situational factors like the task complexity or environmental pressures (Meindl, 1990; Meindl, Ehrlich, & Dukerich, 1985). According to this theory, people tend to romanticize and idealize leaders, which can result in misconceptions about how and why work is actually completed (Bligh, Kohles, & Pillai, 2011).

Follower-centric approaches like implicit leadership theory or romance of leadership theory tend to emphasize a hierarchal, power-infused separation between a formal leader (manager) and a follower (subordinate). The relationships between leaders and followers are described as one-way – leaders influence followers but followers do not influence leaders. One

empirical example of this perspective comes from an experiment by Van Kleef, Homan, Beersma, and van Knippenberg (2010). These authors were interested in learning whether followers perform better when leaders express anger versus happiness. They discovered that the relationship between leaders' behaviors and followers' performance depends on how agreeable followers are; followers who are less agreeable perform better when leaders express anger, while followers who are more agreeable perform better when leaders express happiness. Thus, the influence of leaders' emotional displays – one of the simplest and most common ways in which humans interact – on followers' performance is at least partially dependent on matching with followers' personality.

An alternative approach to followership is described by Uhl-bien and colleagues (2014), who place import on describing followership as a relational and interaction-based social process rather than a rank or position in which team members are affected by a leader. These authors suggest that while role theory approaches like Katz and Kahn's (1978) associate followership with the subordinate in a hierarchal relationship, their *constructionist* perspective views followership as a mutually influential process through which followers interact with leaders to jointly affect team outcomes (Fairhurst & Grant, 2010).

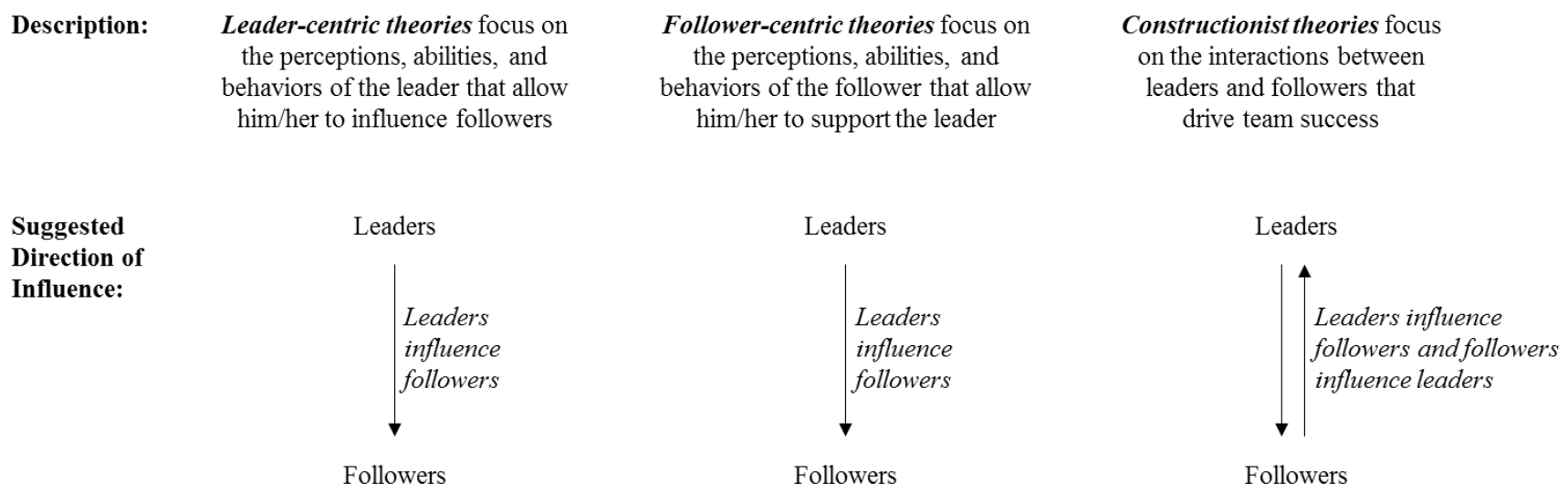
Why might a model in which leaders and followers are mutually interdependent and important be most accurate? Oc and Bashshur (2013) assert that followers exert influence over leaders, and vice versa, because each entity functions as the social context in which the other exists. They argue that leaders are dependent on followers, specifically with regard to the *strength* and *immediacy* of followers. Strength refers to the power ascribed to followers by their positions or personal characteristics (e.g., expert power; French & Raven, 1959) – namely, the number of followers and the extent to which they are cohesive, and the persuasive or supportive

behaviors they are able to target toward leaders. Immediacy refers to the social-psychological distance separating followers from leaders as well as their physical distance and the frequency with which they interact. Oc and Bashshur also discuss the parallel, intertwined nature with which leadership and followership should occur:

> "...in the same way that followers react to leaders, leaders react to followers. Indeed, that is a premise of our model, that leaders choose to change (or not) their behaviors in response to social influence. However, these reactions should also feedback into the follower perceptions and shape subsequent follower reaction. In short, this is a dynamic relationship of bottom up influence and top down counterinfluence" (p. 931).

See Figure 2 for a summary comparison of these constructionist perspectives versus leader- and follower-centric approaches. While leader- and follower-centric approaches focus on leaders as influencers of followers, constructivists argue that followers can and do influence leaders as well, and are equally important drivers of team success. When followership is considered alongside shared leadership, which itself is a mutually-influential process through which team members interact to collectively carry out leadership activities, it becomes clear that the two processes are conceptually and practically intertwined.

Figure 2. Three Approaches to Studying Leadership and Followership in Teams



When defining shared leadership earlier, I mentioned four key components. Shared leadership is dynamic because different team members may engage in leading behaviors throughout a task. Shared leadership is also emergent, or founded in mutually influential social interactions among team members. It is also multidirectional in that leading behaviors can be targeted downward or laterally from peer-to-peer. Finally, it is goal-oriented in that leading behaviors are carried out in pursuit of specific team or organizational goals. When discussing followership in the context of leaderless teams, a shared process view is most relevant. All four components of the shared leadership definition can be applied to define a mirror process: shared followership. Because multiple team members engage in following behaviors while working together, shared followership is dynamic. Because followership is based on interactions among team members, it is also emergent; followership cannot exist without the presence of multiple people coordinating their efforts during task work. Followership is multidirectional in that following behaviors may be targeted upward – at higher-level managers, for example – or laterally – from peer-to-peer, as may be the case in a leaderless team. Finally, shared followership occurs when and because team members collectively strive toward a task or organizational goal, just as shared leadership does. Therefore we should also consider it goal-oriented.

Table 1 provides a full summary of the followership-related terms and definitions described here, as well as the leadership-related terms and definitions described earlier. Note that leading and following refer to specific behaviors like fostering a positive atmosphere (leading) and obeying instructions (following). Leader and follower represent team members who consistently engage in either type of behavior over time. These are functions or roles that team members fulfill while interacting with one another in pursuit of shared goals. Leadership and

followership are terms used when describing the overall processes through which leaders and followers influence one another. In other words, leadership occurs when leaders lead; and followership occurs when followers follow. Formal leadership and formal followership indicate processes occurring when either leading or following behaviors are prescribed as part of someone's job responsibilities. Finally, shared leadership and shared followership refer to processes that occur when multiple team members engage in either leading or following behaviors throughout a task in order to drive a team toward success. When leadership is shared, for example, any given team member who is filling the role of a leader (by leading consistently over time) can switch into a follower role (by following consistently over time). This shifting of leading behaviors would not typically occur in a formal leadership situation, where one person takes primary responsibility for fulfilling the role of "Leader."

Given this definition of shared followership as a dynamic, emergent, multidirectional, goal-oriented process, as well as the empirical results and conceptual approaches described earlier, it is likely that team success is influenced by the extent to which team members engage in following behaviors.

> Hypothesis 2. *Shared followership and team performance will be positively related such that teams in which more members engage in followership behaviors throughout a task tend to perform better than teams in which fewer members engage in followership behaviors.*

Table 1. Key Definitions

Term	Definition
Leading	Behaviors like asking for input, giving instructions, assigning roles, providing feedback, and fostering a positive atmosphere, which prompt *following* behaviors and purposefully guide team members toward task success
Leader	A team member who consistently engages in *leading* behaviors
Leadership	Overall process through which *leaders* respond to and influence *followers*
Formal Leadership (related: "Vertical" or "Traditional" or "Classic" Leadership)	Leadership that occurs when one team member acts as a *leader*, engaging in *leading* behaviors consistently, as prescribed by this team member's job description
Shared Leadership (related: "Distributed" or "Plural" or "Collective" Leadership)	Leadership that occurs when multiple team members act as *leaders*, engaging in *leading* behaviors consistently, throughout a task

Term	Definition
Following	Behaviors like providing input when asked, following instructions, fulfilling an assigned role, adjusting based on feedback, and supporting a positive atmosphere, which are in response to another team member's *leading* behaviors and enable task success
Follower	A team member who consistently engages in *following* behaviors
Followership	Overall process through which *followers* respond to and influence *leaders*
Formal Followership	Followership that occurs when one team member acts as a *follower*, engaging in *following* behaviors consistently, as prescribed by this team member's job description
Shared Followership	Followership that occurs when multiple team members act as *followers*, engaging in *following* behaviors consistently, throughout a task

The Importance of Synchrony

Shared leadership, or natural leadership that occurs in teams when no members' formal job duties require it, implies a process of give-and-take among team members such that one person leads while the rest follow, then another person leads while the rest follow, then another person leads while the rest follow, and so on. However, the reciprocal, or counterpart, process of followership is not often discussed, measured, or modeled – an issue lamented by many others (e.g., Chemers, 2000; Gooty, Connelly, Griffith, & Gupta, 2010). When followership *is* studied, it is often treated as a constraint or moderator of the relationship between leadership and performance (e.g., Van Kleef, Homan, Beersma, & van Knippenberg, 2010); for leadership to positively affect organizational or team outcomes, followership must also occur to some extent (Küpers & Weibler, 2008). However, work in this area has been primarily theoretical or review-based, with little published data to support assertions about the importance of followership occurring alongside leadership in order for a team to be successful.

One such body of work concerns constructionist theory (or "co-constructionist theory"), which proposes that solely focusing on leadership or followership is insufficient; instead, leadership and followership should be considered mutually dependent processes occurring simultaneously as team members interact throughout a task (DeRue & Ashford, 2010; Fairhurst & Grant, 2010; Uhl-Bien & Ospina, 2012). This approach considers "followers to be active participants with leaders in co-constructing leadership, followership, and outcomes" (Uhl-bien, Riggio, Lowe, & Carsten, 2014 p. 84); and suggests that "leadership and followership are co-created in and through the relational nature of social interaction" (Fairhurst & Uhl-bien, 2012). Followers and leaders are therefore not necessarily determined by formal assignment within the organization but rather are expected to naturally emerge through social interactions among team

members; an expectation aligned with common definitions and theories of shared leadership, as described earlier.

Multiple versions of constructionist theory have been published, all of which refer to the parallel and intertwined nature of leadership and followership. For example, DeRue (2011) suggested that team members tend to engage in either leading or following behaviors, and that after doing so consistently, they internalize identities associated with one or the other. DeRue suggested focusing on double interacts (Morgeson, DeRue, & Karam, 2010; Weick, 1969), also sometimes called contingent response patterns, which occur when someone's behavior depends on how others are behaving in a given moment. In the context of leadership and followership, neither process is entirely separate from the other, so the study of one necessitates the study of the other. DeRue and Ashford (2010) discuss a very similar model in which leaders' claims (to leadership) are met with followers' granting of those claims over time until clear, quasi-formal roles are established. These roles may be stable throughout task work, or they may be renegotiated as circumstances change. According to DeRue and Ashford, a team member is only a "leader" if his or her team mates support and grant that "leader" identity while simultaneously taking on "follower" identities for themselves. Thus, leaders and followers must be reciprocally supported.

Another example of constructionist theory comes from Shamir (2007), who proposed that followers actively influence leaders through leader-member exchange relationships such that team outcomes are produced jointly (Dvir & Shamir, 2003). The unique aspect of Shamir's perspective is the active role played by followers; according to him, followers do not only support the leader's direction and goals but also contribute to key decision-making. Here again followers are not recipients or granters of the leader's influence but rather obvious influencers

themselves. Similar to DeRue and Ashford's conceptualization, Shamir also suggests that researchers balance studies of leaders and followers such that the characteristics, behaviors, and outcomes of both are deemed important. This point is particularly relevant to the current study because leading and following behaviors are treated as key, equally important predictors of team success.

Common across theories of constructionist leadership and active followership is the central focus placed on leadership and followership as relational or interaction-based processes occurring across team members throughout task work. Translating this to the context of overall team functioning and performance, high-performing teams should be teams that include members who engage in leading behaviors as other members engage in following behaviors (Muethel & Hoegl, 2013; Reicher et al., 2005). In other words, team members must fulfill the two processes synchronously. This assertion is irrespective of the internal pattern of leadership and followership; high-performing teams may consist of some team members who consistently engage in leadership and others who consistently engage in followership, or they may consist of team members who switch in and out of leadership/followership roles repeatedly during task work. When studying teams without formal leaders in place, such patterns emerge naturally. The current study of synchrony does not involve differentiating how often the internal pattern of leadership and followership processes changes throughout task work but rather to what extent they occur in synchrony. Specifically, I suggest that the critical determinant of team success is the extent to which some team members fulfill leader-like roles while others fulfill follower-like roles and vice versa.

Figures 3, 4, and 5 depict example patterns of team member behaviors. In Figure 3, no one leads when any one follows, indicating a complete lack of synchrony. There are time periods

when multiple team members are engaging in leading behaviors, in other types of task work (collectively called "active" behaviors), or are not engaging in any activities at all (collectively called "inactive" behaviors). However, because following behaviors do not occur alongside leading behaviors, the team lacks synchrony. Figure 4 shows a team whose members engage in synchrony about half of the time. Toward the beginning and end of this task, at least one team member is leading while at least one other is following. Finally, Figure 5 includes members who consistently follow when others lead. Although members also engage in other types of behaviors – and are sometimes even inactive – the concurrence of leading and following represents complete synchrony for this team.

Figure 3. Example Team Demonstrating 0% Synchrony

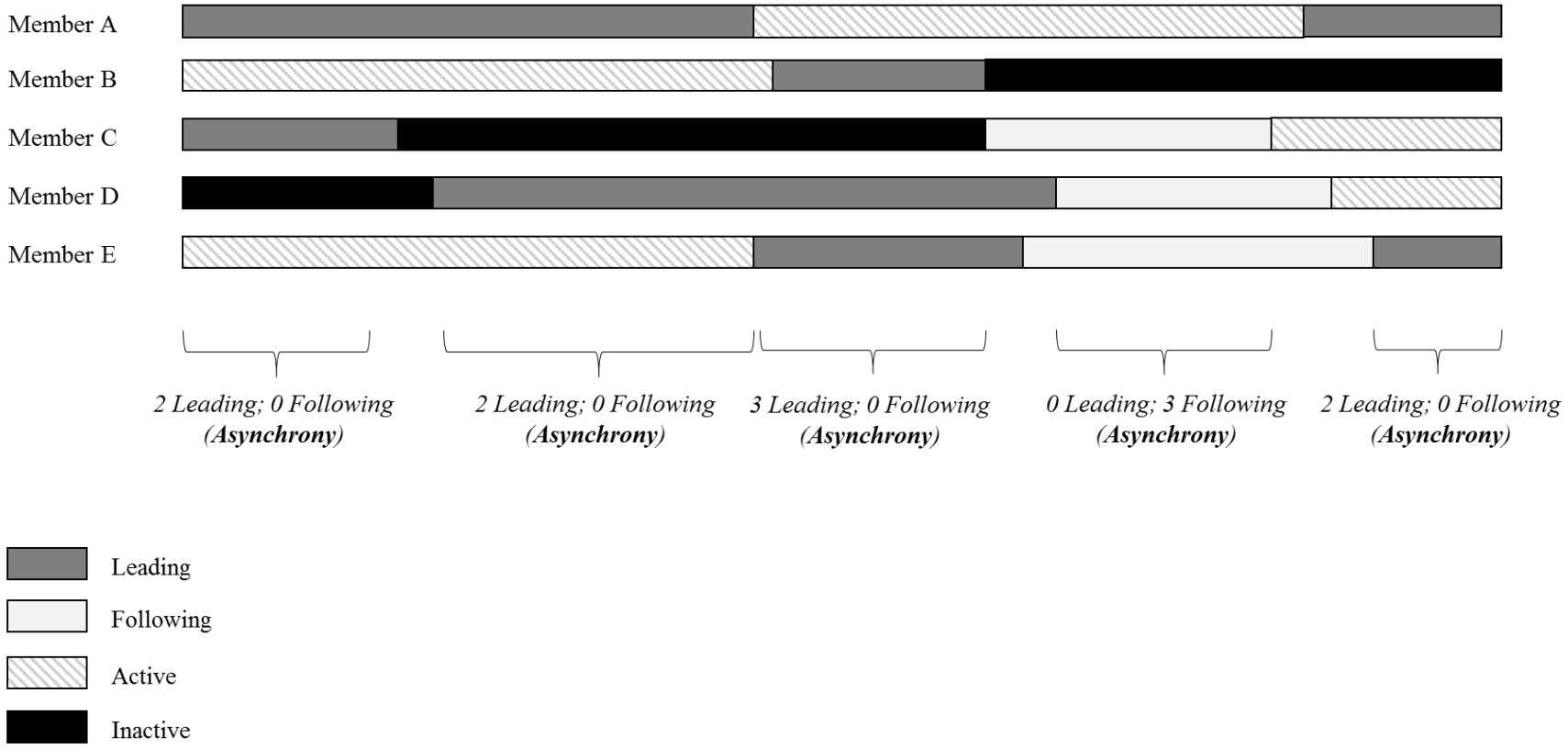


Figure 4. Example Team Demonstrating 50% Synchrony

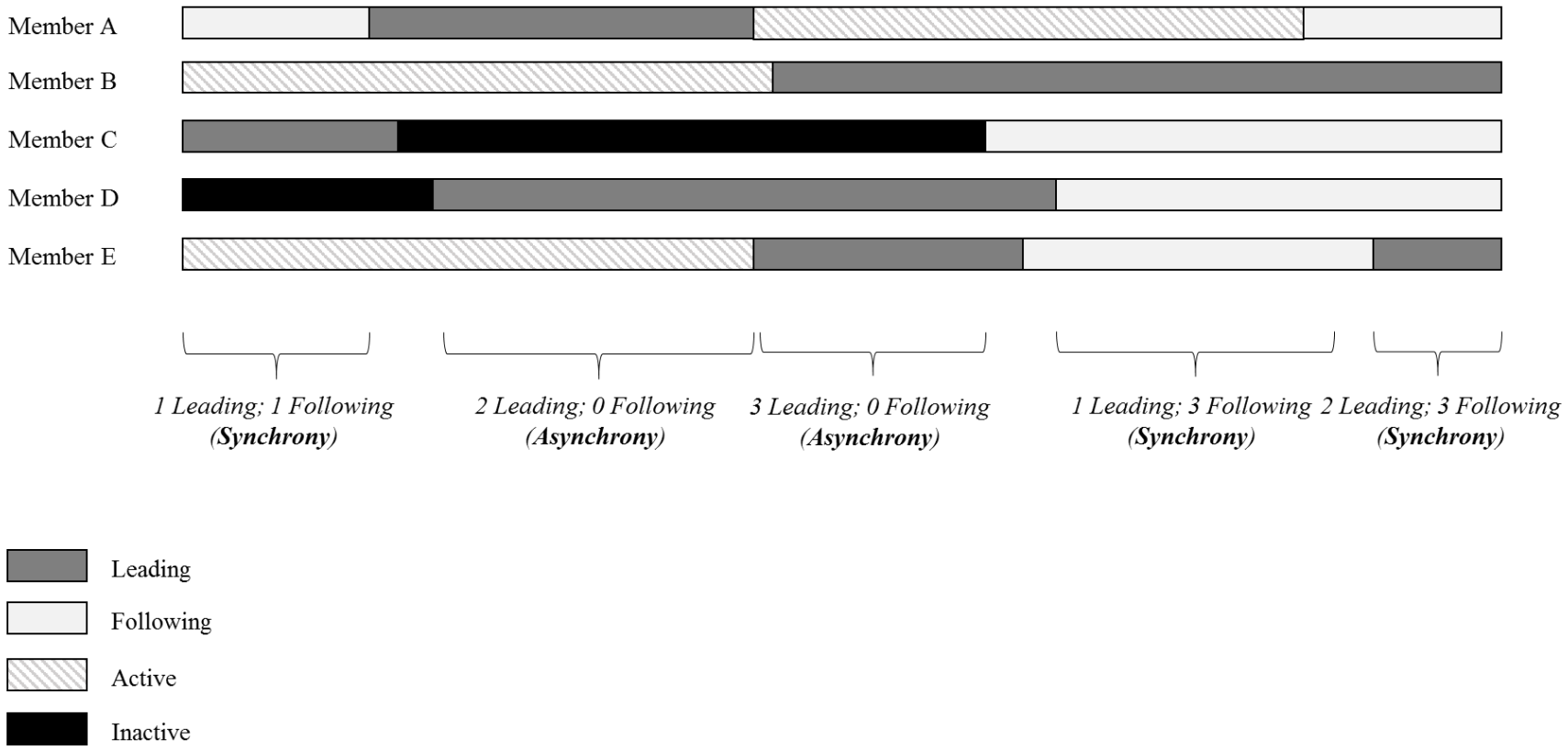
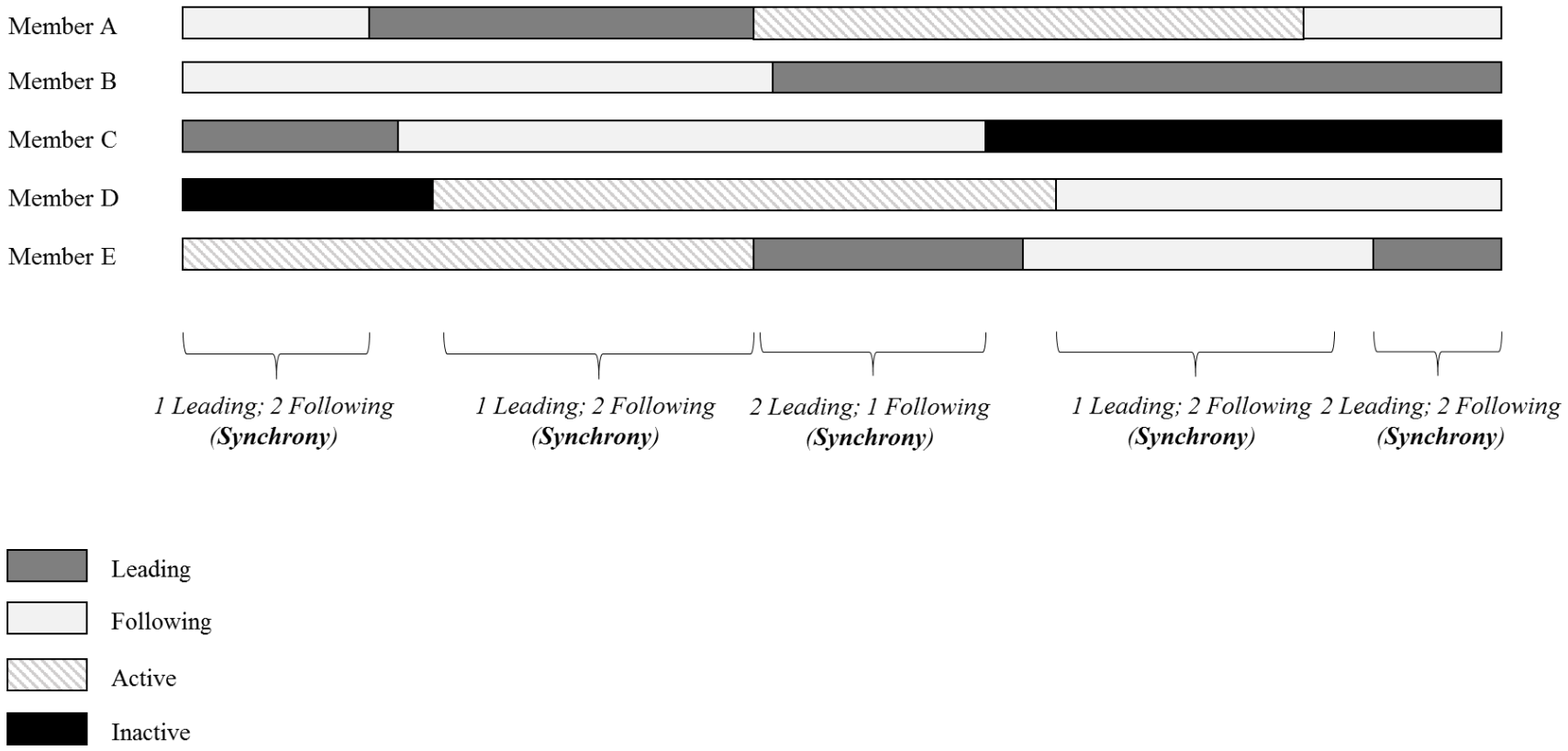


Figure 5. Example Team Demonstrating 100% Synchrony



Outside the literatures specific to leadership and followership, other theories have been used to describe emergent, complementary cycles of teamwork more generally. Multilevel theory is one such framework; according to multilevel theory, team phenomena emerge as a result of social interaction among team members: "A phenomenon is emergent when it originates in the cognition, affect, behaviors, or other characteristics of individuals, is amplified by their interactions, and manifests as a higher-level, collective phenomenon" (Kozlowski & Klein, 2000, p. 55). Scholars of multilevel theory focus on the ways in which team members interact to develop shared phenomena like team mental models, cohesion, and climate – with clear relevance for leadership and followership processes also. Emergence in systems is directed by social acts that provide structure and condition later social acts that reinforce this structure; in other words, one team member's behavior determines others' behaviors, and together these behaviors represent patterns of interaction across individuals.

