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THE DYNAMIC RELATIONSHIP BETWEEN COLLECTIVE EFFICACY AND PERFORMANCE IN TEAMS

A Dissertation in

Psychology

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

December 2015

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ABSTRACT

When teams work together in business settings, there are often times when their attitudes at the start of the project seem to be a self-fulfilling prophecy. Teams with members that are confident in their teams' abilities to succeed do well, thus giving them more confidence, which allows their subsequent performance to skyrocket. Whereas teams that lack confidence do poorly which lower their confidence even further. This study addresses the dynamic relationship between collective efficacy and performance in teams and focuses on how these constructs interact over time to form either positive (in the case of the first team) or negative (in the case of the second team) collective efficacy spirals. The study also examines teamwork behaviors as a mediator of the collective efficacy-performance relationship and locus of causality attributions as a moderator of the performance-collective efficacy relationship. The sample was 251 individuals in 51 teams enrolled in a senior level Hospitality Management class at a large Mid-Atlantic university. Participants filled out paper-and-pencil surveys after four in-class performance episodes in which they worked together on a hotel operation simulation. Multilevel modeling was used to test the hypotheses. While none of the hypotheses were supported, ancillary analyses indicate that task interdependence may interact with collective efficacy to impact performance. Implications for practice and research are discussed as well as possible future directions.

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ACKNOWLEDGEMENTS

First, I would like to thank my advisor Susan Mohammed. Without her patience and willingness to work with my very deadline-oriented style, this dissertation would not have been possible. I would also like to thank James LeBreton for guiding me through some tricky statistical territory and my other committee members, Sam Hunter, Larry Martinez, and Dan Mount for their invaluable insight and feedback throughout this process. I would also like to thank Dan Mount, Michael Quinn, and Sean McGinn for lending me some of their class time and their incredible flexibility and assistance with my data collection.

Next I would like to thank the rest of the I-O faculty and students. The support of the entire program was instrumental over the last four and half years and encouraged me to persist through many of my graduate school hurdles. Last but certainly not least, I would like to thank my family, and especially my parents, for all of their support over the last twenty years of schooling! They have provided me with endless encouragement both academically and otherwise and I am grateful for all that they have done.

Chapter 1

INTRODUCTION

Imagine two teams working on the same class project. One team has members that are confident in their abilities to succeed and then do so continuously over the course of the semester. Not only does Team 1 succeed at their task, but they seem to gain confidence as time goes on and their performance gets stronger. On the other hand, Team 2 lacks the confidence of Team 1. The members in Team 2 do not believe in their ability to succeed and their performance over the course of the semester seems to act as a self-fulfilling prophecy: as their performance decreases, so does their confidence in their ability to succeed in the future. What is it that distinguishes Team 1 from Team 2? Why did it seem like Team 1 was destined to succeed from the beginning while Team 2 seemed doomed? The chain of events separating these two teams was likely initiated by their vastly different levels of collective efficacy.

Collective efficacy refers to a group's shared belief that they are capable of reaching a particular goal or performance standard (Bandura, 1997). Collective efficacy is important in teams because of its strong positive relationships with outcomes such as performance (Baker 2001; Chen, Thomas & Wallace, 2005; Hodges & Carron, 1992), job satisfaction, and organizational commitment (Borgogni, Russo, & Latham, 2011). Despite being an emergent state, which may shift over time as various team dynamics change (Mathieu, Maynard, Rapp & Gilson, 2008), the vast majority of collective efficacy research has been cross-sectional in nature (e.g., Alavi & McCormick, 2008;

Chen et al., 2005; Cheng, Lam & Chan, 2008; Tasa, Sears, & Schat, 2011). Therefore, little is known about how collective efficacy may change and develop over time as well as how this may affect relationships with other variables.

As such, there is also a dearth of research about the potential reciprocal relationship between collective efficacy and team performance. Although research has shown that collective efficacy has a direct, positive relationship with performance (e.g., Baker, 2001; Chen et al., 2005; Hodges & Carron, 1992), it is also quite possible that the relationship can operate in the opposite direction than what is typically assumed: team performance could enhance subsequent collective efficacy. Examining the directional relationship of performance to collective efficacy could provide insight into how collective efficacy develops in teams over time. Moreover, despite the strong possibility that a reciprocal relationship may exist between collective efficacy and performance, this relationship has not been examined in the context of teams within organizations. The current research seeks to meet this need by examining the longitudinal effects of collective efficacy and team performance in teams engaged in a work simulation. Furthermore, the present study also examines the effects of mediators (i.e., teamwork behaviors) and moderators (i.e., attributions) on these relationships in order to provide a more detailed understanding of these complex relationships.

This research contributes to the current literature in several ways. First, this study answers repeated calls to study the dynamic nature of teams (i.e., Humphrey & Aime, 2014; Kozlowski & Bell, 2003; Mathieu et al., 2008; Mathieu, Tannenbaum, Donsbach, & Alliger, 2014). Ilgen, Hollenbeck, Johnson, and Jundt's (2005) IMOI (i.e., input-mediator-output-input) framework for team processes highlights the iterative nature of

teamwork with the "OI" link: teams' outputs often flow into their next set of inputs. However, the "OI" link has been under researched in the literature (Ilgen et al., 2005; Mathieu et al., 2008). The current study uses the full IMOI framework to understand the iterative and complex nature of the collective efficacy-performance and performance-collective efficacy relationships. This is accomplished by clarifying the relationship between collective efficacy and performance over time and focusing on mediators (i.e., teamwork behaviors) and moderators (i.e., locus of causality attributions) of the relationships. Furthermore, this answers the call by Gully, Incalcaterra, Joshi, and Beaubien (2002) for more longitudinal research focusing on the directionality of the relationship between collective efficacy and group performance.

However, the relationship between collective efficacy and performance is likely to be more complex than a pure reciprocal relationship. The second contribution of this study is the empirical examination of collective efficacy-performance spirals. Two decades ago, Lindsley, Brass, and Thomas (1995) proposed that the efficacy-performance relationship takes the form of a deviation-amplifying spiral, with the strength of the relationships between the variables increasing over time. Yet, in the twenty years following the publication of this paper, their propositions have not been empirically examined at the team level. This is unfortunate because much remains to be known about why some teams experience synergistic gains while others experience debilitating losses over time. The current paper empirically tests the existence of deviation-amplifying efficacy-performance spirals.

Additionally, temporal relationships are essential to the discussion of spirals, as spirals form over multiple performance episodes (Lindsley et al., 1995), which also

allows for the examination of how the components of the spirals (i.e., performance and collective efficacy) may change over time. This is especially important in the case of emergent states, such as collective efficacy, because emergent states arise through group member interaction, which evolve over the lifespan of the group (Gibson, 1999). Therefore, this study also answers the call for more research into the dynamic nature of emergent states such as collective efficacy (Mathieu et al., 2008).