Although an empirical body of research applying multilevel theory to study emergence has not yet accumulated (Kozlowski, 2012), its application to the current research is clear: As team members interact throughout a task, certain shared characteristics and processes emerge as a result of those interactions and critically influence team outcomes. Consistent with this perspective is the consideration of leadership and followership as mutually dependent processes into and out of which team members fluctuate. When those fluctuations are considered in aggregate, it becomes possible to not only evaluate the extent to which leadership and followership *occur* but also the extent to which the two processes *co-occur* across team members in synchrony. Morgeson and Hoffman (1999) describe the series of events through which team processes like leadership and followership co-occur as follows:

> "…the actions of individuals will meet in space and time, resulting in interpersonal interaction. This interaction results in a discrete event, and subsequent interaction produces what can be termed an event cycle. These events and event cycles represent points of "contact," or "encounters" between ongoing individual processes. Events and event cycles, thus, define the system of interaction between individuals…" (p. 252).

Synchrony is directly tied to this idea that intrateam processes occurring simultaneously influence one another and define the team's overall cycles of interaction. Although Morgeson and Hoffman (1999) offer a clear conceptualization of this phenomenon, the basic notion is not novel. One early example of these ideas comes from Karl Weick (1969), who when describing the ways in which individuals' behaviors are "interlocked" during collaboration noted they are also "embedded in in conditionally related processes" (p. 91). Katz and Kahn (1978) discuss similar issues with regard to role/identity development; cycles or patterns of behavior emerge as individuals interact over time.

To further explain the notion of synchrony and its importance for teams, consider the following studies of emergent behavior patterns in animals and humans. Herbert-Read and colleagues (2011) studied the rules of interaction among mosquito fish to examine the ways in which each fish adjusts its behavior to others in the same school. The authors discovered that mosquito fish use visual cues to determine where other members of their school are, then accelerate if others are far and decelerate if others are near. They also found that each fish notices and responds to other members in the school one-at-a-time. Because all fish in the school engage in this adjustment simultaneously, a spontaneous pattern of self-organization emerges that allows the fish to thrive as a collective. Biologists have studied emergent patterns of behavior that support collective success for decades, shown for example in the flock behavior of

birds and herd behavior of land mammals (Green, 1994). Common across these studies is the finding that any one being's behavior is determined by the behaviors of its teammates. A bird flying in a flock or a land mammal traveling in a herd attempts to stay near others, to move at the same speed as others, and attempts to avoid colliding with others (Reynolds, 1987). These rules of interaction allow flocks, herds, and schools of fish to survive and flourish.

This behavioral adjustment has also been discovered in humans working together. Wing and colleagues (2014), for example, observed members of two internationally recognized string quartets to study second-by-second variations in musical timing. The authors learned that the participating violinists recognized and adjusted to one another's timing at each millisecond. In a study focusing on the movements of football players during a competitive game, Duarte et al. (2013) discovered that players tended to coordinate their movement during plays versus others on their same team. This was especially true when the team moved in certain directions (longitudinally across the field versus laterally across the field). Looking across the two halves of the game, the authors reported that movement patterns became more regular over time.

Taken together, this research suggests that humans and animals synchronize their behaviors when working within a collective, and that synchrony may lead to favorable outcomes – for example, winning awards and favor as a string quartet or warding off a predator as a school of fish. This type of behavioral synchrony can be defined as "the coordination of movements between individuals in both timing and form during interpersonal communication" (Kimura & Daibo, 2006, p. 115). When applied to the study of leadership and followership in teams, I suggest that synchrony occurs in reciprocal interactions wherein one team member engages in leading behaviors and others engage in following behaviors as a direct, although perhaps subconscious, result. This reciprocity continues in that following behaviors prompt additional

leading behaviors, and so on. The more synchronously team members behave, the better they should perform together. The mutual, interactive pacing of each team member's activities relative to other team members' activities has been called coupling by some (e.g., Strogatz, 2001) and entrainment by others (e.g., Ancona & Chong, 1996). Generally these terms refer to the tendency of people within a collective (or units of systems) to establish harmonized patterns of interrelated behaviors that enhance their efficiency and effectiveness.

Hypothesis 3a. *Synchrony will moderate the relationship between shared leadership and team performance such that the relationship will be stronger for teams whose members behave more synchronously and weaker for teams whose members behave less synchronously.*

Hypothesis 3b. *Synchrony will moderate the relationship between shared followership and team performance such that the relationship will be stronger for teams whose members behave more synchronously and weaker for teams whose members behave less synchronously.*

Hypothesis 3c. *Teams whose members demonstrate more synchrony will perform better than teams whose members demonstrate less synchrony.*

Personal Characteristics Predictive of Leadership

If synchrony is a key determinant of team performance, then team selection practices may benefit from identifying personal characteristics that differentiate teams whose members engage

in synchrony from those whose members do not. Although there is an abundance of research evidencing predictors of leadership, there are relatively fewer established predictors of followership. In addition to delineating personal characteristics that predict each process, in the next few sections I will discuss how and why teams whose members are more similar with regard to those personal characteristics may also demonstrate more synchrony in terms of leadership and followership.

There are a variety of ways in which team members may differ from one another. Typically researchers categorize team member differences as surface-level or deep-level characteristics. Surface-level characteristics like age, race, and gender are perceivable after even brief exposure to a particular person; deep-level characteristics, on the other hand, are only able to be gauged after lengthier interactions with that person (Bell, 2007). Personality, values, attitudes, and skillsets are all examples of deep-level characteristics. Although it has become common to study team composition in terms of surface- and deep-level characteristics, the latter category shows more promise as a predictor of team performance (Harrison, Price, Gavin, & Florey, 2002; Hollenbeck, DeRue, & Guzzo, 2004) – especially in the long-term (Harrison, Mohammed, McGrath, Florey, & Vanderstoep, 2003). Pelled and colleagues argue that this is because deep-level characteristics offer clear implications for the task at-hand, while surface-level characteristics do not (Pelled, 1996; Pelled, Eisenhardt, & Xin, 1999; Simons, Pelled, & Smith, 1999). For example, a space crew might be optimally composed of team members who are intelligent, curious, experienced, and patient because the tasks crewmembers must complete are complex, innovative, and of long-duration. There is no reason to suspect that a space crew whose members are more or less similar with regard to age, gender, race, etc. should be better- or worse-performing. Even if surface-level characteristics are influential, this can likely be better

explained (conceptually and empirically) by deeper-level characteristics that correlate with surface-level characteristics yet hold truer relationships with task performance – for example, age versus amount of experience.

In the current research I focus on three deep-level characteristics potentially predictive not only of team performance but also of leadership behaviors that mediate relationships with team performance. First, the average, or overall level, of expertise across team members is a known predictor of team performance (e.g., Devine & Philips, 2001). In other words, teams whose members on average have greater experience and education relevant to the task at-hand will engage in more leading behaviors and will perform better. In one study testing relationships among expertise and team performance, Mohammed and colleagues (2002) collected grade-point averages from undergraduates participating in a laboratory-based task. They averaged grade point averages across team members and included the team-level grade-point average variable as a predictor of team performance. Results evidenced strong relationships between average grade-point average and task performance, even when included alongside various other team characteristics like neuroticism and agreeableness.

Expertise has also been linked directly with leadership. In a meta-analysis of the relationship between intelligence – a construct closely related to expertise – and leadership, Judge, Colbert, and Ilies (2004) discovered a corrected correlation of .27. Intelligence was also identified as the key prototypical characteristic of all leaders by Lord, Fori, and De Vader (1984). Using an implicit leadership theory rationale, these authors suggest that people naturally link intelligence with leadership such that they tend to perceive effective leaders as smart people and smart people as effective leaders. In addition to basic ability or intelligence, expertise also encompasses experience in a particular context or field. Cavazotte and colleagues (2012)

discovered that employees with more managerial experience tended to engage in more leadership behaviors, and that engaging in more leadership behaviors tended to result in more favorable ratings of those managers. Strang (2004) found that leaders who earned stronger scores on Leadership Development Level interviews – interviews measuring participants' beliefs about and experiences leading others – also tended to engage in key leading behaviors like designing tasks, taking initiative, and encouraging teamwork.

Second, the overall level of self-efficacy should predict performance such that teams whose members are more efficacious on average will perform better. Much research in organizational science supports this. One meta-analysis by Gully, Incalcaterra, Joshi, and Beaubien (2002) discovered an overall moderate positive relationship between team-level self-efficacy and performance ($\rho = .41$). This relationship was even stronger for interdependent teams. In other words, teams whose members are more confident about their collective ability to succeed do actually perform better than teams whose members are less confident; and this is especially true for teams whose members rely on one another to effectively complete their collective assignments.

In addition to predicting team performance, efficacy is also a key predictor of leadership and leader emergence. In one study, Kolb (1999) measured the self-confidence of team members as well as the extent to which they emerged as leaders while working together on class projects. She found that team members who felt more efficacious about their abilities and likelihood of success tended to lead more often than those who felt less efficacious. Another study by Kipnis and Lane (1962) measured the self-efficacy of Navy officers as well as their preferences for leading others in various ways. Their results indicated that officers who lacked self-efficacy tended to refer their subordinates to others for help and to rely on administrative procedures

rather than face-to-face communication and problem solving, Aside from these quantitative studies, most qualitative research targeting the traits of effective or emergent leaders point to the primary importance of self-efficacy or self-confidence (Judge, Bono, Ilies, & Gerhardt, 2002). For example, Yukl (1998) identified self-confidence, an internal locus of control, and an achievement orientation as key leader traits – all of which are conceptually similar to self-efficacy.

Third, the overall level of conscientiousness across team members should positively relate to the amount of leadership occurring within the team and also to team performance. Conscientiousness, or the relatively stable preference for thoroughness, organization, and care taken when completing one's work (Ozer & Benet-Martínez, 2006), is one of the most often-cited predictors of work performance for individuals, and that research has expanded into the domain of teams as well. LePine and colleagues (1997), for example, discovered that decision-making teams were most accurate – or best-performing – if team members were very conscientious as well as high in cognitive ability.

In addition to conscientiousness being positively linked with team performance, literature reviews like the one conducted by Judge, Ilies, Bono, and Gerhardt (2002) identify leadership as a potential mediating mechanism of this relationship; one reason why conscientious people perform well is because they tend to engage in leading behaviors that enable their preferences for how to complete tasks (conscientiously) to drive team success. In other words, conscientious leaders tend to be more effective leaders, and more effective leaders tend to have more effective teams. Conscientiousness has also been meta-analytically linked with leader emergence (Ilies, Gerhardt, & Le, 2004) and with fulfilling certain types of leadership (e.g., transformational and transactional, Bono & Judge, 2004).

Taken together, these results suggest that teams whose members have expertise, are efficacious, and are conscientious will demonstrate more shared leadership and will be more successful than teams whose members lack expertise, efficacy, and conscientiousness.

Hypothesis 4a. *Teams whose members have greater expertise on average will demonstrate more shared leadership than teams whose members have less expertise on average.*

Hypothesis 4b. *Teams whose members are more efficacious on average will demonstrate more shared leadership than teams whose members are less efficacious on average.*

Hypothesis 4c. *Teams whose members are more conscientious on average will demonstrate more shared leadership than teams whose members are less conscientious on average.*

Hypothesis 4d. *Teams whose members have greater expertise on average will perform better than teams whose members have less expertise on average.*

Hypothesis 4e. *Teams whose members are more efficacious on average will perform better than teams whose members are less efficacious on average.*

Hypothesis 4f. *Teams whose members are more conscientious on average will perform better than teams whose members are less conscientiousness on average.*

Personal Characteristics Predictive of Followership

Compared with the vast number of empirical articles available providing evidence for personal characteristics of leaders that are and are not predictive of team performance, relatively few have focused on personal characteristics of followers that predict team performance. Even so, there exist conceptual models and qualitative research regarding followership and its potential predictors. I will draw from these studies to identify three indicators of team members' skill and personality likely to influence the extent to which they engage in and share following behaviors.

While reviewing extant theories of followership, Uhl-bien and colleagues (2014) suggest many personal characteristics that might influence whether team members engage in followership behaviors. They mention political skill, goal orientation, and Machiavellianism as potentially important traits; awareness and support of the task, motivation to lead, and power orientation as key motivational factors; and implicit followership schemas, role orientations, identity, and romance-based conceptualizations of the leader as influential perceptions that affect how followers interact with leaders.

Carsten, Uhl-bien, West, Patera, & McGregor (2010) also offer qualitative findings relevant to the current endeavor. These authors conducted semi-structured interviews with employees from various backgrounds, occupations, organizations, and levels to learn about how people think about followership as well as the personal characteristics affecting whether people engage in following behaviors and how effectively they do so. Carsten and colleagues discovered

about a dozen key personal characteristics through this study: Participants reported that effective followers are *team players*, or willing to cooperate with others; have *positive attitudes* such that they emphasize good and hopeful aspects of their work; are *proactive*, or identify opportunities to contribute and do so before opportunities are assigned as tasks by leaders; *express opinions* by making their ideas and feelings known to the team, even when they challenge the stance of a leader; are *flexible* and able to adapt to changing circumstances; *obey* and defer to leaders' directions; are *skilled communicators*; are *loyal*, or supportive toward the leader; are *responsible* and worthy of trust; *take ownership* of their work; are *mindful* of the team's and company's long-term goals; and have *sound morals/ethics*.

Berg (1998) took a similar qualitative approach to understand the characteristics of effective followers. In a series of workshops Berg discussed followership with managers from real-world organizations. As a result of this work, Berg suggested five key follower attributes: (1) *loyalty* and support for the leader, (2) *affection* for the leader, (3) having a *voice* separate and unique from the leader, (4) performing *outside the limelight* of the leader, and (5) behaving collaboratively and *complementarily* alongside the leader (Baker, 2006). Berg noted that these five attributes are common and important regardless of what style of leadership employed by managers.

In summary, the personal characteristics identified by these researchers align with how followers are typically described: As team members who support and complement the leader, who feel a sense of collectivism or collectivistic identity, and who are skilled with working in social contexts. In my dissertation I will focus on these three personal characteristics, labeled respectively as agreeableness, psychological collectivism, and social skills. Notice that I am referring to the ways in which these characteristics influence performance in aggregate – I intend

to explore not whether agreeable people perform well individually but rather whether teams whose members are more agreeable on average tend to perform well as a unit. This standpoint treats the team as a melting pot of personal characteristics; followership and leadership are roles fulfilled jointly by team members, and personal characteristics together form higher-level patterns that influence followership and leadership as well as ultimate team success.

Social skills, agreeableness, and psychological collectivism have each been established as a key predictor of team performance in previous research. Teams perform better if members are more agreeable (Bradley, Baur, Banford, & Postlethwaite, 2013), if they are more psychologically collective (Eby & Dobbins, 1997), and if they have stronger social skills (Rapp & Mathieu, 2007) on average (Barrick, Mitchell, & Stewart, 2003; Bell, 2007; Stewart, 2003). These three characteristics are also similar to those identified qualitatively by Carsten, Uhl-bien, West, Patera, and McGregor (2010) and Berg (1998), as described above.

Hypothesis 5a. *Teams whose members have stronger social skills on average will demonstrate more shared followership than teams whose members have weaker social skills on average.*

Hypothesis 5b. *Teams whose members are more agreeable on average will demonstrate more shared followership than teams whose members are less agreeable on average.*

Hypothesis 5c. *Teams whose members are more psychologically collective on average will demonstrate more shared followership than teams whose members are less psychologically collective on average.*

Hypothesis 5d. *Teams whose members have stronger social skills on average will perform better than teams whose members have weaker social skills on average.*

Hypothesis 5e. *Teams whose members are more agreeable on average will perform better than teams whose members are less agreeable on average.*

Hypothesis 5f. *Teams whose members are more psychologically collective on average will perform better than teams whose members are less psychologically collective on average.*

I chose the aforementioned personal characteristics as predictors of leadership and followership because there is theoretical and/or empirical precedence in the organizational science literature for each one. However, many other factors may affect the extent to which team members engage in leadership and followership throughout a task. My goal is therefore not to determine the influence of expertise, self-efficacy, conscientiousness, social skills, agreeableness, and psychological collectivism exclusively but rather to offer them as examples and describe how they might combine across team members to predict leadership, followership, synchrony, team performance. Outside the leadership and followership literatures, team performance and team members' behaviors are commonly discussed as consequences of skill-

and personality-based averages like the ones I have described here. In the next section, I will introduce how diversity or variance across team members with regard to these personal characteristics might affect leadership/followership synchrony in particular. For example, it may be that teams whose members are more efficacious on average fulfill more leadership behaviors, but that synchrony is most likely to occur when team members are similar or homogenous in their levels of self-efficacy.

Team Diversity Predictors of Synchrony

Some scholars argue that effective teams are composed of individual members who are *different* from one another in terms of knowledge, skills, abilities, and other personal characteristics because diversity provides members with access to a larger pool of experiences, ideas, information, and support than if each person was working alone (e.g. diversity with regard to ethnicity, Cox, Lobel, & McLeod, 1991; or with regard to personality, Hoffman, 1959). Other scholars argue that effective teams are composed of members who are *similar* to one another with regard to those same aspects due to human tendencies to favor others who are like themselves. For example, the similarity-attraction hypothesis states that people are attracted to, and more cooperative with, comparable others (Byrne, 1971). In a related vein, social identity and self-categorization theories state that people characterize themselves and others according to salient characteristics like gender and race, and react more positively to in-group members than out-group members (Turner, 1985). In an effort to reconcile these competing alternatives, scholars have moved away from arguing that either similarity or differentiation is preferable and instead toward identifying circumstances (moderators) under which each one is favorable.

One such circumstance is the particular type of personal characteristic under study. Mannix and Neale (2005) note that teams may be most successful if members have the same surface-level characteristics like race and age and different deep-level characteristics like personality and expertise. These authors review empirical research regarding the similarity-attraction hypothesis and social categorization theory to suggest that interpersonal attraction and liking are strongest if each team member perceives his or her teammates as "in-group" – i.e., of the same race, gender, values, or beliefs. They describe how humans tend to prefer working with other humans whose attributes and preferences match their own; the more similarities, especially in surface-level characteristics like race and gender, the more instantaneous interpersonal liking and attraction tends to occur. This phenomenon is also sometimes referred to as homophily (McPherson, Smith-Lovin, & Cook, 2001) – or by the common saying "birds of a feather flock together" – and has garnered substantial empirical research support over the years. For example, Sacco and Schmitt (2005) discovered that surface-level diversity (misfit with coworkers) among restaurant workers leads to turnover. Mannix and Neale (2005) also discuss why differentiation may benefit teams, specifically when diversity exists in team members' backgrounds, experiences, and skills. If each person brings a unique set of expertise to the team context, then there is more information and understanding available collectively than any one member would have access to alone. This information processing approach represents one key reason why organizations prefer team-oriented structures instead of individual-oriented ones; the more people with specialized expertise in the room, the more potential access to better ideas and solutions, which should ultimately translate into favorable business outcomes. Generally, deep-level diversity tends to have positive effects on team performance (Jehn & Bezrukova, 2004;

Pelled Eisenhardt, & Xin, 1999) and surface-level diversity tends to have negative effects (Jackson, Joshi, & Erhardt, 2003; Leonard, Levine, & Joshi, 2004)[1].

In addition to the type of personal characteristic under study, a number of moderators have been identified that help explain why differentiation may be better or worse for team performance than similarity. For example, van Knippenberg, De Dreu, and Homan (2004) suggest that team members' task motivation, ability, social identity, and the type of work being done all moderate the diversity-performance linkage. Time is another key factor; Harrison and colleagues (1998) found that the negative effects of surface-level diversity became weaker, and the positive effects of deep-level diversity became stronger, over time as team members interacted. Findings like these have prompted recent reviews of the literature (e.g., Kozlowski & Bell, 2013) and meta-analyses (e.g., Joshi & Roh, 2009) to focus on contextual, task, and temporal features that affect whether differences or similarities among team members result in more favorable outcomes.

Overall, the complex effects of team diversity on teamwork and performance outcomes remain unsolved (Roberson, 2012; van Knippenberg & Schippers, 2007). For the purpose of my dissertation, I ask the following: Given the influence of personal characteristics like agreeableness and expertise, might it be better for teams to include members who are very similar or very different from one another? I suggest the former; teams will be most synchronous and successful if members have more favorable personal characteristics on average *and if members are more similar with regard to those personal characteristics*. This perspective is inspired by previous studies of climate strength (e.g., Schneider, Salvaggio, & Subirats, 2002). Climate strength studies assess the degree to which employees think and feel similarly about working for an organization. Organizational outcomes are thought to be most favorable if there is

a high overall level of the climate (i.e., how positive employees perceive the climate to be on average) as well as high climate strength (i.e., to what extent employees agree that the climate is positive).

Thus, I will test whether teams whose members are more similar with regard to key personal characteristics tend to be more successful versus teams whose members are less similar with regard to those characteristics.

Hypothesis 6a. *Teams whose members are more similar in terms of expertise will demonstrate more synchrony than teams whose members are less similar in terms of expertise.*

Hypothesis 6b. *Teams whose members are more similar in terms of self-efficacy will demonstrate more synchrony than teams whose members are less similar in terms of self-efficacy.*

Hypothesis 6c. *Teams whose members are more similar in terms of conscientiousness will demonstrate more synchrony than teams whose members are less similar in terms of conscientiousness.*

Hypothesis 6d. *Teams whose members are more similar in terms of social skills will demonstrate more synchrony than teams whose members are less similar in terms of social skills.*

Hypothesis 6e. *Teams whose members are more similar in terms of agreeableness will demonstrate more synchrony than teams whose members are less similar in terms of agreeableness.*

Hypothesis 6f. *Teams whose members are more similar in terms of psychological collectivism will demonstrate more synchrony than teams whose members are less similar in terms of psychological collectivism.*

Reciprocal Links between Synchrony and Team Performance

Thinking about leadership and followership as predictors of team performance is consistent with the input-process-outcome framework (McGrath, 1964) commonly used to describe team functioning. This framework depicts how pre-existing conditions like team member demographics, team size, and norms within the team's overarching organization (inputs) affect the ways in which members interact (processes) which in turn affect the team's effectiveness (outcomes).

Recently, updates have been made to McGrath's original input-process-outcome model to more centrally incorporate time in its application. Kozlowski, Gully, McHugh, Salas, & Cannon-Bowers (1996), Marks, Mathieu, and Zaccaro (2001), and Mathieu, Maynard, Rapp, and Gilson (2008) suggested that teams undergo multiple cycles of inputs, processes, and outcomes en route to task completion, thereby representing teamwork as a continuously changing phenomenon. In a similar vein, Ilgen, Hollenbeck, Johnson, and Jundt (2005) included reciprocal links and feedback loops in their rendition of the input-process-outcome model to link each variable within the model to every other variable, thus demonstrating the possibility that each category

influences the others interdependently over time. As a result of theoretical endeavors by Marks et al. (2001), Mathieu et al. (2008), Ilgen et al. (2005), and others, the current understanding of the input-process-outcome model explicitly considers temporal cycles as critical components. Even so, there remain very few longitudinal empirical studies of team functioning that incorporate the input-process-outcome model.

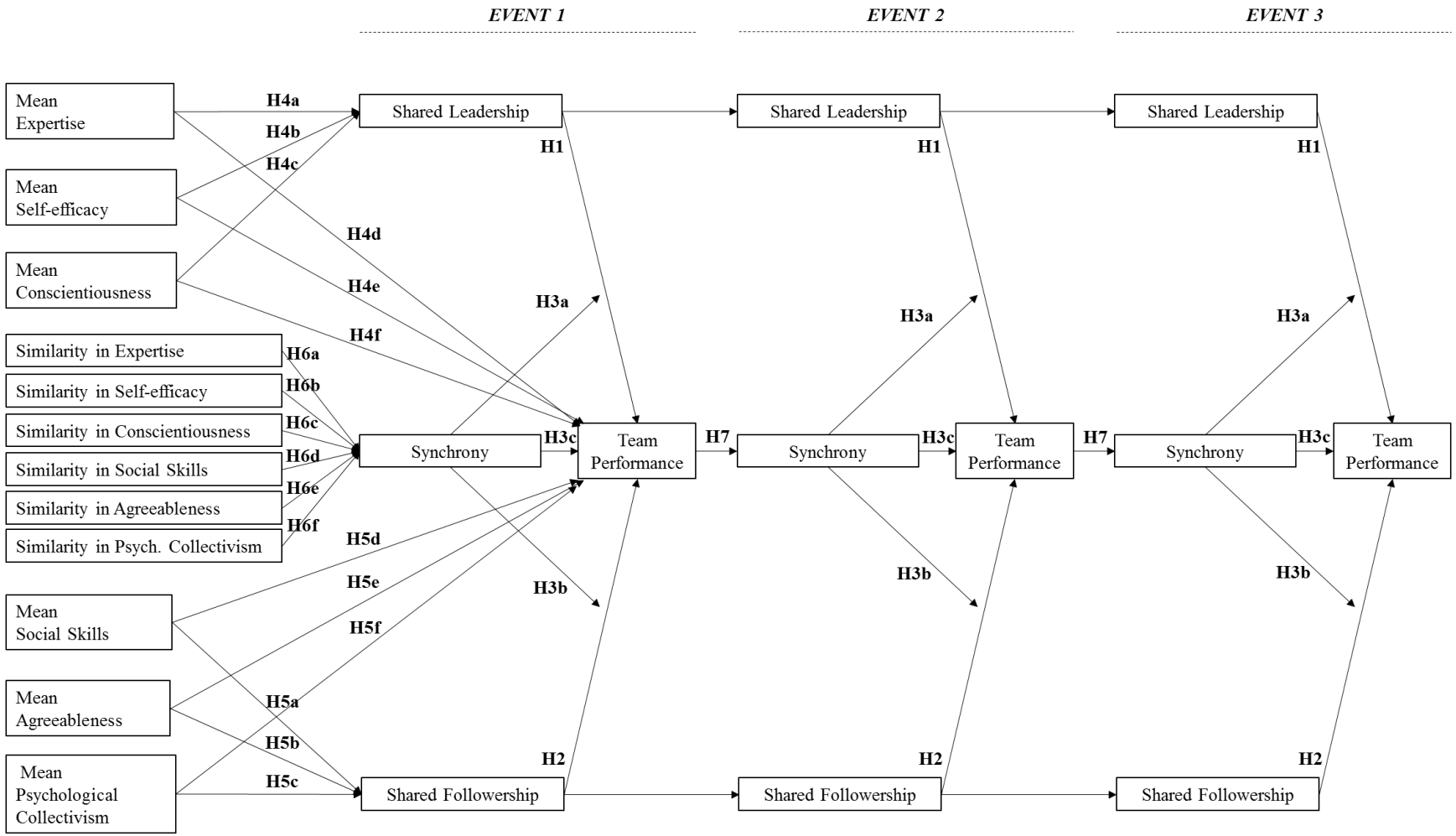
The model used in this dissertation represents an over time, or multi-cycle, version of the input-process-outcome framework that also incorporates feedback and moderation (see Figures 1 and 5). I base my investigation of synchrony on this framework because it simply yet realistically depicts team functioning, in ways consistent with current trends in theories of constructionist leadership and active followership. This framework also allows for the treatment of team performance not only as an outcome variable but as a continuously fluctuating time series that influences, and is influenced by, other phenomena occurring within the team. In particular, the reciprocal relationship between synchrony and team performance can be estimated; teams whose members demonstrate more synchrony are likely to perform better, as described earlier, and teams that perform better are likely to demonstrate more synchrony.

> Hypothesis 7. *There will be a positive relationship between team performance and subsequent synchrony such that better-performing teams in a given event will demonstrate more synchrony in a subsequent event.*

In summary, I have suggested a set hypotheses aimed at understanding the importance of leadership and followership occurring in synchrony among team members. Figure 6 summarizes my hypotheses in a complete model of relationships. A number of theories were reviewed in

support of these hypotheses, including constructionist theories that propose the necessary interrelationships among leaders' and followers' behaviors and social influence theories that describe how followers and leaders adjust future behaviors based on one another's previous behaviors. When available, quantitative and qualitative research evidence was presented to further strengthen hypotheses. Specifically, I reviewed scientific research concerning potential antecedents of leadership, followership, and the synchrony of these two processes, focusing on the average level and similarity of six key personal characteristics. I also considered the positive feedback loop through which synchrony and team performance might relate across teamwork events.

Figure 6. Detailed Model of Proposed Relationships



Note. Psych. Collectivism = Psychological Collectivism.

Next, I will propose a method of data collection and plan for analyses. Before moving on, however, I would like to briefly describe the rationale for my sample. The data from this sample has already been collected as part of a long-term stream of research led by Steve W. J. Kozlowski (Michigan State University) and Rose Fernandez (University of Washington). Their research team recorded videos of medical students and residents collaborating in Emergency Room simulation exercises in order to validate a resource-light teamwork training program. I worked in this research team throughout my graduate education at Michigan State University, for example by training and managing the coding of all videos along specific teamwork dimensions in 2011 and 2012, and running analyses and presenting findings at conferences and in manuscripts. For the purposes of this dissertation, I have trained and managed a new set of research assistants to re-code all videos – this time recording leadership and followership information.

Although this is a "sample of convenience," and unfortunately limited in size, for many reasons it is an optimal source of information for a study of leadership/followership synchrony. First, within any of these emergency medical simulation teams, members hold the same title and status. This enables the natural emergence of shared leadership and followership without the influence of formal power hierarchies. Second, all team members have the education and resources required to perform well in the simulation. Even so, some teams perform much better than others, and differences in performance are largely attributable to teamwork issues like the fulfillment of leadership and followership responsibilities. Third, the simulation is high-fidelity, engaging, and standardized; timing and events are pre-arranged by the research team, but participants are surprised as unexpected issues arise and they must work together to resolve them. Fourth and finally, video data provides second-by-second information about what team

members are doing; as a result, I am able to precisely pinpoint the leading and following behaviors used to calculate synchrony.

METHOD

Participants

The sample for this study included fourth-year medical students and first-, second-, and third-year emergency medicine residents ($N_{individuals}$ = 226). Participants were assigned to teams of four-to-six members (N_{teams} = 44). Each team included either medical students or residents; no team included both medical students and residents. All participants were enrolled in a medical school in the Midwest. Data were collected on this school's campus between August 2010 and February 2011. All participants were pre-screened to ensure they held the level of education and procedural knowledge required to participate in the simulation task described next. Most participants were male (61%) and most were white (70%). Their average age was 27.60 (minimum = 24; maximum = 41).

Task

While participating in this research, each team engaged in an emergency medical simulation lasting about 30 minutes. This simulation required participants to interact with a programmable human physiology-based METI HPS® medical mannequin with intact respiratory, circulatory, and pharmacologic properties. The mannequin accepted and responded to medicine, fluids, and procedures administered by the team. One confederate was also present throughout every simulation. The confederate played the role of nurse, administering medications, making calls, and preparing equipment on the team's behalf. The confederate also ensured that the team moved through the simulation at an appropriate pace and prevented the team from spending too much time on tangential/noncritical issues. Because of this and other

purposeful aspects of the simulation design, all teams experienced the various elements of the simulation in standardized fashion. However, the ways in which team members interacted and how well they performed throughout the simulation was entirely left to their own discretion.

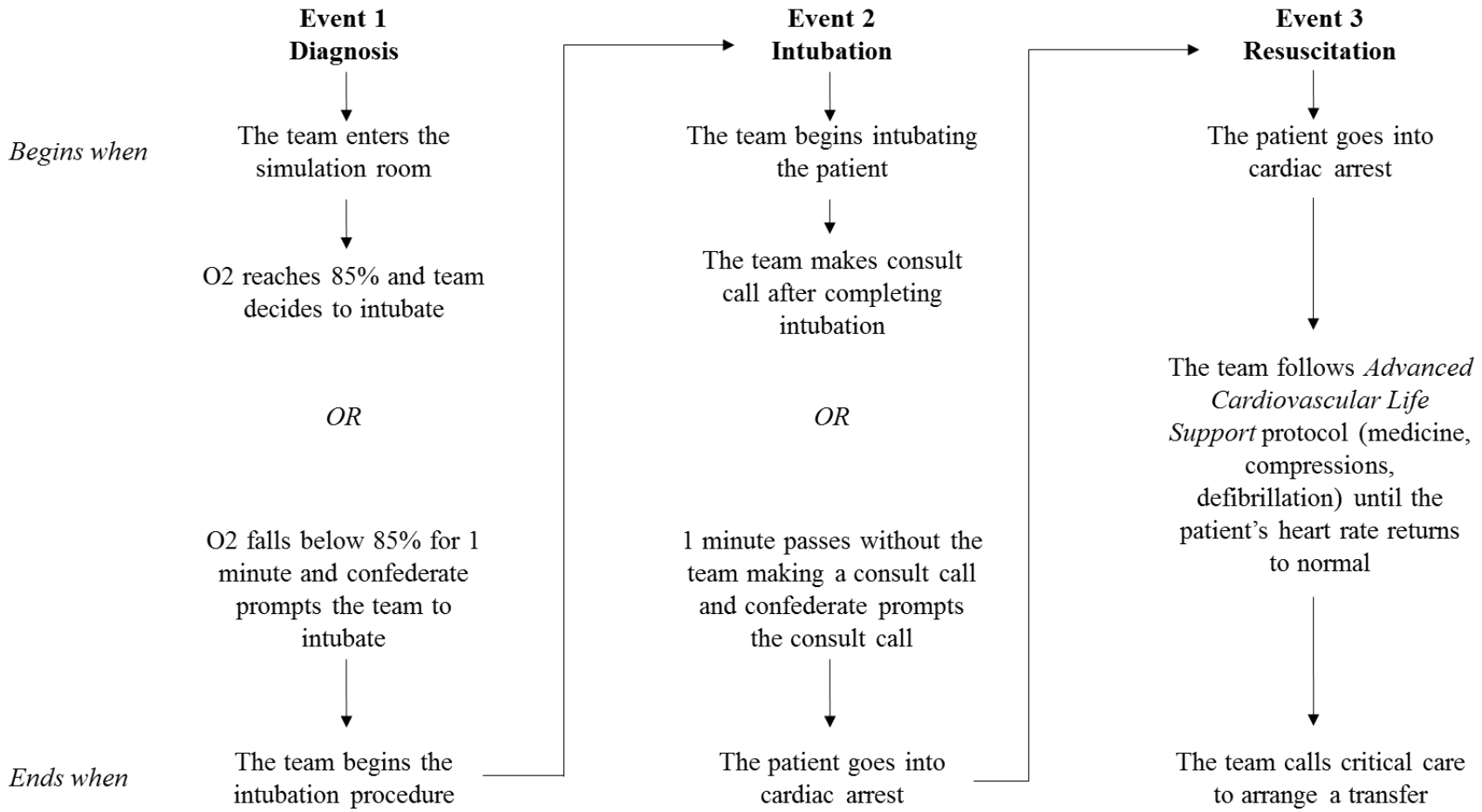
The simulation was broken into three events (see Figure 7). The first event, Diagnosis, began when the team entered the simulation room. This room was equipped with all resources typically available in the Emergency Room, including a crash cart, intubation supplies, a heart rate monitor, an intravenous fluid kit, and patient charts. Once the patient's oxygen saturation reached 85%, the team should have realized the need to intubate. If the team did not, and instead allowed the oxygen saturation to fall below 85% for one minute, the confederate prompted the team to intubate. Once the team began the intubation procedure, the first event (Diagnosis) ended and the second event, Intubation, began.

The Intubation event required the team to insert an endotracheal tube and to attach the endotracheal tube to a bagging device. This procedure let the team open and send air directly into the patient's lungs, thereby increasing his oxygen saturation. If the team proved unable to intubate after multiple attempts, the confederate stepped in to complete the procedure so the team could move on. After intubating, the team was expected to call the Intensive Care Unit to arrange patient transfer. If the team did not make this call within one minute, the confederate prompted it. During this call, the patient went into cardiac arrest. The second event (Intubation) ended when the patient went into cardiac arrest and the third event, Resuscitation, began.

The Resuscitation event involved the team recognizing that the patient had entered cardiac arrest and subsequently following an established protocol to deliver medicine, compressions, and defibrillation until his heart rate returned to normal. As with all interactions with the patient, the effectiveness with which the team delivered patient care (i.e., administering

the correct medications with the correct dosages, applying consistent, strong chest compressions, and defibrillating in the correct locations at the correct voltage levels) determined how much time passed before the patient stabilized. Once stabilized, the team should have called critical care to arrange a transfer. Again, if the team did not make this call within one minute, the confederate would prompt it.

Figure 7. Task Flow



Measures

All individual difference data (expertise, self-efficacy, conscientiousness, agreeableness, psychological collectivism, social skills) were collected before participants entered the simulation room. While engaging in the simulation[2], participants were recorded via video and audio. These videos were later coded by trained research assistants to collect leading, following, and other types of behavioral data; and by emergency medical physicians to collect performance data.

Expertise. Expertise was represented by one survey question asking the participant to report the number of resuscitations he or she had participated in previously ("How many resuscitations have you participated in?").

Mean. Mean expertise was calculated by averaging expertise data across team members.

Similarity. The standard deviation across expertise scores represents the extent to which team members are dissimilar; lower standard deviations indicate greater similarity and vice versa.

Self-efficacy. Eight items assessed the extent to which each participant felt confident in his or her ability to perform well across different tasks and situations (e.g., "I believe I can meet the challenges of my tasks," "I am certain that I can manage the requirements of my tasks"). These items are available in Appendix A. Participants indicated their agreement with these items on a five-point scale that ranged from "strongly disagree" (1) to "strongly agree" (5). These items were averaged to create each participant's general self-efficacy datum. The Cronbach's alpha for this scale indicated adequate internal consistency ($\alpha = .91$).

Mean. Mean general self-efficacy was calculated by averaging general self-efficacy data across team members.

Similarity. The standard deviation across self-efficacy scores represents the extent to which team members are dissimilar; lower standard deviations indicate greater similarity and vice versa.

Conscientiousness. Donnellan and colleagues' (2006) mini-IPIP marker scale was used to assess the extent to which each participant prefers organization and responsibility (e.g., "Like order," "Often forget to put things back in their proper place"). These items are available in Appendix B. Participants indicated their agreement with four conscientiousness items on a five-point scale ranging from "very inaccurate" (1) to "very accurate" (5). These items were averaged to create each participant's conscientiousness datum. The Cronbach's alpha for these items represented response reliability ($\alpha = .74$).

Mean. Mean conscientiousness was calculated by averaging conscientiousness data across team members.

Similarity. The standard deviation across conscientiousness scores represents the extent to which team members are dissimilar; lower standard deviations indicate greater similarity and vice versa.

Agreeableness. Four additional items from Donnellan and colleagues' (2006) mini-IPIP marker scale were used to assess the extent to which each participant empathizes with and is interested in other people (e.g., "Feel others' emotions," "Am not interested in other people's problems"). These items are also available in Appendix B. Participants indicated their agreement with agreeableness items on a five-point scale ranging from "very inaccurate" (1) to "very accurate" (5). These items were averaged to create each participant's agreeableness datum. Items were internally consistent ($\alpha = .81$).

Mean. Mean agreeableness was calculated by averaging agreeableness data across team members.

Similarity. The standard deviation across agreeableness scores represents the extent to which team members are dissimilar; lower standard deviations indicate greater similarity and vice versa.

Psychological collectivism. Jackson, Colquitt, Wesson, and Zapata-Phelan's (2006) fifteen-item scale was used to capture how much each participant enjoys and prefers working with others versus working alone. Instructions prompted participants to think back to previous times when they worked in teams (e.g., "I was not bothered by the need to rely on group members," "Group goals were more important to me than my personal goals"). These items are available in Appendix C. Participants indicated their agreement with psychological collectivism items on a five-point scale that ranged from "strongly disagree" (1) to "strongly agree" (5). These items were averaged to create each participant's psychological collectivism datum. The Cronbach's alpha for this scale indicated adequate internal consistency ($\alpha = .89$).

Mean. Mean psychological collectivism was calculated by averaging psychological collectivism data across team members.

Similarity. The standard deviation across psychological collectivism scores represents the extent to which team members are dissimilar; lower standard deviations indicate greater similarity and vice versa.

Social skills. Seven items measured the extent to which each participant feels capable and effective when interacting with others (e.g., "I am keenly aware of how I am perceived by others," "In social situations, it is always clear to me exactly what to say and do"). These items are available in Appendix D. Participants indicated their agreement with social skills items on a

five-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). These items were averaged to create each participant's social skills datum. Items were internally consistent (α = .76).

Mean. Mean social skills was calculated by averaging social skills data across team members.

Similarity. The standard deviation across social skills scores represents the extent to which team members are dissimilar; lower standard deviations indicate greater similarity and vice versa.

Team performance. Three emergency medical physicians watched participant videos and coded them for relevant patient care indicators (one coder per video). The checklist used for this coding procedure was created by, and content-validated by, emergency medical physician subject-matter experts. All performance patient care indicators are available in Appendix E. Items were marked based on whether anyone within the team fulfilled a particular behavior within a predetermined time period. Ten subject-matter experts (emergency medical physicians) reviewed the items in this checklist and rated how critically they affected ultimate patient outcomes (e.g., life vs. death, long-term vs. short-term negative effects). The items in this checklist were standardized, weighted based on the subject-matter experts' criticality ratings, and then summed to create one performance datum for each team and every event.

Leading and following behaviors. Leading and following behavioral data were coded by eight trained research assistants using the protocol available in Appendix F. The definitions and behavioral examples for leading and following in the coding protocol were derived from a review of the literature concerning each process (e.g., Barry, 1991; Carson & Tesluk, 2007; Carson, Tesluk, & Marrone, 2007; Fleishman, Mumford, Zaccaro, Levin, Korotkin, & Hein,

1991; Gibb, 1954; Hackman & Walton, 1986; Hiller, Day, & Vance, 2006; Hollander, 1985; Morgeson, DeRue, & Karam, 2010; Yukl, Gordon, & Taber, 2002; Zaccaro & Marks, 1999) – as described earlier. In addition to coding whenever each team member engaged in leading or following behaviors, research assistants also coded whenever each team member engaged in neither leading nor following but rather general patient care activities like reading blood pressure or reviewing a chest x-ray ("active"). If any team member was standing aside, not working with others / engaging in the simulation in any fashion, this was also captured ("inactive").

Thus, the coding protocol guided research assistants to mark whenever each team member fulfilled one of four roles: Leader, follower, active, and inactive. For an example coded team/video, see Figures 3, 4, and 5. These roles could be fulfilled for a few seconds or many minutes, and each team member could switch in and out of them often, rarely, or not at all. Although the "active" and "inactive" roles are not relevant to the current research, it was important for the quality of coders' work to utilize mutually exclusive behavioral categories. Noldus The Observer® computer software was used to view videos, to standardize the coding scheme, and to record research assistants' coding.

Before coding, all research assistants received three waves of training. First, they learned to identify and understand the various medical terms and procedures associated with the simulation. Second, they received instructions and examples for using Noldus The Observer® video coding software. Third and finally, coders were given the coding protocol (see Appendix F). Each research assistant then practice-coded one video and received feedback. Once I was confident in each research assistant's understanding of the medical terms and procedures, the coding software, and the coding protocol, he or she was assigned multiple videos per week until all videos had been coded by at least two research assistants. Although I originally planned to

average across coders' work to derive final behavioral (video) data, I ultimately chose to rely on only data from the most accurate coder. After months of training, re-training, and monitoring coders, it was clear that some were better able to capture behaviors in the videos than others. In order to preserve the integrity of the data to be used in analyses, I chose to grade coders on their accuracy via two means, then utilize only data from coders with higher grades. The first grading method involved checking reliability between the coder's work and my own work; the more closely our coding matched, the better the coder's score. The second method involved checking reliability between the coder's work and every other coder he/she paired with; the more closely the coding matched with others, the better the coder's score.

To prepare coded data for analyses, a method of aggregation was needed to represent the time during which team members simultaneously engaged in leading, following, active, or inactive behaviors. Recall that these behaviors were coded for every second of every video. In other words, every second of every video for each team member is represented by one behavioral category: leading, following, active, or inactive. The final coded dataset included hundreds of thousands of rows of second-by-second behavioral codes for team members. The proportion of team members engaging in each of these behaviors was calculated by dividing the number of team members engaging in a particular behavior (e.g., leading) by the total number of team members. For example, if one team member was leading out of five total team members, the proportion of the team leading was 1/5 or .20 – for that particular second. These second-by-second proportions were then averaged for each event separately. This means that a team might have an average proportion leading equal to .40 during Event 1 (Diagnosis) and an average proportion equal to .60 during Event 2 (Intubation). Translated into sharing terms, this can be conceptualized as 40% of the team simultaneously engaging in leading – or sharing leadership –

in Event 1, and 60% in Event 2. 1.00 (or 100%) would represent a second when all team members engage in a particular behavior, while 0 (or 0%) would represent a second when no team members engage in a particular behavior.

Synchrony. The synchrony of leadership and followership for each event signifies whether or not team members follow when others lead. To calculate this variable, I used a simple five-second moving window algorithm. Whenever a team member fulfilled a leadership role, if one or more other team members engaged in followership within a five-second window, then this time window was marked as synchronous. Alternatively, if a team member fulfilled a leadership role but no other team member engaged in followership within the next five seconds, then this time window was marked as asynchronous.

A five-second window was chosen because it allows for typical visual and audio processing times for the participant who is receiving information and acting upon it (in the video) as well as the coder who is receiving information and acting upon it (using the coding software). Reaction time studies tend to identify the time required for these activities to fall between .15 seconds and 1.5 seconds (Basil, 2014; Nickerson, 1973; Woods, Wyma, Yund, Herron, & Reed, 2015). This range exists because of secondary factors like where the person's focus lies, age / mental agility, distractors in the environment, processing lag, and the extent of internal consideration needed before acting. Reaction time in itself is a complicated area of study with many still-unknown influencers. Even so, a five-second window is appropriate because it is long enough to allow for slow reaction from the participant and the coder but short enough to prevent artificial linkages between followership and leadership[3].