Furthermore, the third contribution of this paper is through the examination of potential mediators (i.e., teamwork behaviors) and moderators (i.e., attributions) in the spiral relationships. Teamwork behaviors serves as both a mediator and potential antecedent of collective efficacy, answering the call for further research into the antecedents of collective efficacy (e.g., Alavi & McCormick, 2008; Tasa, Taggar, & Seijts, 2007). Additionally, the present study also examines the moderating role of team-level attributions. Specifically focusing on whether internal attributions strengthen the relationship between performance and subsequent collective efficacy (and conversely, whether external attributions mitigate this relationship).

The literature review section is organized in order to fully understand all components of the study model depicted in Figure 1 (Appendix A). First, the dynamic nature of teams is reviewed with a focus on the development of team processes as well as the iterative and reciprocal nature of team processes over time. Next, collective efficacy is discussed, focusing on outcomes of collective efficacy, namely performance, and how collective efficacy may evolve over a team's lifespan. From there, the concept of spirals is introduced in more detail with a focus on both conceptual and empirical research on efficacy spirals. The review then shifts to a discussion of mediators and moderators by

examining how teamwork behaviors relate to both collective efficacy and performance and also by discussing the different forms of attributions and how they relate to efficacy at the team level.

INSERT FIGURE 1 ABOUT HERE

Literature Review

Teams Over Time

In order to understand how the effects of collective efficacy may differ in a group over the course of its development, it is important to first understand temporal frameworks in the team literature. Marks, Mathieu, and Zaccaro (2001) introduced a recurring phase model of team processes and the notion that teams use different processes over the course of performance episodes. This temporally based framework focuses on three distinct types of processes: action phase processes, transition phase processes, and interpersonal processes. Action phase processes occur when teams are engaging in activities directly related to their goals (e.g., monitoring progress towards goals, systems monitoring, team monitoring and back up resources, and coordination activities). Transition phase processes occur before or after action phases when team members are either planning activities or evaluating prior activities (e.g., mission analysis, goal specification, and strategy formulation and planning). Finally, interpersonal processes are

used by team members to manage member-related processes during both action phases and transition phases (e.g., conflict management, motivation and confidence building, and affect management). There is meta-analytic support for these three distinct types of processes (LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). LePine and colleagues' (2008) results demonstrate that the team processes identified by Marks and colleagues (2001) did indeed load onto the three teamwork process factors (i.e., transition processes, action processes, and interpersonal processes) as proposed. The meta-analysis also revealed that these three factors also loaded on one higher order "team processes" factor.

The recurring phase model suggests that different processes are important at different times in a team's functioning and that input-process-output relationships (I-P-O; originally identified by McGrath, 1984) occur repeatedly throughout the team's lifespan, depending on what type of phase the team is in at a given time. These cycles are dependent on team episodes, which are defined as identifiable performance periods in which the teams perform and performance feedback is available (Mathieu & Button, 1992). Typically, episodes are defined by the structure of the task. For example, if a class team was assigned to participate in a month-long project but had specific deliverables and received feedback at the end of every week, each week would be defined as a performance episode. Marks and colleagues (2001) therefore proposed that team performance over time may be viewed as a series of I-P-O episodes and that outcomes from one episode may function as an input into the subsequent episode. Additionally, processes may vary from one episode to the next.

Ilgen and colleagues (2005) extended the I-P-O framework used by Marks and colleagues (2001) and discussed the increased relevance of the IMOI framework (i.e.,

input-mediator-output-input). In their criticism of the I-P-O model, Ilgen and colleagues (2005) remark that the I-P-O framework limits research by implying that the path from inputs to outcomes is linear and that this framework only captures a single cycle. Instead, they propose that the IMOI model captures three distinct phases of team processes and that there are unique affective, behavioral, and cognitive factors in each phase. First, the "IM" phase captures team forming. This phase focuses on trusting (affective), planning (behavioral), and structuring (cognitive). The "MO" phase is the functioning phase and focuses on factors such as bonding (affective), adapting (behavioral), and learning (cognitive). Finally, the authors did not identify specific affective, behavioral or cognitive factors for the "OI" phase, as they say little research has been done in this area.

Another advantage of the IMOI framework in comparison to the I-P-O framework is that, even though an interpersonal process (i.e., teamwork behaviors) is the mediator of interest in the current study, the IMOI framework allows for more flexibility by using the term "mediator" rather than "process." Furthermore, while Marks and colleagues (2001) suggest that the "output" in the I-P-O model may serve as an input during a later team phase, the IMOI model includes an iterative phase in which outputs affect subsequent inputs (i.e., "OI"). Although the implication for Marks and colleagues is that the "output" may directly act as the new "input," the IMOI model allows the output to influence a different variable (e.g., mediator) that will function as the input in the new phase or episode.

Mathieu and colleagues (2008) point out that the "OI" relationship typically happens as teams transition from one phase to the next, rather than within performance episodes. Returning to the previous example, class teams may experience "OI"

relationships as they move from the end of one week in their month-long project to the beginning of the subsequent week, but likely would not experience these relationships within the week (i.e., performance episode) itself. Mathieu and colleagues (2008) also expand on the IMOI framework by pointing out that team emergent states (i.e., collective efficacy) are likely to be influenced by previous performance episodes and that these relationships would be influenced by their progress over time. The cyclical nature of the IMOI framework also makes it a strong fit for understanding and discussing the existence of spirals that may occur over time (both at the team level and at the individual level).

Collective Efficacy

Collective efficacy is based on social cognitive theory (Bandura, 1982) and refers to "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1997, p. 447). Collective efficacy is important when studying group behaviors as a strong positive relationship has been demonstrated between collective efficacy and group performance (Bandura, 2000; Stajkovic, Lee, & Nyberg, 2009; Lindsley et al., 1995; Tasa et al., 2007). Additionally, collective efficacy has also been shown to positively predict a number of other group-level outcomes such as enthusiasm and satisfaction with group tasks (Salanova, Llorens, & Schaufeli, 2011) as well as a group's ability to overcome challenges (Illia, Bonaiuto, Pugliese, & van Rekom, 2011). Furthermore, although commonly assessed using cross-sectional research methods, measuring changes in collective efficacy over time is crucial because collective efficacy arises through group

member interactions (Gibson, 1999) and group member interactions evolve over the lifespan of the group.

Definition and conceptualization

Collective efficacy is based on social cognitive theory (Bandura, 1982) and refers to how well a group believes it can handle specific tasks (Bandura, 1997). Because of this task-specific focus, a group's sense of collective efficacy is context dependent, and groups can have different levels of collective efficacy for different tasks. For example, a design team may have a high sense of collective efficacy with regard to designing a product and meeting thier client's needs, but may have a low sense of collective efficacy in their ability to present their work to clients and communicate clearly.

Collective efficacy is an emergent state that varies over the course of a team's development (Goncalo, Polman, & Maslach, 2010). By definition, emergent states materialize from interactions between team members over time; therefore, emergent states will be altered as team members' interactions shift over the team's lifespan (Morgeson & Hofmann, 1999). In their review of the team effectiveness literature, Mathieu and colleagues (2008) note the importance of addressing how emergent states, like collective efficacy, change over time and highlight that this has been largely overlooked by the current literature.

Collective efficacy is related to self-efficacy, which refers to an individual's belief that he or she is capable of achieving a goal or accomplishing a specific task (Bandura, 1986). Self-efficacy shares many common features with collective efficacy, such as the

task-based nature of the construct and variation over time based on external factors (e.g., Salanova et al., 2011). However, self-efficacy is clearly distinct from collective efficacy. Returning to the design team described above, an individual team member might have a high sense of self-efficacy for presenting ideas to large groups, but if the presentation is a group task and she does not believe that her teammates will succeed, the group's sense of collective efficacy for presenting may be low. Although conceptually distinct constructs, collective efficacy and self-efficacy are not completely independent; groups with members who have higher levels of self-efficacy also tend to have higher collective efficacy beliefs than groups with lower levels of self-efficacy (Wang & Lin, 2007).

Several studies examine the individual-level relationship between self-efficacy and performance feedback. For example Silver, Mitchell, and Gist (1995) found that self-efficacy moderated the relationship between performance feedback and attributions. Individuals with high levels of self-efficacy who received negative performance feedback attributed the poor performance to bad luck whereas those with low levels of self-efficacy attributed the poor performance to low levels of ability. Silver and colleagues then conducted a follow-up study and found that the interaction between past performance and attributions accounted for 53 percent of the variance in subsequent self-efficacy. These findings are supported by research by Nease, Mudgett, and Quinones (1999) who demonstrated that individuals with high levels of self-efficacy are more likely to dismiss negative feedback, possibly due to the self-serving attribution bias identified by Silver and colleagues (1995), than individuals with low levels of self-efficacy.

Collective efficacy also differs from group potency, which refers to a "collective belief in a group that it can be effective" (Guzzo, Yost, Campbell, & Shea, 1993, p. 87).

Group potency refers to group members' broad beliefs in their team's ability to perform and is not task-specific. For example, even though the design team mentioned above may have variable levels of collective efficacy depending on the task at hand, they would have one measure of group potency that reflects their confidence in the team's ability to perform in general. Group potency is a distinct construct from collective efficacy, although they are positively correlated (Stajkovic et al., 2009). A meta-analysis examining the relationship between collective efficacy, group potency, and group performance found that collective efficacy fully mediated the relationship between group potency and group performance (Stajkovic et al., 2009). Collins and Parker (2010) also examined the relationship between collective efficacy and group potency over a seven-month period and their results support the distinction between group potency and collective efficacy via the results of their confirmatory factor analyses on the scales at four different time points in teams' life cycles. Collins and Parker also found that collective efficacy and team potency each account for unique variance when predicting team-level outcomes of citizenship behaviors and performance.

Performance

While relationships between collective efficacy and outcomes such as job satisfaction and organizational commitment are certainly important for understanding the impact of collective efficacy in teams, the most commonly studied outcome of collective efficacy is team performance (Gully et al., 2002; Stajkovic et al., 2009). There is a strong theoretical relationship between collective efficacy and team performance since, based on social cognitive theory, as the sense of collective efficacy within a team increases, so do

team members' level of persistence and effort (Bandura, 1997). This proposition has been supported in a range of both empirical studies (e.g., Baker, 2001; Feltz & Lirgg, 1998; Hodges & Carron, 1992; Gibson, 1999; Tasa et al., 2007) and meta-analyses (Gully et al., 2002; Stajkovic et al., 2009). Gully and colleagues (2002) found a strong, positive relationship between collective efficacy and team performance (ρ = .41), which was moderated by task interdependence, such that as task interdependence increased, so did the strength of the collective efficacy to performance relationship. Moreover, a later meta-analysis by Stajkovic and colleagues (2009) included 60 percent more studies than the meta-analysis by Gully and colleagues and also found evidence of a strong positive relationship between collective efficacy and group performance (ρ = .35). Chen and colleagues (2005) examined collective efficacy as a learning outcome and found that there was a positive relationship between team-level collective efficacy and both team- and individual-level adaptive performance. These relationships were moderated by goal choice and goal striving activities at the individual level and by transition and action processes at the team level.

Despite the robust positive relationship between collective efficacy and team performance, there are still many details of this relationship that remain a mystery. First, little is known about how collective efficacy affects team performance over time in a traditional business setting. Second, it is unclear whether team performance also acts as a predictor of collective efficacy over time and whether this relationship is stronger than the efficacy-to-performance relationship.

Other outcomes

The development of collective efficacy among group members is crucial because collective efficacy has been shown to have a strong relationship with a variety of positive outcomes beyond performance. For example, collective efficacy is also positively related to job satisfaction and organizational commitment (Borgogni et al., 2011). Furthermore, recent studies have also demonstrated that groups with high collective efficacy can better overcome challenges such as membership threats (Illia et al., 2011) and that high levels of collective efficacy can enhance group members' enthusiasm, satisfaction, level of comfort, and subsequent engagement in the group's task (Salanova et al., 2011). Collective efficacy is also related to outcomes such as group learning (Edmonson, 1999) and group problem solving (Kline & MacLeod, 1997). High levels of collective efficacy have been shown to correlate with high levels of group motivational investment (Bandura, 2000).

Collective efficacy and performance over time

Some studies have examined the potential reciprocal relationship between collective efficacy and group performance in athletic teams. For example, Myers, Feltz, and Short (2004a) found that collective efficacy was a positive predictor of subsequent performance in offensive football players in ten teams over the course of an eight game season. However, they also found that within teams, performance negatively predicted subsequent collective efficacy. Yet, when this relationship was examined within weeks, rather than teams, the relationship was positive. The authors were unable to provide an

adequate explanation for this occurrence, suggesting that it may be due to unique aspects of the data.

Feltz and Lirgg (1998) also examined both paths of the relationship between collective efficacy and performance using sports teams. In a sample of collegiate ice hockey players in six teams, the authors found that not only did collective efficacy predict performance, but also that collective efficacy significantly increased after a win and significantly decreased after a loss. Myers, Payment, and Feltz (2004b) also used a sample of collegiate ice hockey players in twelve teams and replicated the results of Feltz and Lirgg (1998); they found that in teams that played games on back-to-back days, Saturday collective efficacy had a moderate and positive relationship on Saturday performance and that Friday performance had a small positive relationship on Saturday collective efficacy. These results provide evidence to support the potential existence of a reciprocal efficacy-performance relationship.

Although these studies point to a reciprocal relationship between collective efficacy and performance, due to the unique nature of the athletic samples in these studies (Cannon-Bowers & Bowers, 2006) it is unknown whether the relationships will operate in the same way in a more typical business setting with a small team sample size (ranging from six to twelve teams). Furthermore, none of these authors analyzed the relationships to determine whether the collective efficacy-to-performance path or the performance-to-collective efficacy path was stronger. This shortcoming in the literature was noted by Gully and colleagues (2002), who called for more longitudinal studies to determine the directionality of the relationship between collective efficacy and group performance. As well as exploring the relationship between collective efficacy and group performance,

additional variables should be examined as potential sources of variation in collective efficacy.