To calculate a team's overall synchrony per event, the lengths of all synchronous time windows were summed and then divided by the total length of the event. Synchrony data

therefore represents proportions of time when some team members led while others followed (within five seconds). Each team has synchrony data for every event.

RESULTS

Descriptive Statistics

Before testing hypotheses, descriptive statistics were calculated for all variables. Results are available in Table 2. The descriptive statistics for leadership sharing, followership sharing, and synchrony can be interpreted with regard to percentages of time. Team members shared leadership about half of the time (M = .44; 44%) and they shared followership about a quarter of the time (M = .26; 26%). Team members were synchronous in that some demonstrated followership while others demonstrated leadership about three-quarters of the time (M = .77; 77%). This means that team members were asynchronous in that none were following while others were leading about a quarter of the time (M = .23; 23%).

On average, team members participated in about three resuscitations before engaging in this research scenario (M = 3.28). Team members tended to be moderately conscientious (M = 3.65), efficacious (M = 4.06), socially skilled (M = 3.53), agreeable (M = 4.05), and psychologically collective (M = 3.74). Dissimilarity variables indicate that some teams were composed of very similar members and others were composed of somewhat different members.

Cohen's (1988) d effect sizes were calculated to evaluate whether shared leadership, shared followership, synchrony, or performance differed from one event to the next. As shown in Table 2 and Figure 8, the most leadership sharing occurred during the Intubation phase (somewhat more than in the Diagnosis phase, d = .44, and slightly more than in the Resuscitation phase, d = .17). The most followership sharing occurred during the Resuscitation phase (somewhat more than in the Intubation phase, d = .47, or the Diagnosis phase, d = .32). Synchrony also occurred most often during the Resuscitation phase (slightly more than in the

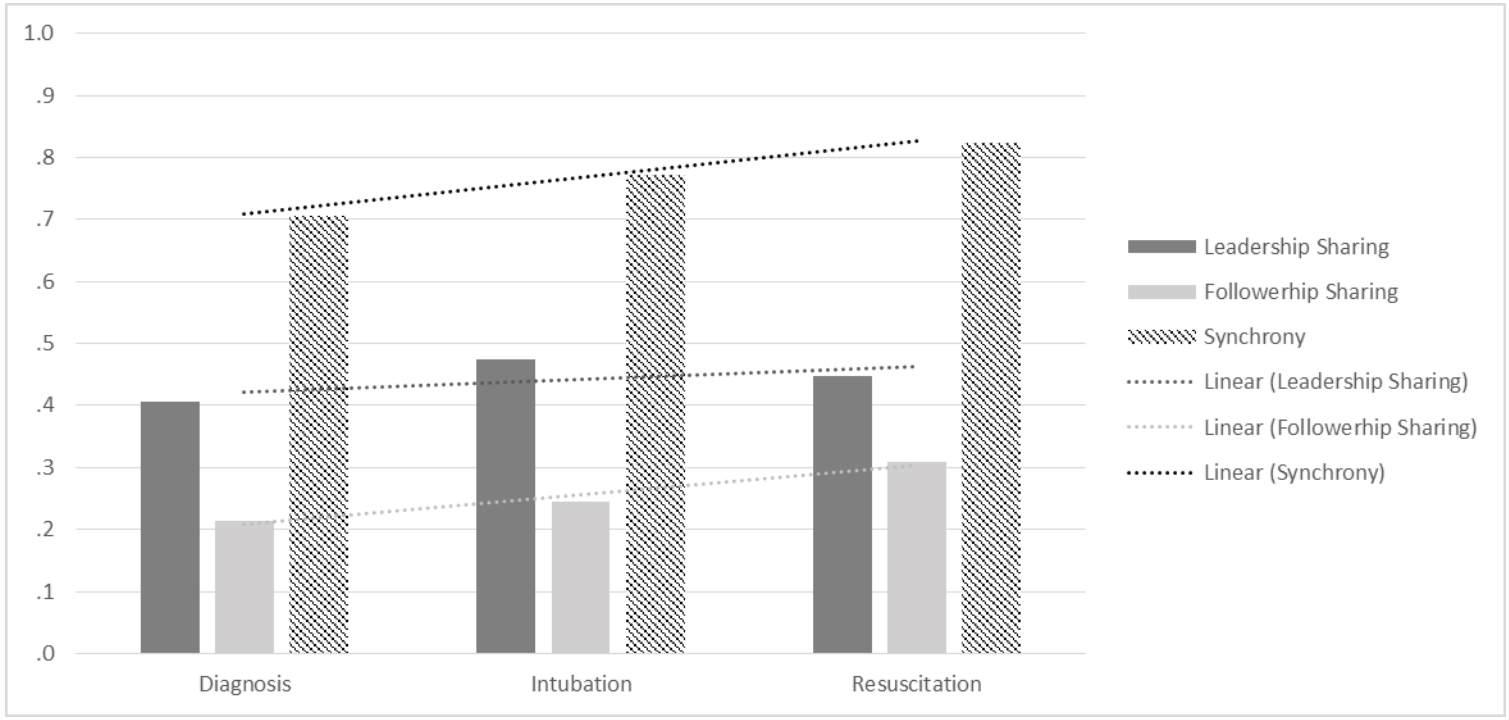
Diagnosis phase, d = .27, or in the Intubation phase, d = .23). Performance was comparable across all three events.

Table 2. Descriptive Statistics for All Variables

	N	Minimum	Maximum	Mean	SD
Leadership Sharing	132	.18	.90	.44	.15
Event 1: Diagnosis	*44*	*.18*	*.72*	*.41*	*.14*
Event 2: Intubation	*44*	*.21*	*.90*	*.47*	*.17*
Event 3: Resuscitation	*44*	*.20*	*.82*	*.45*	*.14*
Followership Sharing	132	.00	.67	.26	.13
Event 1: Diagnosis	*44*	*.00*	*.52*	*.21*	*.12*
Event 2: Intubation	*44*	*.00*	*.56*	*.25*	*.14*
Event 3: Resuscitation	*44*	*.01*	*.67*	*.31*	*.13*
Synchrony	132	.00	1.00	.77	.23
Event 1: Diagnosis	*44*	*.00*	*1.00*	*.71*	*.22*
Event 2: Intubation	*44*	*.00*	*1.00*	*.77*	*.26*
Event 3: Resuscitation	*44*	*.03*	*1.00*	*.82*	*.18*
Team Performance	132	-.51	.66	.00	.21
Event 1: Diagnosis	*44*	*-.50*	*.66*	*.00*	*.24*
Event 2: Intubation	*44*	*-.51*	*.44*	*.00*	*.23*
Event 3: Resuscitation	*44*	*-.33*	*.32*	*.00*	*.18*
Expertise - Mean	44	1.00	5.00	3.28	1.18
Expertise - Dissimilarity	44	.00	2.24	1.02	.71
Conscientiousness - Mean	44	2.95	4.20	3.64	.33
Conscientiousness - Dissimilarity	44	.18	1.47	.71	.31
Self-efficacy - Mean	44	3.59	4.66	4.06	.22
Self-efficacy - Dissimilarity	44	.07	.85	.48	.18
Social Skills - Mean	44	2.86	4.09	3.53	.24
Social Skills - Dissimilarity	44	.12	.78	.47	.20
Agreeableness - Mean	44	3.20	4.60	4.05	.32
Agreeableness - Dissimilarity	44	.21	1.24	.62	.22
Psych. Collectivism - Mean	44	3.35	4.26	3.74	.23
Psych. Collectivism - Dissimilarity	44	.10	.88	.43	.20
Team Size	44	4.00	6.00	5.14	.63

Note. SD = Standard deviation. Psych. Collectivism = Psychological Collectivism. Mean variables represent averages across team member data. Dissimilarity variables represent standard deviations across team member data.

Figure 8. Leadership Sharing, Followership Sharing, and Synchrony by Event



Note. Dotted lines represent simple linear trends for leadership sharing, followership sharing, and synchrony across the three events.

Control Variables

Cohen's (1988) *d* effect sizes were also calculated to evaluate whether three factors affected the focal dependent variable for this research: Team performance. The three potential control variables were team size, scenario order, and training condition. None of these control variables are of substantive interest to the current research.

Team size is often included as a control in studies predicting team performance, but the relationship between these two variables remains unclear. As pointed out in Stewart's (2006) meta-analysis, some researchers find that larger teams are problematic due to coordination difficulties and process loss, while others find that larger teams are beneficial due to an ability to access more resources like time and expertise. Stewart's results support Kozlowski and Bell's (2003) proposition that the influence of team size depends on team type (project teams, production teams, and management teams differ in terms of ideal size). Mixed results are also common in the health care literature, which is relevant due to the sample and context in which the current study takes place. Lemieux-Charles and McGuire's (2006) review notes that larger teams tend to have better patient outcomes but perceive themselves as less effective. These authors also cite studies showing that larger teams tend to have members who do not participate, and therefore are less efficient. Because of the conflicting findings in both organizational science and health care research, it is prudent to investigate the potential effects of team size in the current study and to separate out any effects that exist.

The scenario order control variable represents a practice effect (Shaughnessy, Zechmeister, & Zechmeister, 2014). Two scenarios were utilized in the original research design, with counterbalancing. This means that some teams in the sample completed the scenario under study after already completing another scenario – using a similar patient mannequin and room

setup. Although the tasks and issues presented in each scenario differed, it is possible that having familiarity with one another, with the layout, or with the general research procedure could increase the likelihood of team success.

Finally, the training control variable refers to participation in a 25-minute team effectiveness training program before engaging in the scenario under study. This training program was part of the original research design for which the data were collected. During training, participants learned definitions of common team processes like communication and helping, as well as tips for engaging in these processes effectively in the emergency medical context. About half of the participating teams received this training; the other half received a placebo training that provided general information about healthcare teams and the use of simulation in healthcare education. It is possible that through this training team members gained skills that ultimately enhanced their overall performance.

6-person teams performed slightly better than 5-person teams (d = .24), which performed slightly better than 4-person teams (d = .21). Teams whose members engaged in another scenario before the one being rated for the purpose of this research performed slightly better than teams whose members did not (d = .10). Teams trained on effective teamwork strategies performed about the same as teams that were not (d = .03). Because the effect sizes representing relationships between team size, scenario order, training condition, and performance were small, none were included as control variables in analyses.

Bivariate Correlations

Correlations were computed between all variables (see Table 3). The results of these correlations were used as initial indicators for hypothesis testing. In support of Hypothesis 1,

teams whose members shared leadership more often also performed better (r = .18, p < .05). Other variables related to team performance were average expertise (r = .46, p < .001), similarity in expertise among team members (r = -.21, p < .05), and average psychological collectivism (r = .20, p < .05). In other words, better performing teams tended to include members whose expertise or psychological collectivism was higher on average, or members who were more similar in terms of expertise. Importantly for Hypotheses 2 and 3c, shared followership and synchrony were not significantly related to team performance (Hypothesis 2: r = .04, p = ns; Hypothesis 3c: r = .14, p = ns).

Teams shared leadership more often if their members held greater expertise on average (r = .20, p < .05), indicating some support for Hypothesis 4a. Teams who shared leadership more often also tended to have members who were more similar in their levels of expertise (r = -.29, p < .001) and conscientiousness (r = -.23, p < .01).

Although none of the hypothesized (Hypotheses 5a-f) correlates of shared followership were related as expected (social skills, agreeableness, psychological collectivism), results show that team members shared followership more often if their members held less expertise on average (r = -.19, p < .05), if their members differed in their levels of expertise (r = .22, p < .05), or if their members were more similar in their levels of self-efficacy (r = -.21, p < .05).

Average self-efficacy and similarity in expertise (Hypothesis 6a) were related to synchrony; teams tended to display more synchrony if their members were more efficacious on average (r = .20, p < .05) or if they differed in their levels of expertise (r = .20, p < .05).

I also calculated a lagged correlation between team performance and synchrony as an initial check for Hypothesis 7 (not shown in Table 3). With this hypothesis, I asked whether teams who perform better in a given event demonstrate more synchrony in a subsequent event.

The correlation was not significant (r = .16, p = ns, N = 88). Team performance in one event was also not predictive of leadership sharing (r = .14, p = ns, N = 88) or followership sharing (r = .13, p = ns, N = 88) in a subsequent event. This pattern of relationships persisted when correlating lagged results for both event transitions simultaneously (Diagnosis-to-Intubation and Intubation-to-Resuscitation) and separately.

Bivariate correlations provided support for only a few of my hypotheses. This led me to review the correlational results, identify significant relationships, and develop a simpler model that focused on those significant relationships. Specifically, average expertise was significantly related to leadership sharing (r = .20, p < .05), followership sharing (r = -.19, p < .05), and team performance (r = .46, p < .001). Similarity in expertise was significantly related to leadership sharing (r = -.29, p < .001), followership sharing (r = .22, p < .05), synchrony (r = .20, p < .05), and team performance (r = -.21, p < .05). Average psychological collectivism was significantly related to team performance (r = .20, p < .05). This led me to model average expertise, similarity in expertise, and average psychological collectivism as predictors of team performance through leadership sharing. I acknowledge that average psychological collectivism showed fewer relationships with key variables than did average expertise or similarity in expertise, but with respect to comprehensiveness (in my original model), it was important to retain a social predictor as well as ability predictors. Next, I considered how the relationship between leadership sharing and team performance might depend on followership sharing or synchrony. Correlations indicated a significant relationship between leadership sharing and followership sharing (r = -.23, p < .01) and a weak relationship between followership sharing and team performance (r = .04, p = ns). They also indicated weak relationships between leadership sharing and synchrony (r = -.12, p = ns) and between synchrony and team performance (r = .14, p = ns). Given my

hypotheses about the potential importance of synchrony as well as shared followership, I sought to set these two variables up as competing moderators in order to figure out whether one would prove more critical than the other in predicting team performance. I chose to test each moderator separately because the strong correlation between them (r = .80, p < .001) meant there is great overlap in the information represented by these variables. Thus, the competing moderator approach asks the following question: *Is it more important that multiple team members engage in following behaviors, or that those following behaviors occur alongside leading behaviors?*

Simplified Model of Relationships

Figure 9 represents a reduced and reorganized model of relationships based on the correlational results previously discussed. A direct relationship is shown between shared leadership and team performance. Shared followership and synchrony are included as potential moderators of this relationship, rather than direct predictors of team performance. Because shared followership and synchrony are strongly related to one another (r = .80, p < .001), separate moderated regressions will be run to determine which (if either) is an important determinant of the relationship between shared leadership and team performance. The correlations in Table 3 show that teams whose members share leadership more often tend to share followership less often (r = -.23, p < .01), but there is no relationship suggesting that teams whose members share leadership more often tend to be more or less synchronous (r = -.12, p < ns). Another difference between this model and the one shown in Figure 6 is the exclusion of events. Because performance did not differ across events, and because there was no lagged relationship between performance and synchrony, followership, or leadership, the feedback loop discussed earlier in the Introduction section has been removed for the sake of parsimony.

Correlations were also calculated for each event separately, in order to examine whether similar relationships between variables exist (see Table 4). Most results were very similar to those depicted in Table 3. The following results were different:

- The negative correlation between leadership sharing and followership sharing was strongest in the resuscitation event (r = -.52, p < .001 for resuscitation versus r = -.15, p = ns for intubation and r = -.15, p = ns for diagnosis), meaning the significant overall negative correlation was driven by the resuscitation event.
- The negative correlation between leadership sharing and synchrony was strongest in the resuscitation event (r = -.48, p < .01 versus r = -.10, p = ns for diagnosis and r = 0.00, p = ns for intubation), meaning the significant overall negative correlation was driven by the resuscitation event.
- The positive correlation between leadership sharing and team performance was strongest in the intubation event (r = .39, p < .01 for intubation versus r = -.10, p = ns for diagnosis and r = .26, p = ns for resuscitation), meaning the significant overall positive correlation was driven by the intubation event.
- The positive correlation between average psychological collectivism and team performance was strongest in the intubation event (r = .33, p < .05 versus r = .26, p = ns for diagnosis and r = -.03, p = ns for resuscitation, meaning the significant overall positive correlation was driven by the intubation event.
- The positive correlation between average self-efficacy and synchrony is strongest in the intubation event (r = .31, p < .05 for intubation versus r = .15, p = ns for diagnosis and r = .13, p = ns for resuscitation), meaning the significant overall positive correlation was driven by the intubation event.

Taken together, these results indicate that some of the relationships depicted in Table 3 are stronger in one event versus others. In other words, although team performance does not differ across events (as discussed earlier), the relationships between certain key variables do.

A few additional correlation results merit mention, although they were not specified in hypotheses. Echoing the mean comparison results described earlier (in the Control Variables section), team size was not related to team performance (r = .14, p = ns). Team Size was also not related to leadership sharing (r = -.08, p = ns), followership sharing (r = -.02, p = ns), or synchrony (r = .14, p = ns). Even so, team size determines how many people can be engaging in either leading or following behaviors – thereby setting minimums and maximums dependent on one another. For example, if 3 team members are leading in a 6-person team, then at most 3 team members can be following; if 3 team members are leading in a 4-person team, then at most 1 team member can be following; and so on. This means the correlation results should show a negative relationship between leadership sharing and followership sharing. Indeed, leadership sharing and followership sharing were negatively related (r = -.23, p = ns) such that teams whose members engaged in more leadership sharing tended to engage in less followership sharing.

Table 3. Correlations among All Variables

		1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)
1)	Leadership Sharing																
2)	Followership Sharing	-.23 **															
3)	Synchrony	-.12	.80 ***														
4)	Expertise - Mean	.20 *	-.19 *	-.13													
5)	Expertise - Dissimilarity	-.29 ***	.22 *	.20 *	-.56 ***												
6)	Conscientiousness - Mean	-.04	-.04	-.13	-.15	.18 *											
7)	Conscientiousness - Dissimilarity	-.23 **	.04	-.05	.03	.08	-.31 ***										
8)	Self-efficacy - Mean	.06	.15	.20 *	-.06	.01	.27 **	-.16									
9)	Self-efficacy - Dissimilarity	.17	-.21 *	-.16	.19 *	-.11	-.04	-.20 *	-.07								
10)	Social Skills - Mean	-.07	-.09	-.12	-.18 *	.02	.29 ***	-.20 *	.34 ***	-.04							
11)	Social Skills - Dissimilarity	.11	-.13	-.15	.09	.06	.12	.02	.02	.09	.06						
12)	Agreeableness - Mean	-.15	-.07	-.08	-.16	.08	.21 *	-.05	.05	-.11	.53 ***	.10					
13)	Agreeableness - Dissimilarity	-.07	.03	.02	-.07	.10	-.06	-.04	-.06	-.20 *	-.23 **	-.18 *	-.33 ***				
14)	Psych. Collectivism - Mean	.06	-.01	.04	-.06	-.04	.28 **	-.31 ***	.38 ***	.14	.22 **	.20 *	.25 **	-.15			
15)	Psych. Collectivism - Dissimilarity	-.05	-.01	-.10	.03	.02	.08	.21 *	-.18 *	-.04	-.27 **	.26 **	-.01	-.12	-.19 *		
16)	Team Performance	.18 *	.04	.14	.46 ***	-.21 *	-.12	-.03	.09	-.03	-.05	.15	.04	-.16	.20 *	-.14	
17)	Team Size	-.08	-.02	.14	.01	.05	-.26 **	-.02	.00	-.08	-.23 **	-.01	-.10	.07	.16	.06	.14

Note. Values in table cells are Pearson correlation coefficients. Negative correlations for dissimilarity variables can reversed to be interpreted as similarity correlations. For example, teams whose members are more similar in their levels of expertise tend to perform better, r = -.21, p < .001. Psych. Collectivism = Psychological Collectivism. ***p < .001; **p < .01; *p < .05.

Table 4. Correlations among All Variables, By Event

Variable		Event	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)
1)	Leadership Sharing	Diagnosis																
		Intubation																
		Resuscitation																
		Overall																
2)	Followership Sharing	Diagnosis	-.15															
		Intubation	-.15															
		Resuscitation	-.52 ***															
		Overall	-.23 **															
3)	Synchrony	Diagnosis	-.10	.77 ***														
		Intubation	.00	.82 ***														
		Resuscitation	-.48 **	.82 ***														
		Overall	-.12	.80 ***														
4)	Expertise - Mean	Diagnosis	.07	-.17	-.16													
		Intubation	.25	-.25	-.19													
		Resuscitation	.28	-.19	-.04													
		Overall	.20 *	-.19 *	-.13													
5)	Expertise - Dissimilarity	Diagnosis	-.24	.24	.17	-.56 ***												
		Intubation	-.35 *	.24	.20	-.56 ***												
		Resuscitation	-.28	.20	.25	-.56 ***												
		Overall	-.29 ***	.22 *	.20 *	-.56 ***												
6)	Conscientiousness - Mean	Diagnosis	.04	.08	-.24	-.15	.18											
		Intubation	-.10	-.03	-.02	-.15	.18											
		Resuscitation	-.04	-.17	-.18	-.15	.18											
		Overall	-.04	-.04	-.13	-.15	.18 *											

Table 4 (cont'd)