There is also research to suggest that there is a positive relationship between performance and subsequent efficacy that may lay the groundwork for the existence of the reciprocal relationship. Huang (2014) found that collective efficacy was downward adjusted when negative performance information was received over the course of a two-hour simulation. Although this study suggests that team performance may affect subsequent efficacy beliefs, the nature of the team task makes it difficult to generalize the findings to a true organizational context. Furthermore, the data for this study were analyzed at the individual level, so it is also unclear whether these relationships will operate in the same way at the team level and only covered a short period of time (i.e., two hours rather than the weeks or months that a team would interact over in an organization).

However, Huang's finding also support similar trends that emerged in previous research. Baker's (2001) research focused on three key points: the effect of performance feedback on collective efficacy, the relationship between self-efficacy and collective efficacy over time, and the level of agreement in collective efficacy beliefs over time. Baker (2001) found that collective efficacy changes over time and the pattern of change is unique from one group to the next. The author demonstrated this through providing line graphs of various individuals' collective efficacy beliefs over time, but did not offer any detailed analyses or explanations for the differences. Although Baker sought to determine the effects of performance feedback on collective efficacy, all of the analyses in the paper were conducted at the individual level and Baker noted that "it was difficult

to determine whether changes were related to feedback on past group performance, future group performance, or both" (p. 463). Furthermore, Baker did not report any additional statistical analyses to try to parse out these effects and only provided correlational data for the relationship between group performance and collective efficacy. Despite focusing on individual-level collective efficacy beliefs, Baker's study demonstrated that the relationship between collective efficacy and time is complex. A fuller understanding of mediators between the performance to collective efficacy relationship as well as contextual moderators may help to shed some light on these relationships.

The present study addresses the weaknesses of the previous literature in several ways. First, many of the previous team-level studies had a very small team-level sample size (n = 6 to n = 12); the present study has sample size of 51 teams. Second, there is little empirical research examining these relationships in a traditional organizational setting. While the present study uses an undergraduate student sample, participants engage in simulation that closely mimics what managing a hotel would be like in the real world and data is collected over four performance episodes over the course of two weeks. Finally, the present study seeks to gain a more nuanced understanding of the reciprocal relationship between collective efficacy and performance by examining the effect of mediators and moderators rather than focusing only on main effects.

Spirals

In the case of spirals, an event occurs that may spark a chain of events and typically includes some form of a (positive or negative) feedback loop, suggesting that

the magnitude of relationships between the variables of interest will increase over time. Spirals have been theoretically suggested in a variety of contexts, at both the team and individual level (e.g., Andersson & Pearson, 1999, Hambrick, Li, Xin, & Tsui, 2001, Lindsley et al., 1995). However, few papers have provided empirical examinations of spirals. Below, the limited empirical research is discussed.

At the individual level, Andersson and Pearson (1999) proposed a negative spiral created by incivility in the workplace. The authors put forth ten propositions focused on the relationships between behaviors (i.e., incivility), justice perceptions, and individual differences (i.e., temperament). The authors identify a "starting point" for their spirals (i.e., the initial uncivil behavior) as well as a "tipping point," the point at which the variables of interest have escalated to such an extent that further continuation of the negative spiral is inevitable (in this case, the tipping point had been identified after the third uncivil act has occurred). Despite the thorough development of their spiral propositions, there do not appear to be any peer-reviewed papers that test the existence of these incivility spirals empirically. Although there are empirical papers that test selected relationships from the original paper (e.g., Bunk & Magley, 2013; Milam, Spitzmueller, & Penney, 2009; Taylor & Kluemper, 2012), the main focus of Andersson and Pearson's original article, the persistence and growth of the negative relationships created by the starting point and tipping point behaviors, has been overlooked.

Similar patterns have also occurred for papers that focus on spirals at the team-level. Hambrick and colleagues (2001) proposed a model for negative spirals in international joint venture management groups caused by the effects of initial gaps in compositional factors (i.e., surface- and deep-level diversity factors). Again, this paper

was theoretical and provided no empirical test of the hypotheses, instead identifying ten propositions relating to the occurrence of spirals. Although they did not identify a "starting point" or "tipping point," Hambrick and colleagues proposed a complicated model involving two separate spirals accounting for the negative relationship between team composition and effectiveness. The authors first identify a downward spiral between relationship conflict and task conflict and then suggest that the result of this downward spiral, behavioral disintegration, will feed back into a second negative spiral, this time between behavioral disintegration and task conflict. Although the authors clearly outlined a series of theoretically-backed propositions for the existence of these spirals, there do not appear to be any peer-reviewed empirical papers that test the spiral hypotheses.

Ferguson and Peterson (2015) examined the existence of trust spirals at the team-level. The authors proposed that diversity in the deep-level characteristic of propensity to trust will trigger downwards spirals in actual levels of group trust and final team performance. Although the study collected measures at three time points, actual intragroup trust is only measured twice, which does not meet Lindsley and colleagues (1995) criterion of the necessary three task episodes in order to establish the existence of spirals. Moreover, performance is only measured at the end of the teams' lifespan, so it is unknown whether poor performance feeds back into the spirals by increasing team conflict (the mediator between initial intragroup trust and subsequent intragroup trust). Furthermore, the authors only conducted a test of serial mediation to test their hypothesized relationships between diversity in propensity to trust, affective outcomes, initial trust, relationship conflict, subsequent trust and group performance. This method essentially ignores half of the deviation-amplifying spiral framework by overlooking tests

of whether the relationship between intragroup trust and outcomes increase in magnitude over time (the "amplifying" aspect of deviation-amplifying spirals). Despite these shortcomings, the authors did find support for their hypothesized relationships between diversity in propensity to trust (the "trigger" of the spiral), perceptions of intragroup trust, and affect (i.e., frustration) and behaviors (i.e., relationship conflict) that continue the negative spiral.

Conceptual research on efficacy spirals

Lindsley and colleagues (1995) proposed a complex model of efficacy-performance spirals, which primarily focuses on the "deviation-amplifying" loops between efficacy and performance. Deviation-amplifying refers to a deviation in one variable (e.g., an increase in efficacy) leading to a similar deviation in another variable (e.g., an increase in performance) which then amplifies the deviation in a subsequent measure of the first variable (e.g., efficacy) and so on. The authors suggest that collective efficacy-performance spirals can take three distinct forms: upward spirals (high collective efficacy leads to high performance, which leads to higher collective efficacy, etc.), downward spirals (low collective efficacy leads to low performance, which leads to lower collective efficacy, etc.), and self-correcting spirals (the spiral initially takes the form of a downward spiral but the team is able to identify the cause of the downward spiral and alter their behavior to halt the negative pattern). However, the focus on the deviation-amplifying relationship is an oversimplification of Lindsley and colleagues' model, which also includes the effects of a multitude of mediators and moderators in the efficacy-performance spirals.