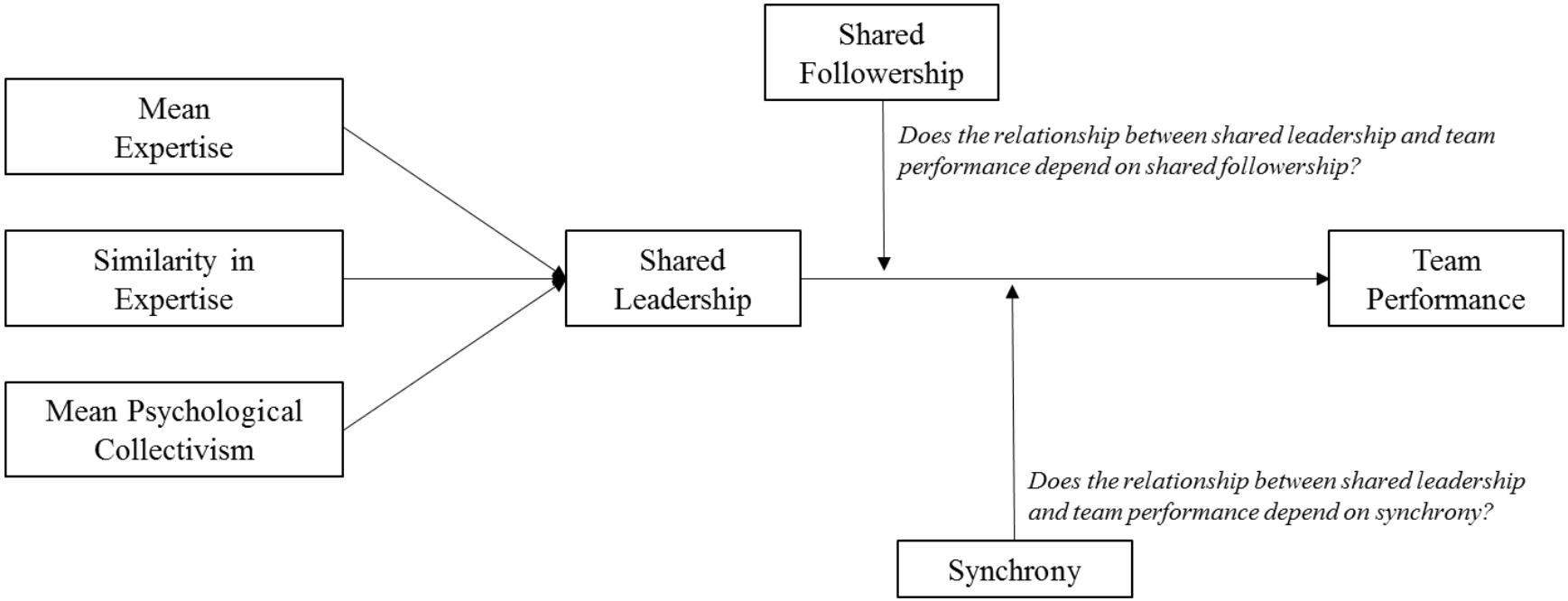
Variable		Event	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)
7)	Conscientiousness - Dussimilarity	Diagnosis	-.19	.01	.08	.03	.08	-.31 *										
		Intubation	-.20	.02	-.17	.03	.08	-.31 *										
		Resuscitation	-.32 *	.10	-.03	.03	.08	-.31 *										
		Overall	-.23 **	.04	-.05	.03	.08	-.31 ***										
8)	Self-efficacy - Mean	Diagnosis	.12	.18	.15	-.06	.01	.27	-.16									
		Intubation	.07	.18	.31 *	-.06	.01	.27	-.16									
		Resuscitation	-.01	.12	.13	-.06	.01	.27	-.16									
		Overall	.06	.15	.20 *	-.06	.01	.27 **	-.16									
9)	Self-efficacy - Dissimilarity	Diagnosis	.07	-.34 *	-.24	.19	-.11	-.04	-.20	-.07								
		Intubation	.22	-.31 *	-.24	.19	-.11	-.04	-.20	-.07								
		Resuscitation	.21	-.03	.05	.19	-.11	-.04	-.20	-.07								
		Overall	.17	-.21 *	-.16	.19 *	-.11	-.04	-.20 *	-.07								
10)	Social Skills - Mean	Diagnosis	-.10	.00	-.05	-.18	.02	.29	-.20	.34 *	-.05							
		Intubation	-.07	-.16	-.16	-.18	.02	.29	-.20	.34 *	-.05							
		Resuscitation	-.07	-.13	-.15	-.18	.02	.29	-.20	.34 *	-.05							
		Overall	-.07	-.09	-.12	-.18 *	.02	.29 ***	-.20 *	.34 ***	-.04							
11)	Social Skills - Dissimilarity	Diagnosis	.06	-.03	-.09	.09	.06	.11	.02	.02	.09	.06						
		Intubation	.11	-.12	-.10	.09	.06	.11	.02	.02	.09	.06						
		Resuscitation	.19	-.24	-.30 *	.09	.06	.11	.02	.02	.09	.06						
		Overall	.11	-.13	-.15	.09	.06	.12	.02	.02	.09	.06						
12)	Agreeableness - Mean	Diagnosis	-.07	.08	.04	-.16	.08	.21	-.04	.05	-.11	.53 ***	.11					
		Intubation	-.28	-.13	-.18	-.16	.08	.21	-.04	.05	-.11	.53 ***	.11					
		Resuscitation	-.10	-.15	-.11	-.16	.08	.21	-.04	.05	-.11	.53 ***	.11					
		Overall	-.15	-.07	-.08	-.16	.08	.21 *	-.05	.05	-.11	.53 ***	.10					

Table 4 (cont'd)

Variable		Event	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)
13)	Agreeableness - Dissimilarity	Diagnosis	-.15	.08	.08	-.08	.10	-.06	-.03	-.06	-.20	-.23	-.18	-.33 *				
		Intubation	-.11	.05	-.01	-.08	.10	-.06	-.03	-.06	-.20	-.23	-.18	-.33 *				
		Resuscitation	.05	-.04	.01	-.08	.10	-.06	-.03	-.06	-.20	-.23	-.18	-.33 *				
		Overall	-.07	.03	.02	-.07	.10	-.06	-.04	-.06	-.20 *	-.23 **	-.18 *	-.33 ***				
14)	Psych. Collectivism - Mean	Diagnosis	-.08	-.03	-.03	-.06	-.04	.28	-.31 *	.39 **	.13	.22	.20	.25	-.15			
		Intubation	.19	.01	.11	-.06	-.04	.28	-.31 *	.39 **	.13	.22	.20	.25	-.15			
		Resuscitation	.03	-.03	.03	-.06	-.04	.28	-.31 *	.39 **	.13	.22	.20	.25	-.15			
		Overall	.06	-.01	.04	-.06	-.04	.28 **	-.31 ***	.38 ***	.14	.22 **	.20 *	.25 **	-.15			
15)	Psych. Collectivism - Dissimilarity	Diagnosis	-.01	-.06	-.08	.02	.02	.08	.21	-.18	-.04	-.27	.26	-.01	-.12	-.19		
		Intubation	-.07	.05	-.10	.02	.02	.08	.21	-.18	-.04	-.27	.26	-.01	-.12	-.19		
		Resuscitation	-.05	-.02	-.13	.02	.02	.08	.21	-.18	-.04	-.27	.26	-.01	-.12	-.19		
		Overall	-.05	-.01	-.10	.03	.02	.08	.21 *	-.18 *	-.04	-.27 **	.26 **	-.01	-.12	-.19 *		
16)	Team Performance	Diagnosis	-.10	.01	.04	.52 ***	-.19	-.20	.07	-.01	.01	.01	.27	.15	-.27	.26	-.16	
		Intubation	.39 **	.18	.29	.52 ***	-.29	.00	-.25	.15	.03	-.10	.11	-.07	-.12	.33 *	-.22	
		Resuscitation	.26	-.10	.04	.32 *	-.14	-.16	.11	.17	-.17	-.08	.04	.04	-.08	-.03	-.03	
		Overall	.18 *	.04	.14	.46 ***	-.21 *	-.12	-.03	.09	-.03	-.05	.15	.04	-.16	.20 *	-.14	
17)	Team Size	Diagnosis	-.16	.04	.19	.01	.05	-.26	-.02	.00	-.08	-.23	-.01	-.10	.07	.16	.06	.07
		Intubation	-.01	-.04	.09	.01	.05	-.26	-.02	.00	-.08	-.23	-.01	-.10	.07	.16	.06	.13
		Resuscitation	-.08	-.07	.18	.01	.05	-.26	-.02	.00	-.08	-.23	-.01	-.10	.07	.16	.06	.23
		Overall	-.08	-.02	.14	.01	.05	-.26 **	-.02	.00	-.08	-.23 **	-.01	-.10	.07	.16	.06	.14

Note. Values in table cells are Pearson correlation coefficients. Negative correlations for dissimilarity variables can reversed to be interpreted as similarity correlations. For example, the "Overall" section of "5)" indicates that teams whose members are more similar in their levels of expertise tend to perform better, r = -.21, p < .001. Correlations in "Overall" rows represent relationships using data across all three events; correlations in "Diagnosis," "Intubation," and "Resuscitation" rows represent relationships using data in only one of the three events. Psych. Collectivism = Psychological Collectivism. ***p < .001; **p < .01; *p < .05.

Figure 9. Reduced Model



Regressions

Next, moderated regression analyses were used to test the model depicted in Figure 9. The goal of these analyses was to quantify the relationship between shared leadership and team performance, as well as the extent to which this relationship depends on shared followership or synchrony. The question being asked through these analyses is: *Does the relationship between shared leadership and team performance depend on the extent to which team members are sharing followership, or does it depend on the extent to which team members are engaging in leadership and followership concurrently (synchronously)?* The three individual difference variables that correlated significantly with team performance were included also (average expertise, expertise similarity among team members, and average psychological collectivism). Given the significant bivariate relationships between these individual differences and team performance, any relationships for leadership, followership, or synchrony that prove significant above-and-beyond those individual differences can be considered meaningful.

Table 5 shows the results of a three-step hierarchal regression analysis examining the moderating effect of followership. In the first step, team performance was significantly predicted by the average expertise of team members ($b = .53$, $p < .001$) and their average level of psychological collectivism ($b = .24$, $p < .01$). In the second step, average expertise and average psychological collectivism remained significant predictors. In addition, the amount of shared leadership occurring was not predictive of team performance ($b = .13$, p = ns) and the amount of shared followership was predictive ($b = .16$, $p < .05$). In the third step, these relationships persisted except the amount of shared leadership was also predictive of team performance ($b = .19$, $p < .05$). The interaction between shared leadership and followership was not significant ($b = .13$, p = ns).

Table 6 shows the results of another three-step multiple regression, this time examining the moderating effect of synchrony on the relationship between shared leadership and team performance. Table 6 results were very similar to Table 5 results overall, which is to be expected given the strong relationship between followership and synchrony – the focal moderators being compared in Tables 6 and 7. In the first step, team performance again was significantly predicted by the average expertise of team members ($b = .53$, $p < .001$) and the average level of psychological collectivism ($b = .24$, $p < .01$). In the second step, when shared leadership and synchrony were added to the model, shared leadership was not a significant predictor of team performance ($b = .11$, p = ns) and synchrony was a significant predictor ($b = .20$, $p < .05$). In the third step, all relationships remained very similar versus the first and second steps. The interaction between shared leadership and synchrony was not significant ($b = .02$, p = ns).

Given that shared leadership was not predictive of team performance after accounting for individual difference variables (see Step 2 in Tables 6 and 7), I adjusted my approach toward comparing the importance of leadership sharing, followership sharing, and synchrony. Throughout these analyses I expected to find that shared leadership is a significant predictor of team performance, with followership and/or synchrony playing moderator roles in that relationship. However, the results in Tables 6 and 7 indicate little support for shared leadership as a key driver of team performance – at least after taking into account certain individual difference variables. Note that I also ran these models excluding the personal characteristic variables (including only shared leadership, shared followership, and the moderation variables). Predictors in these models proved significant, indicating potential overlap between the personal characteristics tested as predictors in these analysis and the focal processes under study.

Next, I ran three multiple regression analyses. Each analysis involved including the individual difference variables in an initial step, then adding either shared leadership, shared followership, or synchrony in a second step. Table 7 shows that leadership was not incrementally predictive of team performance after accounting for individual differences (b = .10, p = ns). Followership was also not incrementally predictive of team performance after accounting for individual differences (b = .13, p = ns). Synchrony was incrementally predictive, however (b = .19, $p < .05$). Thus, although synchrony does not appear to play the moderating role initially hypothesized, there is evidence of a main effect on team performance. When all three predictors are included in the second step simultaneously (see Table 8), none are significant – although the coefficient for synchrony is greatest (b = .20, p = ns), and the overall step is incrementally predictive ($\Delta R^2 = .05$, $p < .05$).

Table 5. Hierarchal Regression Analysis Examining Followership as a Moderator

Predictor Variables	**B**	**SE**	**β**	**ΔR^2**
Step 1				.27***
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.03	.03	.10	
Psych. Collectivism – Mean	.22	.07	.24**	
Step 2				.03
Expertise – Mean	.10	.02	.54***	
Expertise – Dissimilarity	.03	.03	.10	
Psych. Collectivism - Mean	.22	.07	.23**	
Leadership Sharing	.03	.02	.13	
Followership Sharing	.03	.02	.16*	
Step 3				.01
Expertise – Mean	.09	.02	.50***	
Expertise – Dissimilarity	.03	.03	.09	
Psych. Collectivism - Mean	.22	.07	.23**	
Leadership Sharing	.04	.02	.19*	
Followership Sharing	.04	.02	.19*	
Leadership / Followership Interaction	.03	.02	.13	
Total R^2				.31***

Note. ***p < .001; **p < .01; *p < .05.

Table 6. Hierarchal Regression Analysis Examining Synchrony as a Moderator

Predictor Variables	**B**	**SE**	**β**	**ΔR^2**
Step 1				.27***
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.03	.03	.10	
Psych. Collectivism - Mean	.22	.07	.24**	
Step 2				.05*
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.03	.03	.09	
Psych. Collectivism - Mean	.21	.07	.22**	
Leadership Sharing	.03	.02	.11	
Synchrony	.04	.02	.20*	
Step 3				.00
Expertise – Mean	.10	.02	.52***	
Expertise – Dissimilarity	.03	.03	.09	
Psych. Collectivism - Mean	.21	.07	.22**	
Leadership Sharing	.03	.02	.12	
Synchrony	.04	.02	.19*	
Leadership / Synchrony Interaction	.00	.02	.02	
Total R^2				.32***

Note. ***p < .001; **p < .01; *p < .05.

Table 7. Hierarchal Regression Analyses Comparing Leadership Sharing, Followership Sharing, and Synchrony as Incremental Predictors of Performance

Predictor Variables	**B**	**SE**	**β**	**ΔR^2**
Step 1				.27***
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.03	.03	.10	
Psych. Collectivism - Mean	.22	.07	.24**	
Step 2				.01
Expertise – Mean	.10	.02	.52***	
Expertise – Dissimilarity	.04	.03	.12	
Psych. Collectivism – Mean	.22	.07	.23**	
Leadership Sharing	.02	.02	.10	
Total R^2				.28***
Step 1				.27***
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.03	.03	.10	
Psych. Collectivism - Mean	.22	.07	.24**	
Step 2				.02
Expertise – Mean	.10	.02	.54***	
Expertise – Dissimilarity	.02	.03	.07	
Psych. Collectivism - Mean	.23	.07	.24**	
Followership Sharing	.03	.02	.13	
Total R^2				.29***
Step 1				.27***
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.03	.03	.10	
Psych. Collectivism - Mean	.22	.07	.24**	
Step 2				.03*
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.02	.03	.06	
Psych. Collectivism - Mean	.22	.07	.23**	
Synchrony	.04	.02	.19*	
Total R^2				.30***

Note. ***p < .001; **p < .01; *p < .05.

Table 8. Hierarchal Regression Analyses Including Leadership Sharing, Followership Sharing, and Synchrony as Simultaneous Predictors of Performance

Predictor Variables	**B**	**SE**	**β**	**ΔR^2**
Step 1				.27***
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.03	.03	.10	
Psych. Collectivism - Mean	.22	.07	.24**	
Step 2				.05*
Expertise – Mean	.10	.02	.53***	
Expertise – Dissimilarity	.03	.03	.09	
Psych. Collectivism - Mean	.21	.07	.22**	
Leadership Sharing	.02	.02	.11	
Followership Sharing	.00	.03	-.01	
Synchrony	.04	.03	.20	
Total R^2				.32***

Area Charts

The traditional approach to examining shared leadership, shared followership, and synchrony data did not support hypotheses as expected. To further explore team member behaviors and their effects on performance, an extreme group perspective was applied. Area charts were created for the five best-performing teams and the five worst-performing teams, representing the top and bottom performance deciles. The purpose of developing and reviewing these charts was to probe the potential importance of shared leadership, shared followership, synchrony, and other issues not previously considered. By investigating team member behaviors in this detailed, descriptive way, patterns may be illuminated that are not otherwise evident (in the regression analyses discussed earlier). Figures 10 and 11 present these area charts.

The charts represent a departure from the techniques used to consider this data previously, specifically because they depict active and inactive behaviors in addition to leading and following behaviors and because they indicate behavior patterns for each team member individually rather than overall behavioral summaries. Colors are retained to simplify interpretation; blue areas represent leading behaviors, orange areas represent following behaviors, gray areas represent active behaviors, and yellow areas indicate inactivity.

Each Figure includes five sets of area charts. The horizontal axis of each chart represents time – a second-by-second account of who's doing what. The top-most set in Figure 10, for example, represents the behaviors fulfilled by the five members of a high-performing team. On the left side of the pair are rows showing the leading (blue), following (orange), active (gray), and inactive (yellow) behaviors fulfilled by each team member throughout the scenario. The first member was inactive (yellow) at the beginning the task, then engaged in leading behaviors (blue), then following behaviors (orange), then leading behaviors (blue), and so on. The second

member also began as inactive (yellow), then was active (gray), then engaged in leading behaviors, and so on.

On the right side of the top-most set in Figure 10 is a team view; each point on the x-axis depicts the proportion of people engaging in each type of behavior. In other words, for every set of charts in Figures 10 and 11, the picture on the right is a direct summary of members' behaviors shown on the left. Looking again at the top-most set in Figure 10: In the very beginning of the task, all five team members are inactive; after a few seconds, only four team members are inactive (one has switched to another type of behavior); after a few more seconds, only three are inactive; etc. At the very end of the task, one person is leading while the other four team members are following. This information is visible looking at either the individuals' charts on the left or the team-wide chart on the right.

Three differences are evident between the best- and worst-performing teams. First, members of best-performing teams engage in more following behaviors than members of worst-performing teams. In addition to more following happening overall, proportionally more team members are also fulfilling those following behaviors. Note that all best-performing team members follow off-and-on rather than particular people engaging in only following behaviors throughout the task. In a related vein, members are more likely to follow when others lead in the best-performing teams versus the worst-performing teams – in other words, they behave more synchronously. Second, members of best-performing teams switch between behaviors – especially between leading and following – more frequently than members of worst-performing teams. Third and finally, in the best-performing teams there seems to be a clear balance between team members engaging in leading behaviors, those engaging in following behaviors, and those who are active or inactive; whereas Figure 11 shows that in worst-performing teams a clear

majority of members are either leading – as in the first, second, third, and fifth teams shown – or active – as in the fourth team shown.

Looking at these charts, a few additional research questions arise. One issue that is immediately obvious upon reviewing the charts is the consistency with which team members engage in any particular type of behavior. None of the best-performing teams include members who engage in *only* leading or following behaviors, indicating support for the value of sharing either type of behavior. Another issue clear in these charts is that team members can be inactive without prohibiting team success. Similarly, not everyone in the team must be following when someone leads; it seems sufficient to have some following while others fulfill other, unrelated behaviors. Applying this to the emergency medical context in which these teams are operating, think of a situation in which one person is guiding the work and instructing others, while one or two other people are listening and following those instructions, and the remaining team members are reviewing charts and examining the patient – still engaging in critical behaviors, but not because someone prompted them to do so.

Another key finding was that team members did not become more consistent in their behaviors over time. Although the role-development theories described earlier (e.g., DeRue's, 2011) suggest that team members test behaviors early, look for feedback regarding the effectiveness of those behaviors, and become more consistent in the types of behaviors they engage in as they recognize and realize which ones suit them; members of these teams seem to switch in and out of roles throughout the scenario. Finally, the types of behaviors fulfilled – and the overall balance of those behaviors within the team – did not change from one event to the next. This may indicate that particular behavioral patterns are ideal regardless of the situation or

context in which teams are working, or it may indicate that the tasks used in this research are not strong enough to induce participants to behave realistically.

Figure 10. Behavior Charts for High-Performing Teams

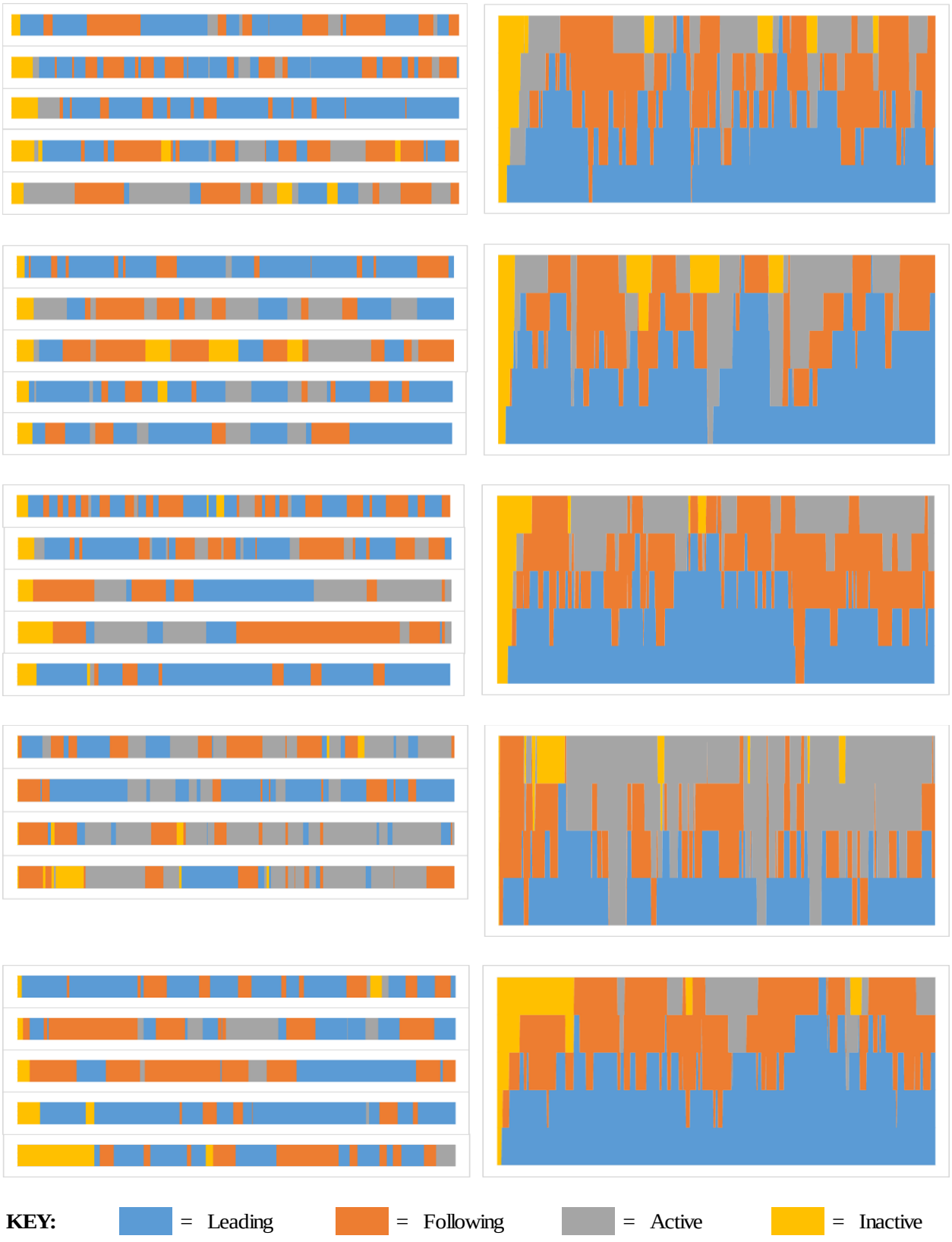
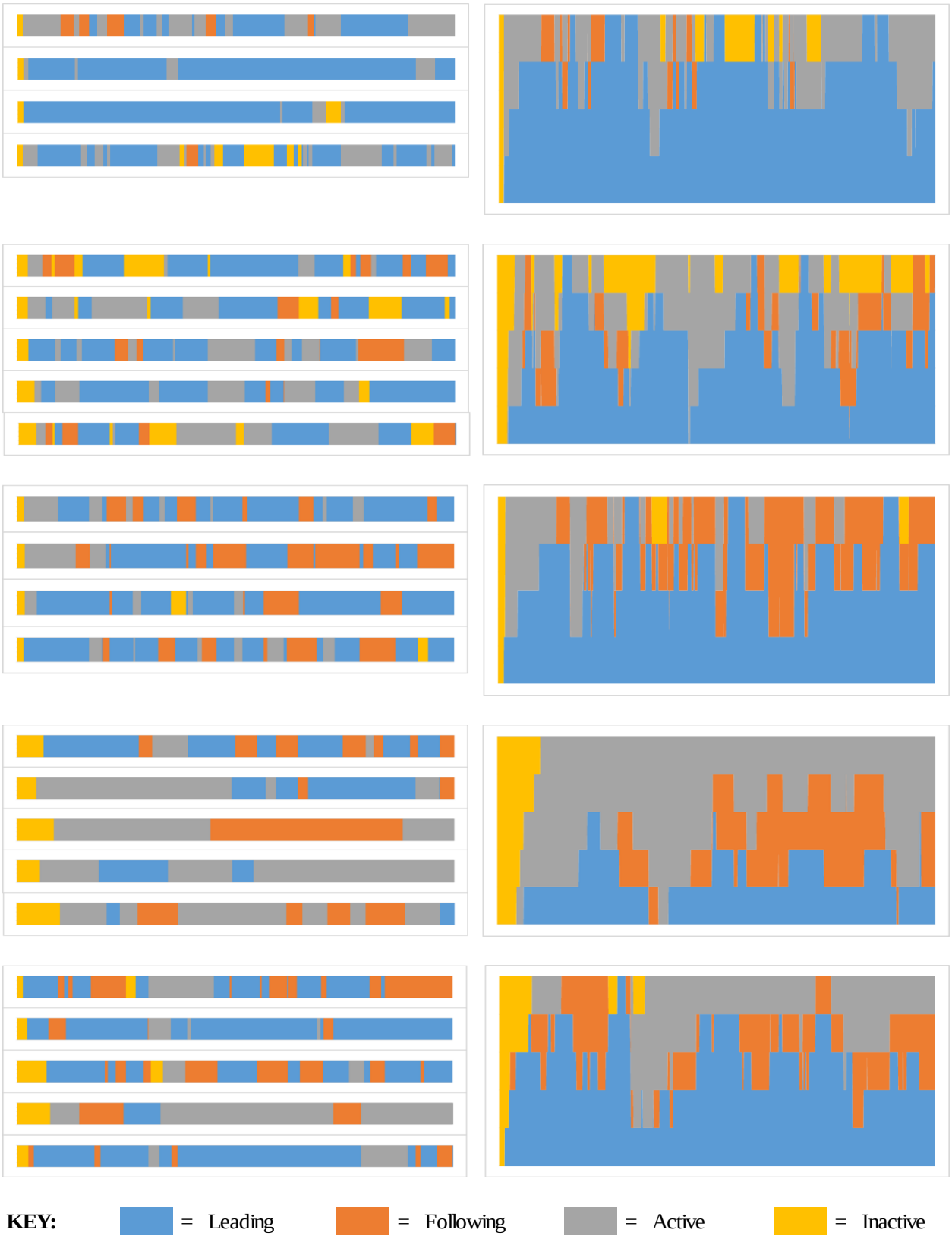


Figure 11. Behavior Charts for Low-Performing Teams



Follow-up: Proportions of Leading and Following Behaviors Exhibited by Individuals

All hypotheses and analyses throughout this presentation focus on team-level indicators of behavior and performance. Key variables like leadership sharing and followership sharing represent the proportion of team members engaging in leading or following behaviors simultaneously, on average throughout the task. As a follow-up analysis, I calculated behavior proportions for individuals also (see Table 9). These descriptives show a wide range in the proportion of time individuals spent on leading, following, active, and inactive behaviors; for example, some individuals never followed (min = .00) and others almost always followed (max = .96). Although individual-level analyses are outside the scope of my dissertation, it may prove useful in future research endeavors to investigate the potential importance of individual-level indicators of role frequency on team performance.

Table 9. Descriptive Statistics for Individual Proportions of Time Spent on Each Behavior

	N	Minimum	Maximum	Mean	SD
Proportion of Time Spent Leading	226	.00	.97	.44	.25
Proportion of Time Spent Following	226	.00	.96	.26	.18
Proportion of Time Spent Active	226	.00	.77	.20	.18
Proportion of Time Spent Inactive	226	.00	.58	.09	.10

Note. SD = Standard deviation.

DISCUSSION

Summary of Approach

The purpose of this study was to evaluate the potential importance of synchrony in terms of leading and following behaviors fulfilled by team members. Based on published conceptual work and empirical research, I predicted that teams would perform better if some members engage in following behaviors while others are engaging in leading behaviors. Specifically, I hypothesized that the relationship between leadership sharing and team performance, as well as the relationship between followership sharing and team performance, would depend on (require) synchrony. Because I focused on synchrony as the critical influencer of these relationships, I reviewed published research to identify its potential predictors in an effort to inform team selection practices. To resolve hypotheses, I worked with trained coders to track leading and following behaviors fulfilled by team members working through a high-fidelity emergency medicine scenario. I applied a moving window algorithm to calculate the extent to which members of each team behaved synchronously throughout the scenario. Analyses targeted links between the personal characteristics of team members, their leading and following behaviors, synchrony, and overall performance.

Summary of Findings

Simple descriptives revealed that team members shared leadership about half of the time and shared followership about a quarter of the time. Team members engaged in following behaviors while others led about three-quarters of the time (synchrony); the remaining amount of time represents when members led but none followed (asynchrony).

Although leadership sharing, followership sharing, and synchrony differed by event, performance did not. Because of this, event was removed from the tested model. The three control variables considered – namely team size, scenario order, and training condition – also proved unrelated to team performance and were therefore left out of analyses.

Another important finding was the the negative relationship between leadership sharing and followership sharing. As mentioned in the Results section, this relationship is constrained by the number of team members available. In other words, the number of team members engaging in leading behaviors reduces the number of team members available who *could* engage in following behaviors. Thus, the mere fact that there are a limited number of people on a team causes a negative relationship between leadership sharing and followership sharing to occur; as more team members engage in leading behaviors (share leadership), fewer are available to engage in following behaviors (share followership).

I also discovered that followership sharing and synchrony were strongly related to one another, indicating much overlap in the information represented by these variables. Followership sharing and synchrony are conceptually similar in that both are dependent on the extent to which leadership occurs. For team members to be able to follow, others must lead; and for leadership and followership to be synchronous, some must follow *while* others lead. However, these variables are also distinct. Followership sharing refers to how many team members are engaging in following behaviors simultaneously, on average – a mirror process to shared leadership. Synchrony refers to whether following and leading co-occur; mathematically, this requires *at least one* team member to be following while *at least one* team member is leading. I initially hypothesized that each of these variables would be an important predictor of team performance, but the strong positive correlation between them means they are – for the most part – redundant.

This redundancy is likely due to the mutual dependence of these variables on leadership sharing (a conceptual issue), while any differentiation is likely due to the temporal nature of the synchrony variable and the attention paid to multiple followers for followership sharing versus just one follower for synchrony (a mathematical/computational issue). Because of this, I present followership sharing and synchrony as competing moderators in my final model (see Figure 9).

I initially suggested a complex, multi-event framework incorporating mediation, moderation, and a number of individual difference inputs (see Figure 6); but bivariate correlation results did not support all hypothesized linkages. Shared leadership was related to team performance, which was consistent with my hypothesis and previous research – for example, a study conducted by Bergman and colleagues (2012) finding that more team members engaging in leading behaviors throughout a task translated into better team outcomes. Shared followership was not related to team performance, however. Synchrony also was not related to team performance – and demonstrated a small, insignificant effect. Shared leadership was related to average team member expertise and similarity in terms of members' expertise. That is, multiple team members engaged in leading behaviors simultaneously if they were more skilled on average and if members tended to be similarly skilled.

Note that most correlation results were similar across events, lending additional support to the removal of event from key analyses. Of the correlation results that did differ across events, two relationships were strongest in the resuscitation event and three other relationships were strongest in the intubation event. Thus, although event was removed from key analyses because it was not a key differentiator for team performance, a few of the relationships between focal variables appear to be driven by either the resuscitation or the intubation event.

Correlation results led me to develop a reduced and reorganized model focusing only on variables with significant bivariate relationships (see Figure 9). Through this reduced model I posited that three key personal characteristics influence team performance (average expertise, similarity in expertise, and average psychological collectivism); that the relationship between these characteristics and team performance is mediated by leadership sharing; and that the relationship between leadership sharing and performance is moderated by either followership or synchrony. Using hierarchal regression analyses, I discovered that average expertise and average psychological collectivism among team members were the most predictive characteristics for team performance. There was no evidence that leadership sharing mediated these relationships. There was also no evidence that followership sharing or synchrony moderated the relationship between leadership sharing and team performance. When compared to one another as incremental predictors of team performance, neither shared leadership nor shared followership significantly predicted performance above-and-beyond the personal characteristics mentioned previously. Synchrony did predict team performance above-and-beyond the personal characteristics, however.

These regression models predicting team performance were also calculated after excluding the personal characteristic variables (including only leadership, followership, and the moderation variables). Predictors in these models proved significant, indicating potential overlap between the personal characteristics tested as predictors in these analysis and the focal processes under study – or a lack of power to identify the significance of small effects representing relationships between leadership sharing, followership sharing, synchrony and team performance after accounting for the personal characteristic variables.

Although results indicate some support for the value of synchrony in leaderless teams, relationships with team performance were weaker than anticipated – especially after accounting for key individual differences. Because my research questions concerning synchrony stemmed from an interest in learning about effective behavioral patterns in teams, I considered alternative ways to review those patterns and to learn about how leadership and followership occur in effective and ineffective teams. I used area charts to map each team member's behavior at every second of the scenario, and to show the proportion of team members engaging in leading behaviors, following behaviors, other types of (active) task-relevant behaviors, and inactivity. These charts were created for the five best-performing teams and the five worst-performing teams, then evaluated using an extreme-groups approach to identify potential differentiators.

As outlined in the Results section, three potential differentiators were identified. First, best-performing teams' members engaged in more following behaviors overall versus worst-performing teams' members. Recall that regressions predicting team performance from shared followership and synchrony produced weak results. One potential rationale for these weak results is an overall lack of followership occurring – a prerequisite for sharing followership, or for engaging in following behaviors when others lead (in synchrony), is for following behaviors to occur in the first place. It may be that shared followership is not as important an indicator of teamwork – and driver of team performance – as a simpler metric indicating whether anyone is following at a particular time-point.

A second differentiator between best- and worst-performing teams was the consistency with which team members engaged in certain types of behavior. Members of best-performing teams tended to switch between behaviors – especially between leading and following behaviors – more frequently than members of worst-performing teams. On a related note, none of the best-

performing team members seemed to engage in the same type of behavior throughout the scenario. Best-performing team members also did not become more consistent in their behaviors over time. These findings concerning the consistency of team members' behaviors is surprising given team role and identity theories that suggest people tend to behave in ways consistent with their experiences, with others' feedback and expectations during a task, and with their broader personal preferences for how to work with others (DeRue & Ashford, 2010; DeRue, 2011; Mumford, Campion, & Morgeson, 2006). On the contrary, best-performing team members seem to trade roles often and do not settle into particular roles over time.

The third differentiator identified was the way in which behaviors seemed to balance among best-performing teams, but not among worst-performing teams. In best-performing teams, typically multiple team members led while others followed and still others were either active or inactive. Note that not everyone in the best-performing teams was following when others led; it may therefore be appropriate for some team members to follow when others lead, and for still other team members to take on team task responsibilities separate from leading (active behaviors). In worst-performing teams, most team members were either leading or active – possibly creating an imbalanced situation that prevented their team as a whole from being successful. Interestingly, one or more team members were sometimes inactive in both best- and worst-performing teams, indicating that inactivity may not negatively impact team performance. Perhaps it is even better for team members to step back, for example if they are not familiar with the tasks being performed or if there are already a sufficient amount of people handling a particular issue.

Impacts on Understanding of Leadership, Followership, and Synchrony in Teams

This presentation provides several contributions to the scientific literatures related to shared leadership, shared followership, and behavioral synchrony in teams.

Shared leadership. Earlier I introduced shared leadership as the emergent, collaborative, and informal version of leadership that occurs when team members naturally and informally fluctuate into and out of leader-like roles in the absence of a formal leader. I cited empirical research studies and a meta-analysis pointing to the importance of shared leadership for team performance; I noted that most scholars have identified a positive, small-to-moderate effect size representing the relationship between these two variables. However, in the current study I found weak support for this relationship. Although the bivariate correlation between shared leadership and team performance was significant, the effect size was small and the relationship was not significant after accounting for key team member characteristics (mean expertise, similarity in expertise, and mean psychological collectivism).

Two issues should be considered alongside the weak support for this relationship found in the current study versus what is commonly observed in the broader literature. First, most scholars studying shared leadership use retrospective survey approaches to gather team members' subjective perceptions about who did or did not engage in leading behaviors throughout a task (Gockel & Werth, 2010). Even so, Bergman and colleagues (2012) used an observational approach similar to the one applied in the current study – and found support for the importance of shared leadership. Still, given the paucity of observational team research in general, it seems possible that my objective measurement of shared leadership – and of team performance – caused a discrepancy that is not yet understood.

Second, and more importantly, the correlation between shared leadership and team performance was strongest for the intubation event. In the Introduction section I mentioned that shared leadership is a better predictor of team performance for teams whose members engage in more complex tasks, or in tasks requiring greater specialization. Of the three events utilized in the current study, the intubation event may be the most complex and specialized. As a reminder, the intubation event requires team members to work together to insert an endotracheal tube that sends air directly into the patient's lungs. During intubation, is most typical for two team members to work on the intubation itself while others check the patient for unconnected injuries and issues or examine test results. If the person who volunteers to intubate is unable to do so, another team member must assist by providing guidance and support; or by taking over – both of which are leading behaviors that occurred often for teams in this study. Throughout the intubation event the patient's oxygen saturation quickly drops to dangerous – and then extremely dangerous – levels. This is stressful for the team, critical for the patient outcome, and intricate in that there is only one correct way to conduct an intubation – and it must be followed. Compared with the intubation event, the diagnosis and resuscitation events seem slower and simpler.

Shared followership. I defined shared followership as a mirror process to shared leadership; an emergent, collaborative, informal version of followership that occurs when team members act in response to others' leading behaviors. I talked about follower-centric theories that focus on the value of followers, following behaviors, and followership; and that ask researchers to include conceptualizations and analyses of followership when studying leadership. Although relatively little empirical research has done so, these theories led me to predict that teams in which multiple members engage in following behaviors tend to perform better than teams in which this does not occur. My hypothesis tests revealed little support for this

relationship; the overall correlation was not significant, and the regression coefficient was significant only when paired with shared leadership (after accounting for key team member characteristics).

Still, as with the correlational results for shared leadership and team performance, the correlation between shared followership and team performance was stronger for the intubation event. This may mean that task complexity and member specialization not only enhances the effects of leadership sharing on team performance but also the effects of followership sharing. Follow-up research would be required to confirm this finding.

Also, although the hypothesis tests prompted only weak support for the relationship between shared followership and team performance, the extreme-groups approach I utilized later indicates stronger support. As shown in the area charts in Figures 10 and 11, best-performing teams have more members engaging in following behaviors during taskwork versus worst-performing team members. Best-performing team members are also engaging in more following behaviors in sum versus worst-performing team members.

Thus, the current study provides some initial support for the importance of shared followership as a separate key team process from shared leadership – especially for complex, specialized events like the intubation task.

Synchrony. I described synchrony as the extent to which team members engage in following behaviors while others engage in leading behaviors. Because leadership and followership processes are necessarily intertwined, team members' simultaneous fulfillment of these processes should drive team performance. I talked about constructionist theory, multilevel theory, and empirical studies targeting the ability to adjust one's own behaviors versus what others are doing in order to succeed and survive. After accounting for key team member

characteristics, the regression coefficient representing the relationship between synchrony and team performance was significant. In addition, when shared leadership, shared followership, and synchrony were entered as simultaneous predictors of team performance, the relationship between synchrony and team performance proved strongest.

The extreme-groups comparison also supports the importance of synchrony; in best-performing teams, members seem to follow when others lead – in worst-performing teams, members do not tend to follow when others lead.

Also noteworthy is that, like the correlation between shared leadership and team performance and the correlation between shared followership and team performance, the correlation between synchrony and team performance is strongest in the intubation event. Overall, the current study suggests that shared leadership, shared followership, and synchrony may be most critical for team success in complex, specialized tasks like the intubation event.

When reviewing these analyses, two concerns arose regarding my focus on synchrony. First, given the extreme-groups comparison results, the overall balance of behaviors seems equally important as, if not more important than, the extent to which team members are following while others lead. Balance has been discussed in social science research for decades, typically with respect to different team members engaging in specialized roles (Belbin, 1981; McCann & Margerison, 1989). My findings suggest the importance of a general balance of behaviors within the team as well – although these behaviors are not, and should not be, associated with predetermined roles given the informal nature of shared leadership and shared followership (and the team/task context in which these processes occur).

Second, I chose to operationalize synchrony as the extent to which *at least one* team member follows when *at least one* team member leads. However, it may be more appropriate or

realistic to consider the number of people who are leading and following as well as what effective leader/follower dyad linkages exist within the team. I would encourage researchers interested in this topic area to pursue these and other related lines of inquiry when exploring team behavioral patterns in the future.

Limitations and Recommendations for Future Research

There are several strengths associated with the current approach to studying leadership, followership, and synchrony in teams, including the behavior-based observation methodology used to collect second-by-second process and performance data and the high-fidelity context in which participants worked together. However, as with any research study, there are also limitations related to this research that constrain its interpretability and must be considered.

The most impactful limitation involves the archival nature of this data. Data used for this the current endeavor were originally collected for the purpose of a separate stream of research aimed at exploring the potential effects of teamwork training across multiple scenarios. Although neither training condition nor scenario order affected team performance (see earlier section on control variables), both variables affected the extent of leadership sharing, followership sharing, and synchrony occurring within the teams. In addition, the relatively small sample size of teams in this dataset prohibited the testing of a complex, multi-event model like the one posed in Figure 6. To test this type of model with sufficient power to detect small effect sizes, I would seek about 10 cases (teams) per estimated parameter. Because almost 40 parameters would be estimated here, I would need data from about 400 teams to detect the significance of weak relationships. However, because relationships tended to be weak or nonexistent among my focal variables, I ultimately reduced and reorganized my model such that this approach was not necessary.

Based on my results, I would recommend several next steps for researchers interested in examining patterns of leadership, followership, and other teamwork processes and behaviors in teams. First, the *sharing* of following behaviors may not be the best metric with which to gauge how followership should ideally occur in teams. One alternative perspective would be to restrict the measurement of leading behaviors such that they can *only* occur when team members follow. This approach would link the two processes, allowing the researcher to gauge the importance of leadership for team performance *only when followers are responsive.* My calculation of synchrony takes a similar, but different, approach – specifically by measuring leading and following behaviors separately for every person and then checking whether at least one person follows when at least one person leads. This difference in the measurement and operationalization of synchrony may prove critical.

Leveraging the performance differentiators identified in the area chart comparisons, another possible next step would be to focus on the flexibility with which team members engage in different behaviors. The results presented here indicate that teams may be more successful if members naturally fluctuate into and out of different roles throughout a task. Because participants in this study were relatively similar in terms of expertise, and because all scenarios took place within the Emergency Room context, it would be important to understand whether this flexibility is effective only for skill-homogenous teams operating in high-stress simulations, or if flexibility is a success driver in other contexts as well.

I would also recommend that researchers consider investigating the balance of different behaviors occurring within a team. Although I operationalized synchrony as the simultaneous fulfillment of leading behaviors by some team members and following behaviors by other team members, the area chart comparisons indicate that a more comprehensive view of synchrony may

be warranted. Specifically, the continuous division of different types of behaviors – leading, following, other types of task-related ("active") work, and even inactivity – among team members seems essential. This leads me to believe that synchronous teams may not be teams whose members engage in two related behaviors concurrently but rather teams whose members naturally coordinate and distribute various different types of behaviors.

Finally, all individual difference data used in this study existed at the team-level, and all performance data was summative across events. This is why I aggregated behavioral data to the team-level and the event-level – so that relationships with individual differences and performance could be analyzed. For a richer examination I would have preferred to link behavior time series with performance time series, for example to be able to investigate whether certain team members' behaviors critically impacted team performance. Other empirical research suggests that some members of a team can drive team success more than others, but this area of inquiry has focused narrowly on contexts where each team member holds a clear role. For example, Humphrey and colleagues (2009) discovered that baseball teams that invested more resources in critical members – pitchers and catchers – tended to win more games than teams that invested fewer resources on players in these critical roles. It would be impactful to understand whether particular members of leaderless teams might emerge as key drivers of team success; as well as what individual differences help predict which members are most critical.

Practical Implications

Although core hypothesis tests did not produce as strong results as anticipated, several practical implications are available upon review of the follow-up area charts explained above. First, encouraging team members to engage in following behaviors, "active" behaviors, and

inactivity when appropriate may be critical for team success. Everyone cannot and should not be leading. In a related vein, team members should balance their behaviors such that different people are handling different responsibilities; perhaps it is not required for everyone to follow when someone leads but rather for some to follow, some to work on separate tasks, and others to step back when their support is not needed. Second, leaderless teams may perform best if members are encouraged to naturally flex between different types of behavior rather than establishing official roles for each person. Third, the results point to the value of synchronous leading/following behaviors for team success; however, additional work is needed to alternatively metric and evaluate synchrony before specific practical implications can be suggested.

CONCLUSION

This research investigated the synchrony with which team members engage in leading and following behaviors as a potential determinant of team success. Relationships between synchrony and team performance proved weaker than anticipated, resulting in a need to conduct follow-up reviews of the data to further understand aspects of team members' behavior patterns that might impact their performance outcomes. Through these follow-up reviews, the importance of followership, behavioral flexibility, and a balanced approach to fulfilling different responsibilities within the team became apparent. Results may be used to guide future research on patterns of team member behavior as well as the ways in which real-world employees are trained or encouraged to act within their work teams.

FOOTNOTES

FOOTNOTES

[1] One exception is a meta-analysis by Webber and Donahue (2001). These authors found no significant relationships between surface-level (social category) or deep-level (informational) diversity and team performance.

[2] All participants also completed a second simulation requiring them to revive another patient with distinct issues and injuries; data from this second simulation are not used in the current study. However, in order to separate noise from meaningful results, I tested the order in which participants completed simulations as a potential control variable (see Control Variables section).

[3] I also ran the models after adjusting the time window used to represent synchrony (from five seconds to three and seven seconds). Adjusting the time window resulted in extremely similar results.

APPENDICES

Appendix A: Measure of General Self-Efficacy

The statements below ask you to describe <u>how confident YOU are</u> that you can handle the challenges of performing tasks you generally face. Please rate your beliefs honestly using the response scale provided.

Response options: Strongly disagree / Disagree / Neutral / Agree / Strongly agree

1. I believe I can meet the challenges of my tasks.
2. I am confident in my understanding of how to perform my tasks.
3. I am confident I can make decisions under ambiguous conditions for my tasks.
4. I am certain that I can manage the requirements of my tasks.
5. I believe I will do well on my tasks if the workload is increased.
6. I am confident that I can cope if my tasks become more complex.
7. I believe I can develop methods to handle changing aspects of my tasks.
8. I am certain I can cope with different task responsibilities competing for my time.

Appendix B: Measures of Conscientiousness and Agreeableness

Please rate the following statements on how accurately each statement applies to you. Please use the response scale provided to answer in terms of <u>how you generally are now</u>, not as you wish to be in the future. Additionally, describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age.

Response options: Very inaccurate / Moderately inaccurate / Neither accurate nor inaccurate / Moderately accurate / Very accurate

1. I am the life of the party. (E+)
2. Sympathize with others' feelings. (A+)
3. Get chores done right away. (C+)
4. Have frequent mood swings. (N+)
5. Have a vivid imagination. (O+)
6. Don't talk a lot. (E-)
7. Am not interested in other people's problems. (A-)
8. Often forget to put things back in their proper place. (C-)
9. I am relaxed most of the time. (N-)
10. I am not interested in abstract ideas. (O-)
11. Talk to a lot of different people at parties. (E+)
12. Feel others' emotions. (A+)
13. I like order. (C+)
14. I get upset easily. (N+)
15. I have difficulty understanding abstract ideas. (O-)
16. I keep in the background. (E-)
17. Am not really interested in others. (A-)
18. Make a mess of things. (C-)
19. Seldom feel blue. (N-)
20. Do not have a good imagination. (O-)

E+ = Positive extroversion item
A+ = Positive agreeableness item
C+ = Positive conscientiousness item
N+ = Positive neuroticism item
O+ = Positive openness item

E- = Negative extroversion item
A- = Negative agreeableness item
C- = Negative conscientiousness item
N- = Negative neuroticism item
O- = Negative openness item

Appendix C: Measure of Psychological Collectivism

The statements below ask you about your relationship with and thoughts about the work and project groups to which you currently belong, and/or have belonged to in the past. Rate each statement, as honestly as possible, using the response scale provided.