For example, the authors identify three factors that will lead to the occurrence of spirals: performance feedback (i.e., feedback that is accurate, timely, and specific will increase the occurrence of spirals), task uncertainty and complexity (i.e., the more ambiguous and complex a task is, the greater the likelihood of spirals) and task experience (i.e., whether the team experiences success or failure in initial task attempts). Furthermore, the authors identify four factors that are likely to promote the continuation of spirals: attributions (i.e., internal, stable, and uncontrollable attributions are more likely to promote the continuation of spirals), information processing (i.e., automatic information processing, or a lack of in-depth analysis of feedback, is more likely to promote the continuation of spirals), emotional arousal (i.e., pressure and anxiety, which may form as a result of internal attributions, are more likely to promote the continuation of spirals) and expectations and labels (i.e., more consistency between expectations and labels with actual performance and attributions is more likely to promote the continuation of spirals). The authors wind these seven factors together, using them as both mediators and moderators, to explain the complex nature of efficacy-performance spirals.

Empirical research on efficacy spirals

Although it would be difficult to empirically test Lindsley and colleagues' (1995) full model of efficacy-performance spirals due to its complex nature, there have been attempts to examine parts of the model. However, these attempts tend focus on the relationships at the individual level (i.e., self-efficacy and individual performance) rather than at the team level, as was originally proposed.

For example, Shea and Howell (2000) use an experimental design with four time points to examine the pattern of the relationships between self-efficacy and performance at the individual level, primarily focusing on teams with self-correcting spirals, rather than deviation-amplifying spirals. Additionally, Shea and Howell chose to focus on the task feedback and task experience aspects of the model proposed by Lindsley and colleagues. The authors found support for the relationship between efficacy and performance over time, but found stronger support for self-correcting spirals than for deviation-amplifying spirals. Additionally, the results support the effect of task feedback on these relationships.

Specifically, Shea and Howell (2000) operationalized the spiral relationship as a significant relationship between self-efficacy and performance and an increase in the magnitude of the relationship between initial self-efficacy and subsequent self-efficacy over time (the authors did not hypothesize about the magnitude of the relationship of efficacy and performance over time, nor did they discuss how initial performance to subsequent performance may be related or change over time). The authors primarily focused on descriptive statistics (i.e., means) and correlations to show that the relationships between self-efficacy and performance over time followed a pattern that would be representative of spirals (i.e., increasing means and significant positive correlations). The authors also tested the efficacy-performance and efficacy-efficacy relationships using partial least squares path modeling. Task feedback was the condition that was manipulated in the experiment and therefore was tested using ANOVA, and the effects of task experience were tested using a series of multiple regressions (one for each time point).

Salanova and colleagues (2011) focused on individual-level efficacy-engagement spirals in two different studies. In their first study, the authors examined the relationship between self-efficacy and engagement (and the mediating effect of affect) over two time points. Although the authors state that the results of their first study support the existence of spirals, Lindsley and colleagues (1995) state that sustained relationships over at least three task episodes are a necessary condition of spirals; therefore, it can be argued that Salanova and colleagues did not truly find evidence of spirals in their first study. Their second study, which used an experimental design and three time points, did support their hypotheses regarding the existence of efficacy-engagement spirals. The study found that a gain spiral exists in the relationship between self-efficacy and engagement: employees with higher levels of self-efficacy had higher levels of engagement, which, in turn, led to higher levels of self-efficacy. While engagement is a more proximal outcome than performance, it is easy to see how there may be a similar gain spiral between efficacy and performance.

Salanova and colleagues (2011) tested their hypotheses using structural equation modeling. However, as was the case with Shea and Howell (2000), Salanova and colleagues did not hypothesize about an increase in magnitude of the relationship between self-efficacy and performance over time, a critical aspect of deviation-amplification spirals; therefore, their empirical examination of the reciprocal relationships between efficacy, engagement, and subsequent efficacy provides no test of the "amplifying" aspect of spirals and is more similar to a test of serial mediation than a true test of spirals.

Summary

As was previously discussed, the majority of peer-reviewed papers that discuss the existence of spirals in the workplace are theoretical, with few papers attempting to empirically examine the whether these spirals truly exist. However, there are cases in which authors do provide empirical tests of these relationships (i.e., Ferguson & Peterson, 2015; Shea & Howell, 2000). From even just a brief overview of empirical tests of spiral relationships, it is clear that there is little consistency in how to examine spirals. Additionally, many studies that purport to support the existence of spirals only provide evidence for the "deviation" aspect of spirals (i.e., that a lower (or higher) value in one variable will cause a lower (or higher) value in a subsequent variable) and completely overlook the "amplifying" aspect of the model (i.e., that the change in the second variable will lead to an even greater deviation in subsequent measures of the first variable). The current study seeks to examine both the "deviation" and "amplifying" components of spirals. Additionally, the current study stays more true to the original Lindsley and colleagues (1995) propositions both by examining the relationships at the team level and also by including mediators (i.e., teamwork behaviors) and moderators (i.e., attributions) in the spiral model.

Teamwork Behaviors

Conceptualization

Teamwork behaviors are a form of interpersonal processes, as identified by Marks and colleagues (2001). In contrast to action processes and transition processes, which occur episodically over a team's lifespan, team members engage in interpersonal processes throughout their entire lifespan. Therefore, it is not important to determine which phase (action or transition) the team is in when studying interpersonal processes, since these processes should be occurring regardless of phase. Furthermore, because of the empirically identified relationship between interpersonal processes and emergent states (i.e., cohesion and potency; LePine et al., 2008) teamwork behaviors are especially important in the context of the current study.

Teamwork behaviors are a form of interpersonal processes and can refer to both task-related and interpersonal behaviors that are related to how Rousseau, Aubé, and Savoie (2006) define teamwork behaviors as "the overt actions and verbal statements displayed during interactions between team members to ensure a successful collective action" (p. 542) and specify that these behaviors are necessary for effective team performance. Teamwork behaviors are distinct from other team-level variables, such as cognitions or emergent states, because they represent activities that are directly observable and quantifiable (Rousseau et al., 2006). For example, when watching team members interact, it is possible to determine how many times a specific team member makes a statement in support of his or her teammates or how frequently a team member makes efforts to refocus a team that may have become sidetracked from their primary topic or goal.

A variety of frameworks exist for conceptualizing teamwork behaviors (e.g., Bowers, Morgan, Salas, & Prince, 1993; Hoegl & Gemuenden, 2001; Kozlowski & Bell, 2003; McIntyre & Dickinson, 1992; Tannenbaum, Beard, and Salas, 1992). However, there are common threads amongst many of these frameworks. Rousseau and colleagues (2006) present an integrative framework for teamwork behaviors consisting of two categories: regulation of team performance and management of team maintenance. These categories are further divided into specific behaviors. For example, regulation of team performance includes preparation of work accomplishment (i.e., goal specification and planning), work assessment behaviors (i.e., performance monitoring and systems monitoring), task-related collaborative behaviors (i.e., coordination, cooperation, and information exchange), and team adjustment behaviors (i.e., backing up behaviors and collaborative problem solving). Management of team maintenance includes psychological support and integrative conflict management. Although some of these behaviors include transition processes (i.e., goal specification and planning) and action processes (i.e., performance monitoring and systems monitoring), many teamwork behaviors fall into the category of interpersonal processes (i.e., task-related collaborative behaviors and team adjustment behaviors). These interpersonal processes-related team behaviors are the focus of the current study.

Teamwork behaviors and performance

Hoegl and colleagues (2004) examined the effect of teamwork quality at Time 1 on team performance at Time 3 (24 months later) using an organizational sample. The authors measured six facets of teamwork that focused on both task-related behaviors and

interpersonal behaviors (i.e., communication, coordination, balance of member contributions, mutual support, effort, and cohesion). Their results demonstrate that teamwork quality had a lasting positive effect on team performance (assessed by project managers). Although not explicitly tested, the authors also found that teamwork quality at Time 1 was positively correlated with teamwork quality at Time 2 (12 months later; r = .47, $p < .01$) suggesting lasting effects of initial teamwork behaviors on later team processes.

Aubé and Rousseau (2005) examined the mediating role of supportive behaviors in the relationship between team goal commitment and team performance. Even though the name of the construct differs, the authors define supportive behaviors as "the extent to which team members voluntarily provide assistance to each other when needed during task accomplishment" (Aubé & Rousseau, 2005, p. 193). Supportive behaviors, therefore, have a strong conceptual similarity to teamwork behaviors. The study examined this relationship in an organizational sample of 73 teams and found that supportive behaviors acted as a mediator between goal commitment and team performance and had a significant positive effect on team performance (β = .36, $p < .01$).

Previous research also suggests that training individuals on teamwork behaviors positively impacts performance (Rapp & Mathieu, 2007). Rapp and Mathieu (2007) used a quasi-experimental design to test the effects of teamwork training in 16 MBA teams. Members in half of the teams engaged in a teamwork training intervention designed to improve their teamwork skills and focused on all three types of team processes identified by Marks and colleagues (2001; i.e., action, transition, and interpersonal). All teams then worked through a computer-based business simulation over an eight-week period. Peer-

rated teamwork behaviors and team processes were both rated at two time points but team performance was only measured at the end of the simulation. Their results support the notion that individuals who receive teamwork training will engage in more teamwork behaviors (at the individual level) than individuals who did not receive the training. Moreover, the results provide support for the full mediation of teamwork processes (i.e., teamwork behaviors) as the mechanism through which the positive effect of teamwork training on team performance occurs. Again, this research shows that teamwork behaviors positively impact team outcomes.

Teamwork behaviors and collective efficacy

Tasa and colleagues (2007) found that individual-level teamwork self-efficacy and group-level collective efficacy both had positive effects on subsequent individual-level teamwork behaviors; however, the authors did not examine the effects of the efficacy variables on team-level teamwork behaviors. Additionally, their results indicate that team-level teamwork behaviors have a positive effect on collective efficacy. Although this study does not examine the effects of teamwork behaviors on team performance or the mediating effect of teamwork behaviors between collective efficacy at Time 1 and collective efficacy at Time 2, it does demonstrate the piecemeal existence of (1) the positive effect of collective efficacy on (individual-level) teamwork behaviors and (2) the effect of (team-level) teamwork behaviors on subsequent collective efficacy. Together, these findings provide evidence for the role of teamwork behaviors as the mediator (the "M" in the IMOI model), although they were not explicitly tested as a mediating variable.

Porter, Gogus, and Yu (2011) tested the mediating effect of backup behaviors, a type of teamwork behavior, on the relationship between collective efficacy and team performance. Specifically, backing-up behavior refers to one or more team members providing resources and aid to a team member so that the team member can accomplish his or her goal (Porter, Hollenbeck, Ilgen, West, & Moon, 2003). The sample included 104 undergraduate business student teams who worked together on a decision-making task. Although the authors relied only on correlations to show the positive effect of collective efficacy on backing-up behavior and backing-up behavior on task performance, their test of the mediation using the Baron and Kenny (1986) method does suggest that the positive effect of collective efficacy on task performance was partially mediated by backing-up behavior. They also used a Sobel (1982) test and found evidence of the indirect effect of collective efficacy on performance through backing-up behavior. Although this study only focused on one form of teamwork behaviors and was not longitudinal in nature, Porter (2005) provides support for teamwork behaviors as a mechanism to explain the positive effect of collective efficacy on performance.

Tasa and colleagues (2011) also tested the mediating effect of teamwork behavior at the team-level as well as antecedents of teamwork behavior at the individual-level. Their results indicate that individual-level agreeableness predicted interpersonal teamwork behavior and that this relationship was moderated by collective efficacy, such that when there was high collective efficacy, team members were more likely to engage in teamwork behaviors. Additionally, the authors found that teamwork behaviors mediated the relationship between collective efficacy and team performance at the team-level. However, even though the authors present their study as longitudinal, the design is

not truly longitudinal as each variable was only measures at one time point (collective efficacy at Time 1, teamwork behaviors at Time 2, and performance at Time 3). Therefore, the results do not indicate whether these relationships are stable across a team's lifespan. Additionally, their sample was upper-level university students enrolled in a business course and their performance metric was the grade they earned on the assignment, provided by the instructor which is not an objective measure of performance and therefore may vary based on the instructor who graded the assignment (this was not taken into account in the analyses). Therefore, while Tasa and colleagues (2011) do provide evidence for the mediating role of teamwork behaviors, their findings are based only on early level of collective efficacy, which may influence the team differently than later levels of collective efficacy (Goncalo et al., 2010).

Attributions

Attributions refer to how individuals explain the causes or reasons behind performance or other occurrences. There is a broad literature on attributions and several different models of attributions exist (Kelly & Michela, 1980; Lord & Smith, 1983); therefore, reviewing attributions on a broad level (i.e., general perceptions of causes) before identifying a specific model will help elucidate overall trends in the literature.

In their review of attribution theory, Kelly and Michela (1980) identify three classes of antecedents to attributions: information (i.e., knowledge about the outcome and how the outcome may have changed based on the action taken), beliefs (i.e., thoughts

about how others would act in a similar situation and the choices they would make), and motivation (i.e., how the individual's welfare will be affected by the outcome). Kelly and Michela also identify three distinct consequences of attributions: behavior (i.e., defined acts the individual takes based on his or her attributions), affect (i.e., how one's internal thoughts and affect may vary based on his or her attributions), and expectancy (i.e., how one's motivation may vary based on attributions). Although in this review attributions are viewed as a mediator between the inputs and outcomes, there is theoretical and empirical support that attributions may also act as a moderator (e.g., Tay, Ang, and Van Dyne, 2006; Weiner 1986).

Although a brief review of the vast attribution literature may make it appear like one could make countless attributions (explanations for outcomes), Weiner's (1986) model breaks attributions down into three broad categories: stability, controllability, and locus of causality (also sometimes referred to as locus of control). Whereas Kelly and Michela (1980) view attributions as a mediators between behaviors and outcomes, Weiner views attributions as factors that may influence the amount of effort that a person may put into the activity in the future. This is more of a moderation-based perspective since it suggests that attributions may create boundary conditions surrounding future efforts or beliefs based on past experiences.