Response options: Strongly disagree / Disagree / Neutral / Agree / Strongly agree

1. I preferred to work in those groups rather than working alone.
2. I felt comfortable counting on group members to do their part.
3. The health of those groups was important to me.
4. I followed the norms of those groups.
5. I cared more about the goals of those groups than my own goals.
6. Working in those groups was better than working alone.
7. I was not bothered by the need to rely on group members.
8. I cared about the well-being of those groups.
9. I followed the procedures used by those groups.
10. I emphasized the goals of those groups more than my individual goals.
11. I wanted to work with those groups as opposed to working alone.
12. I felt comfortable trusting group members to handle their tasks.
13. I was concerned about the needs of those groups.
14. I accepted the rules of those groups.
15. Group goals were more important to me than my personal goals.

Appendix D: Measure of Social Skills

Please rate each statement below on how strongly you disagree or agree with it. Please respond to each item as accurately and honestly as possible using the response scale provided.

Response options: Strongly disagree / Disagree / Neutral / Agree / Strongly agree

1. I find it easy to put myself in the position of others.
2. I am keenly aware of how I am perceived by others.
3. In social situations, it is always clear to me exactly what to say and do.
4. I am particularly good at sensing the motivations and hidden agendas of others.
5. I am good at making myself visible with influential people in my organization.
6. I am good at reading others' body language.
7. I am able to adjust my behavior and become the type of person dictated by any situation.

Appendix E: Coding Protocol for Team Performance

Session Start: _____ _____
Date Time

Session Participants: _____

PATIENT CARE CHECKLIST: Scenario 1

Event 1

Begin: Team enters ER and finds conscious patient in halo. They are given available medical history and proceed to determine the status of the patient and needed treatment.

End: O_2 saturation drops to 85%. Team makes the decision to intubate or is prompted to do so by the nurse after 1 minute.

SCENARIO START TIME: _____

Unless otherwise instructed, place a check next to each action or order.

		✓
IV Details (1st IV)	Time IV confirmed (asking nurse "does pt have IV" or acknowledging to team from sheet that patient has IV)	T=
	Ask that IV is 18 ga or larger (FIRST IV)	☐
Second IV	IV placement ordered	☐
	Time **Second** IV confirmed	T=
	Ask that IV is 18 ga or larger	☐
	Location IV placed (AC)	☐
IV Fluid Order	IV fluid ordered	☐
	Time IV fluid ordered	T=
	Either 1 liter or 2-500 cc boluses ordered	☐
	Fluid ordered is either NS or LR	☐
Vital sign interpretation	Team makes a statement about "sepsis"	☐
	Time team makes statement about sepsis	T=
	Team uses the word "shock"	☐
	Time team uses the word "shock"	T=
Cardiac monitor interpretation	HR is verbalized	☐
	Rhythm is assessed to be "tachycardia"	☐
Chest X Ray	CXR is ordered	☐
	Time CXR ordered	T=
	Interpreted as pneumonia (no points if radiology read needed)	☐
	Also states "left lower lobe"	☐
Labs ordered	CBC	☐
	Differential	☐
	Electrolytes, BUN, Creatinine (Chem 7)	☐
	Blood cultures	☐
	Urine analysis	☐
	Urine culture	☐
	Troponin	☐
	Fingerstick glucose	☐

	Time fingerstick glucose obtained	T=
	Fingerstick glucose ordered BEFORE intubation	☐
	Lactate	☐
	Arterial blood gas	☐
	Magnesium	☐
ECG	ECG is read as sinus tachycardia, otherwise normal	☐
ABG	Interpretation is hypoxia with a metabolic acidosis	☐
Antibiotics Ordered	Team orders medications to cover hospital-acquired pneumonia (see attachment for list)- Should be imipenem or mirapenem	☐
	More than one antibiotic combination is ordered (scored as neg)	☐
	Doses of all antibiotics are correct (see list, no points if pharmacy used)	☐

Event 2

Begin: Team begins to intubate the patient in order to stabilize patient deterioration.

End: Team successfully intubates patient and condition stabilizes. Team phones the ICU or is prompted to do so by nurse. During the consult call, the patient's pulse monitor changes to a VFib rhythm.

Unless otherwise instructed, place a check next to each action or order.
***weighting of items not reflected here, captured in Excel output**

	Behavior			✓
Start of intubation	Recorded as first time blade in mouth **AFTER meds given**			T=
End of intubation	Recorded as time of first bagging through ETT after **successful** intubation			T=
Decision to intubation	Decision made to intubate patient before call to ICU			☐
Intubation Assistance	Team member(s) assist intubator by handing the ETT to intubator when needed			☐
Intubation medications	**Gives 1 sedation medication**	Check if Given	Check if Correct dose	
	Etomidate	☐	☐	
	Versed	☐	☐	
	Other	☐	☐	
	If Paralytic used, medication choice and dose correct	Check if Given	Check if Correct dose	
	Succinylcholine	☐	☐	
	Rocuronium	☐	☐	
	Paralytic NOT used AND reason not used is NOT discussed			☐
	More than one sedative given **before** intubation incorrect (negative points)			☐
	More than one dose of paralytic **before** intubation is incorrect (negative points)			☐
	No intubation meds used (negative points)			☐
	Team CLEARLY verbalizes CORRECT sequence of medications to be given			☐ Yes ☐ No ☐ N/A
Ventilation	Record bagging rate at 1 minute post successful intubation (defined as first ventilation through ETT) – count for 30 seconds and record number			_____
Admission	Team requests admission to an ICU without prompt			☐

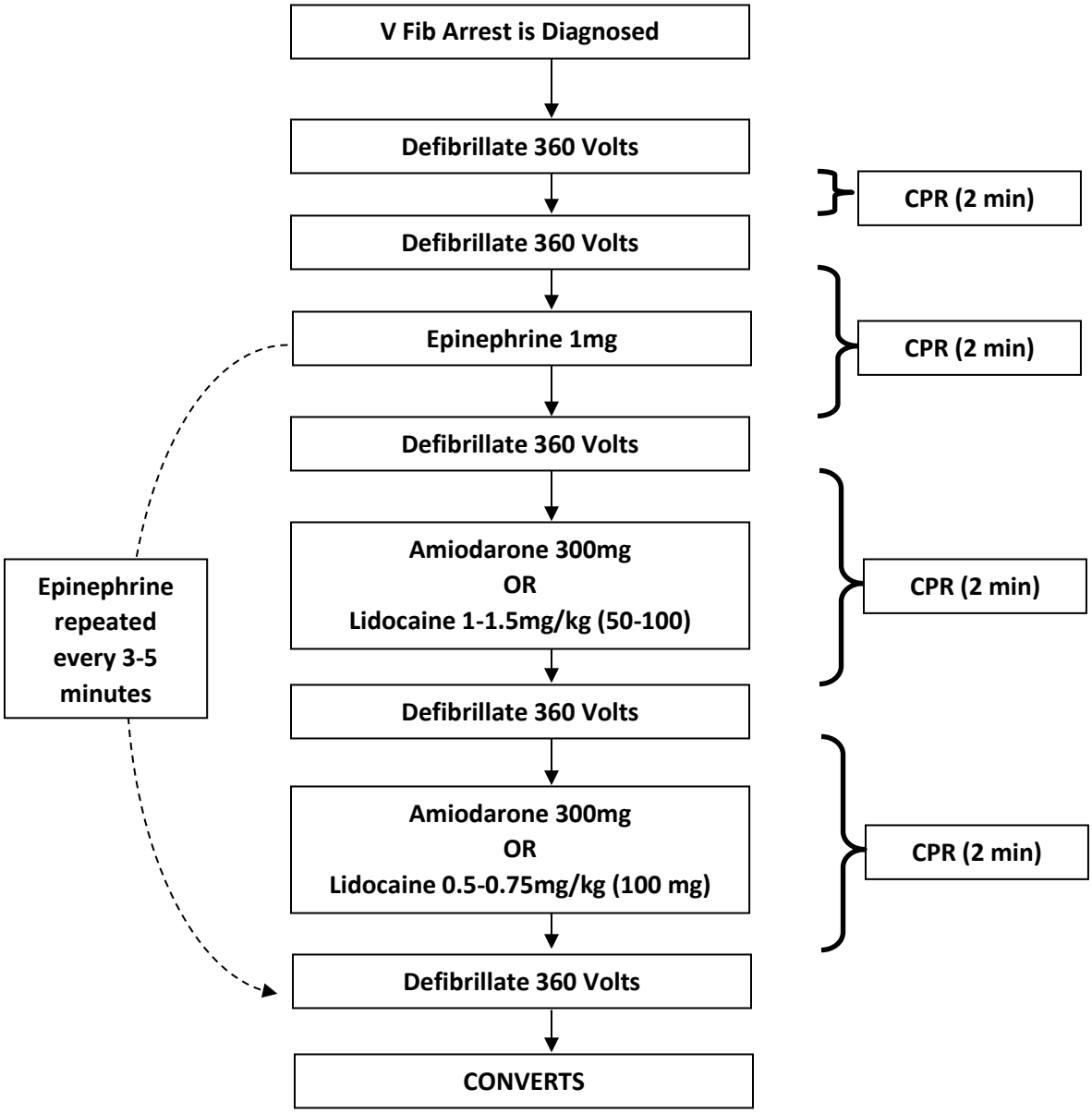
Event 3

Begin: Patient enters into VFib, requiring team to restore normal heart functioning.

End: Team restores normal heart function, indicated by a return to a normal sinus rhythm on the pulse monitor.

Figure 12. ACLS Protocol Provided to Team Performance Coders

Below is a diagram of the ACLS protocol. You can refer to this diagram when coding behaviors in this event, as several behaviors reference the ACLS protocol.



Unless otherwise instructed, place a check next to each action or order.

TIME OF V FIB ARREST _____

	Behavior WHILE ATTEMPTING TO REVIVE PATIENT		✓
Rhythm	Initial rhythm identification is correct (VF)		☐
	Time team identifies arrest ("no pulse", "rhythm change", "he's in VF"		T=
Defibrillation Use length of charge to determine if 360 or not	Paddles are charged to 360 J	Time	Charge Correct
	Defib #1	T=	☐
	Defib #2	T=	☐
	Defib #3	T=	☐
	Defib #4	T=	☐
	Defib #5	T=	☐
	More than 5 "shocks" delivered (negative points)		☐

CPR Block	Quality			Start Time	Stop Time	# Incorrect Pauses (up to 10)
	Adequate	Inadequate	Indeterminate			
Prior to Defib if any						
1						
2						
3						
4						

	More than 4 blocks of CPR done **after** first defibrillation (negative points)	☐
Medications	**Epinephrine dose correct (1 mg)**	☐
	Antiarrhythmic #1	
	• **DRUG CORRECT** • Amiodarone OR Lidocaine	☐
	• **DOSE CORRECT** • Amiodarone (300mg) OR Lidocaine (70 - 100mg (1-1.5 mg/kg) or 1 amp	
	Antiarrhythmic dose #2	
	• **DOSE CORRECT** • ½ of above dose, should NOT be a different drug class	☐
	• **DRUG CORRECT** • Amiodarone OR Lidocaine (SAME CHOICE AS ABOVE)	
	Atropine administered (negative points)	☐
	Procainamide administered (negative points)	☐
	Vasopressin ordered (not available, no penalty)	
ECG	Post-arrest ECG ordered before ICU called	☐
Antiarrythmic Drip	Drip ordered for proper drug before ICU called	☐
	Drip dose is correct	☐
ICU Consult	ICU called after arrest without prompt	☐

Appendix F: Coding Protocol for Leading, Following, and Other Behaviors

1. **Start the recording** (green button) when the first team member (not the confederate) enters the room.

2. You will watch the video multiple times. Use the following steps:

    → Before watching the video, open then Excel spreadsheet on the Desktop called "Tracker for EMT Recoding Spring 2014" and add a description for each team member. This will tell me who you're coding as "Member A" vs. "Member B" etc. so that I can match up your work with someone else's.

    → 1st video review = Click each of the four simulation events as they begin (Diagnosis, Intubation, Resuscitation, Wrap-up). [**NOTE:** You originally had to 'start' and 'stop' each event; I've changed the set-up now so that you just click once to indicate which event has begun, then click the next event when it begins, and so on… no stopping and starting anymore!]
        → You can skip through the video to complete this quickly.
        → You can also choose to do this step while coding your 1st team member.

Diagnosis *begins when the team enters the room and ends when...*
Intubation *begins when someone first places the laryngoscope in the patient's mouth and ends when...*
Resuscitation *begins when the patient goes into v-fib (when the <3 rate becomes irregular) and ends when...*
Wrap-up *begins when the patient's <3 rate returns to normal (sinus) rhythm and ends when the confederate stops the team by saying something like "OK, that's all for today"*

    → 2nd video review = Choose one team member to code first. You'll focus on this person throughout the video and code only his/her behaviors. You'll be marking the time segments during which this person is consistently engaging in leadership, followership, active, or inactive behaviors.
        → The program will force you to have one of these four categories running at all times; i.e., the team member will be fulfilling one (and only one) of the four roles at any given moment.
        → There is no minimum or maximum amount of time required for a team member to "be" a leader, a follower, active, or inactive. You will use your judgment to determine which roles are being fulfilled and when. But: remember that one or two behaviors is not enough to fulfill any of these roles. You're looking for consistency, i.e., engaging in a string of behaviors associated with one of the four categories.

    → Once you have watched the entire video and coded segments during which this team member engages in leadership, followership, activity, or inactivity, you'll start this process again – this time focusing on another team member. You'll repeat the process until all team members have been coded.
        → If you think you can code two team members at once, and do so accurately, go for it.
        → You will not code the confederate.

3. After you have coded for all team members (other than the confederate), make sure the playback bar is located just after the end of the Wrap-up event (i.e., the nurse is letting the team go) and **stop the recording** (red button).

4. **Save your observation** before exiting (the program will prompt you to save if you try to exit without saving) or starting a new one!

Remember to take notes! *Make comments and record issues as they arise (in the behavior rows during coding). This will help me understand discrepancies among coders later.*

Table 10. Examples for Coders of Leading, Following, and Other Behaviors

Category	**Leadership**	**Followership**
Description	*Any team member can fulfill the role of 'leader' at any moment. Someone is being a 'leader' if he/she engages in the below behaviors consistently over some period of time.*	*Any team member who is not behaving as a 'leader' can be a 'follower'. Someone is being a 'follower' if he/she engages in the below behaviors while someone else is being a 'leader'.*
Examples	Asking for others' input Communicating key information so that everyone is aware Making decisions / setting goals for patient care Planning and organizing how patient care will occur Providing feedback Giving instructions/directions to others Assigning roles/tasks to others Monitoring patient status and team activities Helping others Adapting to unexpected circumstances / problem solving Checks that the team has access to all necessary materials/resources Solicits external resources (on the phone) Encouraging/motivating teammates Fostering a positive atmosphere for the team	Providing input when the leader asks for it Listening to and/or reiterating information communicated by the leader Showing deference or approval when the leader makes a decision / sets a goal Participating when the leader organizes a plan for patient care Listening to and/or adjusting based on feedback provided by the leader Following instructions/directions given by the leader Obeying the roles/tasks assigned by the leader Sharing status and team activity information with the leader Accepting help when offered by the leader Participating when the leader adapts/problem-solves Assists when the leader checks materials/resources Fills in when the leader is soliciting external resources (on the phone) Accepting encouragement/motivation when the leader provides it Promotes the positive atmosphere when fostered by the leader

While watching videos, you will designate time periods during which each team member is:

- Leading
- Following
- Active (but not working as a leader or follower)
- Inactive

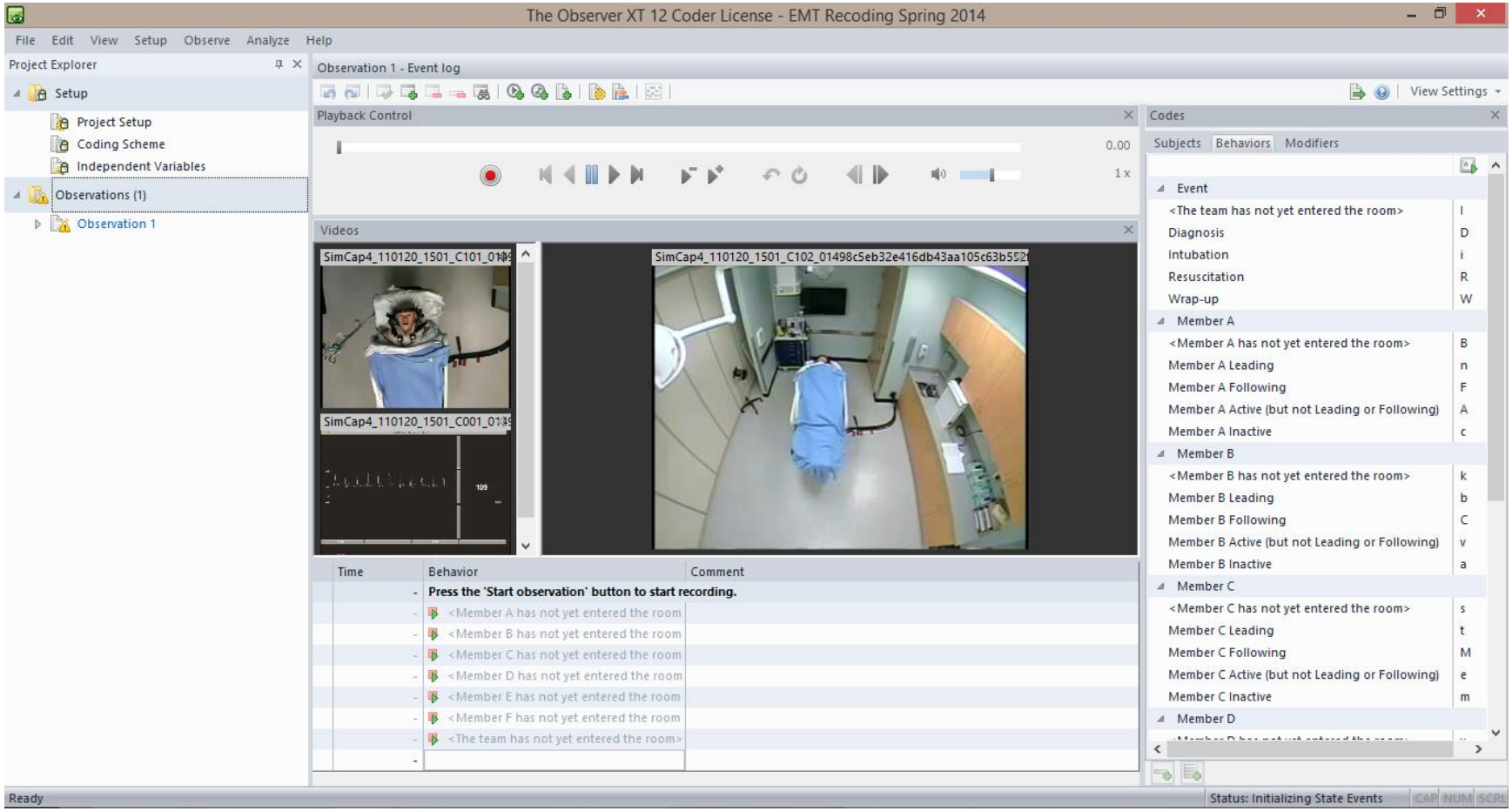
If someone is not being a leader or a follower, but is actively working (e.g., taking blood pressure, discussing an idea with someone else), this person should be coded as active.

If someone is not being a leader, a follower, or active, this person should be coded as inactive (e.g., standing aside / not participating in the simulation).

IMPORTANT: Note that leadership does not require followership; a person can be a "leader" even if no one is following. But followership does require leadership; a person cannot be a "follower" unless someone else is leading. This is why every followership behavior listed above is linked with a leadership behavior.

Appendix G: Coding Software Setup

Figure 13. Screenshot of Software Used by Coders to Identify Leading, Following, and Other Behaviors



REFERENCES

REFERENCES

Ancona, D. & Chong, C.-L. (1996). Entrainment: Pace, cycle, and rhythm in organizational behavior. *Research in Organizational Behavior, 18*, 251-284.

Avolio, B. J., Walumbwa, F. O., & Weber, T. J. (2009). Leadership: Current theories, research, and future directions. *Annual Review of Psychology*, *60*(1), 421-449.

Baard, S. K. (unpublished). Multiple leaders within a team: A critical review.

Baker, S. D. (2006). *The effect of leader-follower agreement on team effectiveness* (Doctoral dissertation). Retrieved from ProQuest (UMI #3209933).

Barrick, M. R., Mitchell, T. R., & Stewart, G. L. (2003). Situational and motivational influences on trait-behavior relationships. In M. R. Barrick and A. M. Ryan (Eds.), *Personality and work: Reconsidering the role of personality in organizations* (pp. 60-82). San Francisco, CA: Jossey-Bass.

Barry, D. (1991). Managing the bossless team: Lessons in distributed leadership. *Organizational Dynamics*, *20*(1), 31-47.

Basil, M. D. (2014). Secondary reaction-time Measures. In Annie Lang (Ed.), *Measuring Psychological Responses to Media Messages* (pp.85-98). Hillsdale, NJ: Lawrence Erlbaum Associates.

Bass, B. M. & Avolio, B. J. (2000). *Multifactor Leadership Questionnaire: Technical report, leader form, rater form, and scoring key for MLQ form 5x-short* (2nd ed). Redwood City, CA: Mind Garden, Inc.

Bass, B. M., & Stogdill, R. M. (1990). *Handbook of leadership* (vol. 11). New York: Free Press.

Belbin, R. M. (1981). *Management teams: Why they succeed or fail* (1st ed.). London: Butterworth-Heinemann.

Bell, S. T. (2007). Deep-level composition variables as predictors of team performance: A meta-analysis. *Journal of Applied Psychology*, *92*(3), 595-615.

Berg, D. N. (1998). Resurrecting the muse: Followership in organizations. In E. B. Klein, F. Gabelnick, and P. Herr (Eds.), *The psychodynamics of leadership* (pp. 27-52). Madison, CT: Psychosocial Press.

Bell, S. T. (2007). Deep-level composition variables as predictors of team performance: A meta-analysis. *Journal of Applied Psychology*, *92*(3), 595-615.

Bergman, J. Z., Rentsch, J. R., Small, E. E., Davenport, S. W., & Bergman, S. M. (2012). The shared leadership process in decision-making teams. *Journal of Social Psychology*, *152*(1), 17-42.

Bjugstad, K., Thach, E. C., Thompson, K. J., & Morris, A. (2006). A fresh look at followership: A model for matching followership and leadership styles. *Journal of Behavioural and Applied Management*, *7*(3), 304-319.

Bligh, M. C., Kohles, J. C., & Pillai, R. (2011). Romancing leadership: Past, present, and future. *The Leadership Quarterly*, *22*(6), 1058-1077.

Bono, J. E. & Judge, T. A. (2004). Personality and Transformational and Transactional Leadership: A meta-analysis. *Journal of Applied Psychology*, *89*(5), 901-910.

Bradley, B. H., Baur, J. E., Banford, C. G., & Postlethwaite, B. E. (2013). Team players and collective performance: How agreeableness affects team performance over time. *Small Group Research*, *44*(6), 680-711.

Burke, C. S., Stagl, K. C., Klein, C., Goodwin, G. F., Salas, E., & Halpin, S. M. (2006). What type of leadership behaviors are functional in teams? *The Leadership Quarterly*, *17*(3), 288-307.

Byrne, D. (1971). *The attraction paradigm*. New York: Academic Press.

Carson, J. B., Tesluk, P. E., & Marrone, J. A. (2007). Shared leadership in teams: An investigation of antecedent conditions and performance. *Academy of Management Journal*, *50*(5), 1217-1234.

Carsten, M. K., Uhl-Bien, M., West, B. J., Patera, J. L. & McGregor, R. (2010). Exploring social constructions of followership: A qualitative study. *The Leadership Quarterly*, *21*(3), 543-562.

Chemers, M. M. (2000). Leadership research and theory: A functional integration. *Group Dynamics: Theory, Research, and Practice*, *4*(1), 27-43.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Contractor, N. S., DeChurch, L. A., Carson, J., Carter, D. R., & Keegan, B. (2012). The topology of collective leadership. *The Leadership Quarterly*, *23*(6), 994-1011.