Types of attributions

Weiner's (1986) three-dimensional model of attributions divides attributions into three distinct classes. Subsequent research (i.e., Forsyth & McMillan, 1981; Russell, 1982) supports this three-factor model.

Controllability. Controllability refers to how much influence an individual has on what they believe to be the cause behind an event or their performance (Forsyth & McMillan, 1981). For example, a student who believes she did poorly on a test because she was in a bad mood would be making an attribution with a lower level of controllability than if she believed her poor performance might have due to a lack of effort (in this example, the student does not claim to be able to exert much individual influence over her own mood). Students who make attributions with a high level of controllability have been found to have higher levels of positive affect than students who made attributions with low levels of controllability (Forsyth & McMillan, 1981).

Locus of causality. Locus of causality was originally identified by Heider (1958) and distinguishes between attributions made based on factors that originate within the individual and factors that are external to the individual. For example, in the context of classroom performance, a student may attribute her exam grade to how much knowledge she accumulated through studying (i.e., an internal attribution) or the student may attribute the grade to good or bad luck (i.e., an external attribution). Locus of causality has also been found to be closely related to affect, with individuals reporting different affective responses to an event depending on whether they made internal or external attributions (e.g., when students are successful and make *external* attributions they report feeling gratitude, surprise, and thankfulness whereas successful students who make *internal* attributions report feeling pride, confidence, and satisfaction; Weiner, Russell & Lerman, 1978; Weiner, Russell, & Lerman, 1979).

Stability. The stability dimension refers to how much the cause behind the attribution may fluctuate (Forsyth & McMillan, 1981). Using the classroom example,

students who attribute performance to luck would have lower stability in their attributions than students who attribute their exam performance to ability because there is more opportunity for "luck" to fluctuate than true ability. Research has found that the stability of attributions is related to subsequent task expectations; people who attribute their past performance to stable causes are more likely to have positive future expectations surrounding the task than people who attribute their performance to unstable causes (Weiner, Nierbenberg, & Goldstein, 1971).

Attributions and self-efficacy

The majority of the attributions research is at the individual level. However, understanding these individual-level relationships is important to understanding how and why similar relationships may function at the team level.

Tay and colleagues (2006) tested the moderating effect of locus of causality attributions on the relationship between interview success (i.e., performance) and subsequent interviewing self-efficacy (internal judgments of one's interviewing abilities). Specifically, the authors proposed that internal causal attributions would strengthen the relationship between interview success and subsequent interview self-efficacy because successful applicants would attribute their success to their ability (an internal factor). Additionally, if unsuccessful applicants also attribute their outcomes (in this case, failure to receive a job offer) to internal attributes (i.e., incapability), the relationship between interview outcomes and subsequent interview self-efficacy would also be strengthened (i.e., a negative interview outcomes would exert an even greater negative effect on subsequent efficacy). Conversely, the authors proposed that external causal attributions

(i.e., either good or bad luck) would mitigate the relationship between interview outcomes and subsequent efficacy. The interaction effect was empirically supported.

Additional empirical research supports the relevance of locus of causality attributions to the job search process. Liu, Wang, Liao, and Shi (2014) found that the positive relationship between perceived job search progress and related efficacy beliefs (i.e., job search behavior self-efficacy and employment self-efficacy) was moderated by internal attributions. The results indicate that the relationships were strengthened when job seekers made higher levels of internal attributions. The authors suggest that this moderation occurred because individuals with high levels of internal attributions about their success in the job search process believe that they are highly capable and attractive candidates. This is another example of a time when attributions served as boundary conditions for an outcome (i.e., perceived success) to efficacy relationship.

The relationship between self-efficacy and attributions has also been studied in other contexts. For example, Tolli and Schmidt (2008) used a sample of undergraduate students and an experimental design to test the possible moderation of attributions on the relationship between performance feedback and self-efficacy. The authors found support for the moderating effect of locus of causality attributions on the relationship between performance feedback and subsequent efficacy. Specially, individuals who made internal attributions and received positive feedback saw a gain in self-efficacy whereas participants who made internal attributions and received negative feedback, as well participants who made external attributions (regardless of the feedback that they received) saw a decrease in self efficacy. This research is also aligned the findings of

Silver and colleagues (1995) who found that individuals who made internal attributions for their past performance had higher levels of self-efficacy.

Although the majority of studies focus on the moderating effect of locus of causality attributions, Thomas and Mathieu (1994) found that stability attributions moderated the positive effect of goal achievement on self-efficacy such that individuals who made high stability attributions and had high goal achievement had high self efficacy; individuals who made high stability attributions and had low goal achievement had significantly lower self-efficacy (there was no moderating effect for individuals who made low stability attributions). The authors also examined the moderating role of locus of causality attributions and found that internal attributions strengthened the positive relationship between goal achievement and satisfaction.

Attributions and collective efficacy

Although not as expansive as the body of research on individual-level relationships between attributions and self-efficacy, there are some empirical studies that examine these variables at the group level, typically in the context of sports teams.

For example, Dithurbide, Sullivan, and Chow (2009) studied the relationship between team performance, collective efficacy, and attributions in sports teams. The authors proposed that locus of causality attributions would have a main effect on collective efficacy and that this relationship would be moderated by performance. Although they tested the relationship between all three dimensions of Weiner's (1986) attribution model, the authors only found a significant main effect for stability attributions on collective efficacy; when teams believed the reasons behind their

performance were less stable (e.g., if they believe their performance was affected by the weather), they had lower levels of collective efficacy. The authors also found a positive effect for the interaction between stability attributions and performance such that, for high performing teams, stable attributions resulted in higher collective efficacy. The authors also found a positive main effect for performance on collective efficacy but did not test the interaction between performance and the other forms of attributions. Based on their empirical results, it is also possible that there was a main effect of performance on efficacy that was moderated by attributions (the interaction was significant for stability, but not tested for controllability or locus of causality). Therefore, additional research is needed to understand if the interaction holds for other forms of attributions as well.

Allen, Jones, and Sheffield (2009) also examined the role of attributions and collective efficacy in sports teams. Although they did not propose any explicit hypotheses, the authors tested the relationship between team performance, attributions, and emotion, as well as the relationship between performance, attributions, and efficacy. These authors also examined all three types of attributions identified by Wiener (1986). There was an interaction between team performance and locus of causality attributions on positive emotions such that high performing teams with internal attributions also has high levels of happiness at the end of their performance episode. Furthermore, locus of control attributions and stability attributions interacted to affect performance such that when team success was viewed as stable over time and teams had internal attributions, teams reported higher levels of collective efficacy.