Cox, T., Lobel, S., & McLeod, P. (1991). Effects of ethnic group cultural differences on cooperative and competitive behavior on a group task. *Academy of Management Journal*, *34*(4), 827-847.

Crevni, L., Lindgren, M., & Packendorff, J. (2010). Leadership, not leaders: On the study of leadership as practices and interactions. *Scandinavian Journal of Management*, *26*(1), 77-86.

Crossman, B. & Crossman, J. (2011). Conceptualising followership: A review of the literature. *Leadership*, *7*(4), 481-497.

Day, D. V. (2012). Leadership. In S. W. J. Kozlowski (Ed.), *The Oxford handbook of organizational psychology* (pp. 696-729). New York: Oxford University Press.

de Jonge, J., Dormann, C., Janssen, P. P. M., Dollard, M. F., Landeweerd, J. A., & Nijhuis, F. J. N. (2001). Testing reciprocal relationships between job characteristics and psychological well-being: A cross-lagged structural equation model. *Journal of Occupational and Organizational Psychology*, *74*(1), 29-46.

Denis, J.-L., Langley, A., Sergi, V. (2012). Leadership in the plural. *Academy of Management Annals*, *6*(1), 211-283.

DeRue, D. S. (2011). Adaptive leadership theory: Leading and following as a complex adaptive process. *Research in Organizational Behavior*, 31, 125-150.

DeRue, D. S. & Ashford, S. J. (2010). Who will lead and who will follow? A social process of leadership identity construction in organizations. *Academy of Management Review*, *35*(4), 627-647.

Donnellan, M. B., Oswald, F. L., Baird, B. M., & Lucas, R. E. (2006). The mini-IPIP scales: Tiny-yet-effective measures of the Big Five factors of personality. *Psychological Assessment*, *18*(2), 192-203.

Duarte, R., Araujo, D., Correia, V., Davids, K., Marques, P., & Richardson, M. J. (2013). Competing together: Assessing the dynamics of team-team and player-team synchrony in professional association football. *Human Movement Science*, *32*(4), 555-566.

Eby, L. T. & Dobbins, G. H. (1997). Collectivistic orientation in teams: An individual and group-level analysis. *Journal of Organizational Behavior*, *18*(3), 275-295.

Eden, D. & Leviatan, U. (1975). Implicit leadership theory as a determinant of the factor structure underlying supervisory behavior scales. *Journal of Applied Psychology*, *60*(6), 736-741.

Ensley, M. D., Hmieleski, K. M., & Pearce, C. L. (2006). The importance of vertical and shared leadership within new venture top management teams: Implication for the performance of startups. *The Leadership Quarterly*, *17*(3), 217-231.

Fairhurst, G. T. & Grant, D. (2010). The social construction of leadership: A sailing guide. *Management Communication Quarterly*, *24*(2), 171-210.

Fairhurst, G. T. & Uhl-Bien, M. (2012). Organizational discourse analysis (ODA): Examining leadership as a relational process. *The Leadership Quarterly*, *23*(6), 1043-1062.

Feldt, T., Kivimäki, M., Rantala, A., Tolvanen, A. (2004). Sense of coherence and work characteristics: A cross-lagged structural equation model among managers. *Journal of Occupational and Organizational Psychology*, *77*(3), 323-342.

Fiedler, F. E. (1964). A contingency model of leadership effectiveness. In L. Berkowitz (Ed.), *Advances in experimental social psychology*. New York: Academic Press.

Fleishman, A., Mumford, D., Zaccaro, J., Levin Y., Korotkin, A., & Hein, B. (1991). Taxonomic efforts in the description of leaders' behaviour: A synthesis and functional interpretation. *The Leadership Quarterly*, *2*(4), 245-287.

French, J. R. & Raven, B. H. (1959). The bases of social power. In D. Cartwright (Ed.), *Studies in Social Power* (pp. 150-167). Ann Arbor, MI: Institute for Social Research.

Frese, M., Garst, H., & Fay, D. (2007). Making things happen: Reciprocal relationships between work characteristics and personal initiative in a four-wave longitudinal structural equation model. *Journal of Applied Psychology*, *92*(4), 1084-1102.

Friedrich, T. L., Vessey, W. B., Schuelke, M. J., Ruark, G. A., & Mumford, M. D. (2009). A framework for understanding collective leadership: The selective utilization of leader and team expertise within networks. *The Leadership Quarterly*, *20*(6), 933-958.

Gibb, C. A. (1954). Leadership. In G. Lindzey (Ed.), *Handbook of social psychology* (pp. 877-917). Reading, MA: Addison-Wesley.

Gockel, C. & Werth, L. (2010). Measuring and modeling shared leadership: Traditional approaches and new ideas. *Journal of Personnel Psychology*, *9*(4), 172-180.

Gooty, J., Connelly, S., Griffith, J., & Gupta, A. (2010). Leadership, affect, and emotions: A state of the science review. *The Leadership Quarterly*, *21*(6), 979-1004.

Green, D. G. (1994). Emergent behavior in biological systems. *Complexity International*, retrieved July 2014 from http://www.complexity.org.au/vol01/green01/

Gully, S. M., Incalcaterra, K. A., Joshi, A., & Beaubien, J. M. (2002). A meta-analysis of team-efficacy, potency, and performance: Interdependence and level of analysis as moderators of observed relationships. *Journal of Applied Psychology*, *87*(5), 819-832.

Hackman, J. R. & Walton, R. E. (1986). Leading groups in organizations. In P. S. Goodman (Ed.), *Designing effective work groups*. San Francisco, CA: Jossey-Bass.

Harrison, D. A. & Klein, K. J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *Academy of Management Review*, *32*(4), 1199-1228.

Harrison, D. A., Price, K. H., Gavin, J. H., & Florey, A. T. (2002). Time, teams and task performance: Changing effects of surface- and deep-level diversity on group functioning. *Academy of Management Journal*, *45*(5), 1029-1045.

Harrison, D. A., Mohammed, S., McGrath, J. E., Florey, A. T., & Vanderstoep, S. W. (2003). Time matters in team performance: Effects of member familiarity, entrainment, and task discontinuity on speed and quality. *Personnel Psychology*, *56*(3), 633-669.

Herbert-Read, J. E., Perna, A., Mann, R. P., Schaerf, T. M., Sumpter, D. J. T., & Ward, A. J. W. (2011). Inferring the rules of interaction of shoaling fish. *Proceedings of the National Academy of Sciences*, *108*(46), 18726-18731.

Hiller, N. J., Day, D. V., & Vance, R. J. (2006). Collective enactment of leadership roles and team effectiveness: A field study. *The Leadership Quarterly*, *17*(4), 387-397.

Hoch, J. E., Pearce, C. L., & Welzel, L. (2010). Is the most effective team leadership shared? The impact of shared leadership, age diversity, and coordination on team performance. *Journal of Personnel Psychology*, *9*(3), 105-116.

Hoffman, L. (1959). Homogeneity and member personality and its effect on group problem solving. *Journal of Abnormal and Social Psychology*, *58*(1), 27-32.

Hollander, E. P. (1985). Leadership and power. In G. Lindzey and E. Aronson (Eds.), *Handbook of social psychology* (pp. 485-538) (3rd ed.). New York: Random House.

Hollenbeck, J. R., DeRue, D. S., & Guzzo, R. (2004). Bridging the gap between I/O research and HR practice: Improving team composition, team training, and team task design. *Human Resource Management*, *43*(4), 353-366.

Humphrey, S. E., Morgeson, F. P., & Mannor, M. J. (2009). Developing a theory of the strategic core of teams: A role composition model of team performance. *Journal of Applied Psychology*, *94*(1), 48-61.

Ilgen, D. R., Hollenbeck. J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology*, *56*, 517-543.

Ilies, R., Gerhardt, M. W., & Le, H. (2004). Individual differences in leadership emergence: Integrating meta-analytic findings and behavioral genetics estimates. *International Journal of Selection and Assessment*, *12*(3), 207-219.

Jackson, C. L., Colquitt, J. A., Wesson, M. J., & Zapata-Phelan (2006). Psychological collectivism: A measurement validation and linkage to group member performance. *Journal of Applied Psychology*, *91*(4), 884-899.

Jackson, S. E., Joshi, A., & Erhardt, N. L. (2003). Recent research on team and organizational diversity: SWOT analysis and implications. *Journal of Management*, *29*(6), 801-830.

Jehn, K. A. & Bezrukova, K. (2004). A field study of group diversity, workgroup context, and performance. *Journal of Organizational Behavior*, *25*(6), 703-729.

Jöreskog, K. G. & Sörbom, D. (1993). *LISREL 8: User's reference guide*. Chicago: Scientific Software International.

Joshi, A. & Roh, H. (2009). The role of context in work team diversity research: A meta-analytic review. *Academy of Management Journal*, *52*(3), 599-627.

Judge, T. A., Bono, J. E., Ilies, R., & Gerhardt, M. (2002). Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology, 87*(4), 765-780.

Judge, T. A., Colbert, A. E., & Ilies, R. (2004). Intelligence and leadership: A quantitative review and test of theoretical propositions. *Journal of Applied Psychology, 89*(3), 542-552.

Judge, T. A. & Piccolo, R. F. (2004). Transformational and transactional leadership: A meta-analytic test of their relative validity. *Journal of Applied Psychology*, *89*(5), 755-768.

Judge, T. A., Piccolo, R. F., & Ilies, R. (2004). The forgotten ones? A re-examination of consideration, initiating structure, and leadership effectiveness. *Journal of Applied Psychology*, *89*(1), 36-51.

Katz, D. & Kahn, R. L. (1978). *The social psychology of organizations* (2nd ed.). New York: John Wiley & Sons.

Kimura, M. & Daibo, I. (2006). Interactional synchrony in conversations about emotional episodes: A measurement by "the Between-Participants Pseudosynchrony Experimental Paradigm". *Journal of Nonverbal Behavior*, *30*(3), 115-126.

Kipnis, D. & Lane, W. P. (1962). Self-confidence and leadership. *Journal of Applied Psychology*, *46*(4), 291-295.

Klein, K. J., Ziegert, J. C., Knight, A. P., & Xiao, Y. (2006). Dynamic delegation: Shared, hierarchical, and deindividualized leadership in extreme action teams. *Administrative Science Quarterly*, *51*(4), 590-621.

Kolb, J. A. (1999). The effect of gender role, attitude toward leadership, and self-confidence on leader emergence: Implications for leadership development. *Human Resource Development Quarterly, 10*(4), 305-320.

Komaki, J. L. & Minnich, M. R. (2002). Crosscurrents at sea – the ebb and flow of leaders in response to the shifting demands of racing sailboats. *Group & Organization Management, 27*(1), 113-141.

Kozlowski, S. W. J. (2012). *The Oxford handbook of organizational psychology*. New York: Oxford University Press.

Kozlowski, S. W. J. & Bell, B. S. (2013). Work groups and teams in organizations: Review update. In N. Schmitt and S. Highhouse (Eds.), *Comprehensive handbook of psychology: Industrial and Organizational Psychology* (2nd edition, vol. 12). New York: Wiley.

Kozlowski, S. W. J., Gully, S. M., McHugh, P. P., Salas, E., & Cannon-Bowers, J. A. (1996). A dynamic theory of leadership and team effectiveness: Developmental and task contingent leader roles. In G. R. Ferris (Ed.), *Research in personnel and human resource management* (vol. 14, pp. 253-305). Greenwich, CT: JAI Press.

Kozlowski, S. W. J. & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein and S. W. J. Kozlowski (Eds.), *Multilevel theory, research and methods in organizations: Foundations, extensions, and new directions* (pp. 3-90). San Francisco, CA: Jossey-Bass.

Küpers, W. & Weibler, J. (2008). Inter-leadership: Why and how should we think of leadership and followership integrally? *Leadership, 4*(4), 443-475.

Lemieux-Charles, L. & McGuire, W. L. (2006). What do we know about health care team effectiveness? A review of the literature. *Medical Care Research and Review*, *63*(3), 263-300.

Leonard, J. S., Levine, D. I., & Joshi, A. (2004). Do birds of a feather shop together? The effects on performance of employees' similarity with one another and with customers. *Journal of Organizational Behavior, 25*(6) 731-754.

LePine, J. A., Hollenbeck, J. R., Ilgen, D. R., & Hedlund, J. (1997). Effects of individual differences on the performance of hierarchal decision-making teams: Much more than g. *Journal of Applied Psychology*, *82*(5), 803-811.

Lord, R. G., Foti, R. J., & De Vader, C. L. (1984). A test of leadership categorization theory: Internal structure, information processing, and leadership perceptions. *Organizational Behavior and Human Performance, 34*(3), 343-378.

Lord, R. G. (1985). An information processing approach to social perceptions, leadership and behavioral measurement in organizations. *Research in Organizational Behavior, 7*, 87-128.

Mannix, E. & Neale, M. A. (2005). What differences make a difference? The promise and reality of diverse teams in organizations. *Psychological Science in the Public Interest, 6*(2), 31-55.

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review*, *26*(3), 356-376.

Mathieu, J., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management, 34*(3), 410-476.

McCann, D. J. & Margerison, C. J. (1989). Managing high-performance teams. *Training and Development Journal, 43*(11), 52-60.

McGrath, J. E. (1962). *Leadership behavior: Requirements for leadership training.* Washington, DC: Prepared for U.S. Civil Service Commission Office of Career Development.

McGrath, J. E. (1964). *Social psychology: A brief introduction*. New York: Hold, Rinehart, & Winston.

McIntyre, H. H. & Foti, R. J. (2013). The impact of shared leadership on teamwork mental models and performance in self-directed teams. *Group Processes & Intergroup Relations*, *16*(1), 46-57.

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *27*, 415-444.

Meindl, J. R. (1990). On leadership: An alternative to the conventional wisdom. *Research in Organizational Behavior*, *12*, 159-203.

Meindl, J. R. (1995). The romance of leadership as a follower-centric theory: A social constructionist approach. *The Leadership Quarterly*, *6*(3), 329-341.

Meindl, J. R., Ehrlich, S. B., & Dukerich, J. M. (1985). The romance of leadership. *Administrative Science Quarterly*, *30*(1), 78-102.

Mohammed, S., Mathieu, J. E. & Bartlett, A. L. (2002). Technical-administrative task performance, leadership task performance, and contextual performance: Considering the influence of team- and task-related composition variables. *Journal of Organizational Behavior*, *23*(7), 795-814.

Morgeson, F. P., DeRue, D. S., & Karam, E. P. (2010). Leadership in teams: A functional approach to understanding leadership structures and processes. *Journal of Management*, *36*(1), 5-39.

Morgeson, F. P. & Hofmann, D. A. (1999). The structure and function of collective constructs: Implications for multilevel research and theory development. *The Academy of Management Review*, *24*(2), 249-265.

Muethel, M. & Hoegl, M. (2013). Shared leadership effectiveness in independent professional teams. *European Management Journal*, *31*(4), 423-432.

Mumford, T. V., Campion, M. A., & Morgeson, F. P. (2006). Situational judgment in work teams: A team role typology. In J. A. Weekley and R. E. Ployhart (Eds.), *Situational judgment tests: Theory, measurement, and application* (pp.319-343). Hillsdale, NJ: Lawrence Erlbaum Associates.

Naidoo, L. J., Scherbaum, C. A., Goldstein, H. W., & Graen, G. B. (2011). A longitudinal examination of the effects of LMX, ability, and differentiation on team performance. *Journal of Business and Psychology*, *26*(3), 347-357.

Nickerson, R. S. (1973). Intersensory facilitation of response time: Energy summation or preparation enhancement? *Psychological Review*, *80*(6), 489-509.

Oc, B. & Bashshur, M. R. (2013). Followership, leadership and social influence. *The Leadership Quarterly*, *24*(6), 919-934.

Ozer, D. J. & Benet-Martínez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology*, *57*, 401-421.

Pearce, C. L. & Conger, J. A. (2003). *Shared leadership: Reframing the hows and whys of leadership*. Thousand Oaks, CA: Sage.

Pearce, C. L. & Sims, H. P. (2002). Vertical versus shared leadership as predictors of the effectiveness of change management teams: An examination of aversive, directive, transactional, transformational, and empowering leader behaviors. *Group Dynamics: Theory, Research, and Practice*, *6*(2), 172-197.

Pelled, L. H. (1996). Demographic diversity, conflict, and work group outcomes: an intervening process theory. *Organization Science*, *7*(6), 615-631.

Pelled, L. H., Eisenhardt, K. M., & Xin, K. R. (1999). Exploring the black box: an analysis of work group diversity, conflict, and performance. *Administrative Science Quarterly*, *44*(1), 1-28.

Phillips, J. S. & Lord, R. G. (1981). Causal attributions and perceptions of leadership. *Organizational Behavior and Human Performance*, *28*(2), 143-163.

Rapp, T. L. & Mathieu, J. E. (2007). Evaluating an individually self-administered generic teamwork skills training program across time and levels. *Small Group Research*, *38*(4), 532-555.

Reicher, S., Haslam, S. A., & Hopkins, N. (2005). Social identity and the dynamics of leadership: Leaders and followers as collaborative agents in the transformation of social reality. *The Leadership Quarterly*, *16*(4), 547-568.

Reynolds, C. W. (1987). Flocks, herds, and schools: A distributed behavioral model. *Computer Graphics*, *21*(4), 25-34.

Roberson, Q. M. (2012). Managing diversity. In S. W. J. Kozlowski (Ed.), *Oxford handbook of industrial and organizational psychology*. New York: Oxford University Press.

Rush, M. C., Thomas, J. C., & Lord, R. G. (1977). Implicit leadership theory: A potential threat to the internal validity of leader behavior questionnaires. *Organizational Behavior and Human Performance*, *20*(1), 93-110.

Sacco, J. M. & Schmitt, N. (2005). A dynamic multilevel model of demographic diversity and misfit effects. *Journal of Applied Psychology*, *90*(2), 203-231.

Schneider, B., Salvaggio, A. N., & Subirats, M. (2002). Climate strength: A new direction for climate research. *Journal of Applied Psychology*, *87*(2), 220–229.

Shamir, B. (2007). From passive recipients to active co-producers: The roles of followers in the leadership process. In B. Shamir, R. Pillai, M. Bligh, and M. Uhl-Bien (Eds.), *Follower-centered perspectives on leadership*. Stamford, CT: Information Age Publishing.

Shaughnessy, J., Zechmeister, E., & Zechmeister, J. (2014). *Research methods in psychology* (10th ed.). New York: McGraw-Hill.

Simons, T., Pelled, L. H., & Smith, K. A. (1999). Making use of difference: diversity, debate, and decision comprehensiveness in top management teams. *Academy of Management Journal*, *42*(6), 662-674.

Small, E. E. & Rentsch, J. R. (2012). Shared leadership in teams: A matter of distribution. *Journal of Personnel Psychology*, *9*(4), 203-211.

Stewart, G. L. (2003). Toward an understanding of the multilevel role of personality in teams. In M. R. Barrick and A. M. Ryan (Eds.), *Personality and work: Reconsidering the role of personality in organizations* (pp. 183-204). San Francisco, CA: Jossey-Bass.

Stewart, G. L. (2006). A meta-analytic review of relationships between team design features and team performance. *Journal of Management*, *32*(1), 29-54.

Strang, S. E. (2006). Big five personality and leadership developmental levels as predictors of leader performance (Unpublished masters thesis). The University of Georgia, Athens.

Strogatz, S. H. (2001). Exploring complex networks. *Nature*, *410*(6825), 268-276.

Tee, E. Y. J., Paulsen, N., & Ashkanasy, N. M. (2013). Revisiting followership through a social identity perspective: The role of collective follower emotion and action. *The Leadership Quarterly*, *24*(6), 902-918.

Turner, J. (1985). Social categorization and the self concept: A social cognitive theory of group behavior. In E. J. Lawler (Ed.), *Advances in group processes* (vol. 2, pp. 77-122). Greenwich, CT: JAI Press.

Uhl-Bien, M. & Ospina, S. (2012). Paradigm interplay in relational leadership: A way forward. In M. Uhl-Bien and S. Ospina (Eds.), *Advancing relational leadership research: A dialogue among perspectives* (pp. 537-580). Charlotte, NC: Information Age Publishers.

Uhl-Bien, M., Riggio, R. E., Lowe, K. B., & Carsten, M. K. (2014). Followership theory: A review and research agenda. *The Leadership Quarterly*, *25*(1), 83-104.

Van Kleef, G. A., Homan, A. C., Beersma, B., & van Knippenberg, D. (2010). On angry leaders and agreeable followers: How leaders' emotions and followers' personalities shape motivation and team performance. *Psychological Science*, *21*(12), 1827-1834.

van Knippenberg, D., De Dreu, C. K. W., & Homan, A. C. (2004). Work group diversity and group performance: An integrative model and research agenda. *Journal of Applied Psychology*, *89*(6), 1008-1022.

van Knippenberg, D. & Schippers, M. C. (2007). Work group diversity. *Annual Review of Psychology*, *58*(1), 515-541.

Van Vugt, M. (2006). Evolutionary origins of leadership and followership. *Personality and Social Psychology Review*, *10*(4), 354-371.

Vandewaerde, M., Voordeckers, W., Lambrechts, F., & Bammens, Y. (2011). Board team leadership revisited: A conceptual model of shared leadership in the boardroom. *Journal of Business Ethics*, *104*(3), 403-420.

Wang, D., Waldman, D. A., & Zhang, Z. (2014). A meta-analysis of shared leadership and team effectiveness. *Journal of Applied Psychology*, *99*(2), 181-198.

Webber, S. S. & Donahue, L. M. (2001). Impact of highly and less job-related diversity on work group cohesion and performance: A meta-analysis. *Journal of Management*, *27*(2), 141-162.

Weick, K. (1969). *The social psychology of organizing*. Reading, MA: Addison-Wesley.

Weigl, M., Hornung, S., Parker, S. K., Petru, R., Glaser, J., & Angerer, P. (2010). Work engagement accumulation of task, social, personal resources: A three-wave structural equation model. *Journal of Vocational Behavior*, *77*(2), 140-153.

Wing, A. M., Endo, S., Bradbury, A., & Vorberg, D. (2014). Optimal feedback correction in string quartet synchroniztion. *Journal of the Royal Society Interface*, *11*(93), 1-11.

Woods, D. L., Wyma, J. M., Yund, E. W., Herron, T. J., & Reed, B. (2015). Factors influencing the latency of simple response time. *Frontiers in Human Neuroscience*, *9*(131), 1-12.

Wortman, M. (1982). Strategic management and changing leader-follower roles. *Journal of Applied Behavioural Science*, *18*(3), 371-383.

Yammarino, F. J., Salas, E., Serban, A., Shirreffs, K., & Shuffler, M. L. (2012). Collectivistic leadership approaches: Putting the "we" in leadership science and practice [Focal Article]. *Industrial and Organizational Psychology*, *5*(4), 382-402.

Yukl, G. (1998). *Leadership in organizations*. Upper Saddle River, NJ: Prentice Hall.

Yukl, G. (2006). *Leadership in organizations* (6th ed.). Upper Saddle River, NJ: Pearson-Prentice Hall.

Yukl, G., Gordon, A., & Taber, T. (2002). A hierarchical taxonomy of leadership behavior: Integrating a half century of behavior research. *Journal of Leadership & Organizational Studies*, *9*(1), 15-32.

Zaccaro, S. J., Kemp, C., & Bader, P. (2004). Leader traits and attributes. In J. Antonakis, A. T. Cianciolo, & R. J. Sternberg (Eds.), *The nature of leadership* (pp. 104-124). Thousand Oaks, CA: Sage.

Zaccaro, S. J. & Marks, M. A. (1999). The roles of leaders in high performance teams. In E. Sundstrom and Associates (Eds.), *Supporting Work Team Effectiveness* (pp. 95-125). San Francisco, CA: Jossey-Bass.

Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2001). Team leadership. *The Leadership Quarterly*, *12*(4), 451-483.

Zhang, Z., Waldman, D. A., & Wang, Z. (2012). A multilevel investigation of leader-member exchange, informal leader emergence, and individual and team performance. *Personnel Psychology*, *65*(1), 49-78.