Lindsley and colleagues (1995) discussed the relationship between attributions and collective efficacy on a theoretical level. The authors proposed that the occurrence of

team-level efficacy-performance spirals would be positively related to internal, stable, and uncontrollable attributions. Stability attributions were likely to occur because a spiral suggests that similar patterns of performance and behavior have occurred repeatedly and reliably and that stability is inherent to the nature of spirals (stability does not seem to be specific to efficacy-performance spirals). The authors also proposed that during the occurrence of spirals, teams members are likely to make internal attributions. This is because if members made external attributions and did not believe they were responsible for their performance, the relationship between performance and subsequent efficacy would disintegrate and end the spiral. Spirals would also be related to uncontrollability attributions because if teams believed they were in control of their outcomes, they would engage in self-correcting behavior, which would end negative spirals. However, if teams stuck in negative spirals believe that circumstances are out of their control, they are unlikely to engage in any self-correcting behaviors and would therefore perpetuate the existence of spirals in the team. To date, there does not appear to be any peer-reviewed articles that empirically test these propositions.

Development of Hypotheses

Collective Efficacy as an Antecedent of Performance

Meta-analyses by both Gully and colleagues (2002) and Stajkovic and colleagues (2009) provide strong support for the relationship between collective efficacy and subsequent performance. Teams with high collective efficacy beliefs persist longer on

difficult tasks and have higher team performance than their low collective efficacy counterparts in lab settings (Hodges & Carron, 1992; Lichacz & Partington, 1996).

Gully and colleagues (2002) suggest that this is because the sense of confidence that goes hand-in-hand with high levels of collective efficacy encourages team members to persevere when they are faced with difficult situations. Teams with low sense of collective efficacy that lack that a high level of confidence may give up in the face of similar obstacles, which would adversely impact their overall performance. Additionally, high collective efficacy teams set more challenging goals for themselves than teams with low collective efficacy due to the higher levels of confidence in their abilities (Prussia & Kinicki, 1996). Thus, even if high collective efficacy teams fall short of their goals, there is still an opportunity for these teams to out-perform low collective efficacy teams, which set easier goals to begin with.

The present study seeks to replicate and extend the previous research that has found a relationship between collective efficacy and subsequent performance (e.g., Feltz & Lirgg, 1998; Myers et al., 2004a; 2004b; Prussia & Kinicki, 1996) as well as the meta-analytic evidence that supports the existence of these relationships (Gully et al., 2002; Stajkovic et al., 2009). Therefore, it is hypothesized that collective efficacy will be positively related to subsequent team performance.

Hypothesis 1: Collective efficacy will be positively related to subsequent team performance.

Teamwork behaviors as a mediator

Teamwork behaviors can function as the "M" in the IMOI model (Ilgen et al., 2005); they act as a mechanism through which the positive effects of collective efficacy (the "I," or input) influence team performance (the "O," or outcome). Although their meta-analysis did not test causality, LePine and colleagues (2008) found that emergent states (i.e., group cohesion and potency) had a positive relationship with interpersonal team processes and that interpersonal team processes also had a positive relationship with team effectiveness (i.e., team performance). While they did not look at the effects of interpersonal team processes and collective efficacy (which is also an emergent state), past research has shown that collective efficacy and potency share similar relationships with outcomes, such as performance, and moderators, such as interdependence (Gully et al., 2002). Furthermore, since potency is a generalized form of collective efficacy (it captures a teams' sense of confidence that they can perform well overall rather than on one specific task), it follows that these emergent states may operate using similar mechanisms. When looked at together, these meta-analyses suggest that collective efficacy may have a positive relationship with team interpersonal processes, similar to the relationship between interpersonal processes and group potency.

Moreover, collective efficacy can also impact how a team manages resources (Bandura, 1997), which may also impact teamwork behaviors. For example, if resources are not managed well, team members engage in fewer teamwork behaviors because they are unaware of what their team members need. The lack of teamwork behaviors would then negatively impact team performance (Porter, 2005). Conversely, if teams have high collective efficacy and therefore managed resources well, teamwork behaviors would be

positively influenced, which would then have a positive impact on performance (Porter, 2005). Therefore, it is possible that teamwork behaviors may act as a mediator between emergent states (i.e., collective efficacy) and team performance.

There is further evidence to support the positive relationship between teamwork behaviors and team performance. For example, teamwork quality (which would be indicative of successful teamwork behaviors) has a long-lasting positive impact on teamwork behaviors (Hoegl et al., 2004). Furthermore, focused training on teamwork behaviors in a quasi-experimental environment also had a positive impact on performance (Rapp & Mathieu, 2007), again supporting the positive relationship between high levels of teamwork behaviors and subsequent team performance.

Additionally, Rousseau and colleagues (2006) discuss certain contexts in which teamwork behaviors may have more of an impact on team outcomes. One such factor is task structure, or "the extent to which members' actions relate to outputs in an understandable and predictable fashion" (Rousseau, 2006, p. 562). The expectation is that when tasks are highly structured, members should have a clear idea of what needs to be accomplished and how they need to interact in order to achieve their goals. Therefore, Rousseau and colleagues (2006) propose that for highly structured tasks, teamwork behaviors should have more of an impact on team performance. This is important because the task in the current study is highly structured; participants know what they need to accomplish (i.e., strong hotel performance) and how they need to accomplish it (i.e., through making sound business decisions). Therefore, teamwork behaviors should be especially relevant in the context of this study.

Furthermore, previous research suggests that teamwork behaviors mediate the relationship between collective efficacy and team performance (e.g., Porter, 2005; Tasa et al., 2007; Tasa et al., 2011). Specifically, Tasa and colleagues (2011) draw on trait activation theory to explain that the relationship between agreeableness and teamwork behaviors should be strengthened in an environment with high collective efficacy. That is, since collective efficacy may be indicative of positive environmental effects such as increased engagement, team members' natural inclinations towards positive personality traits, such as agreeableness, would be expressed more strongly than in low collective efficacy environments. Stronger levels of expressed agreeableness in the team environment then leads to more collaborative team members who are more likely to engage in teamwork behaviors.

Although the current study does not examine personality traits, the research by Tasa and colleague (2007; 2011) and others (e.g., Bandura 1997; Hoegl et al., 2004; LePine et al., 2008; Porter, 2005) suggests that collective efficacy creates an environment where team members are more likely to work together and engage in positive team-focused processes (i.e., teamwork behaviors), these processes then aid the team in accomplishing their tasks, leading to increased levels of team performance. Therefore, this study seeks to strengthen previous research by explicitly measuring the mediating effect of teamwork behaviors on the relationship between collective efficacy and performance at the team level, as well as extend the current research by examining the relationship in a truly longitudinal sample to determine if the effect is consistent across time.

Hypothesis 2: Teamwork behaviors will partially mediate the positive relationship between collective efficacy and subsequent team performance such that (a) collective efficacy will be positively related to teamwork behaviors, (b) teamwork behaviors will be positively related to subsequent team performance and (c) collective efficacy will have a positive indirect effect on subsequent teamwork behaviors.

The effect of collective efficacy on performance over time

The cyclical nature of the IMOI framework (Ilgen et al., 2005), suggests that the relationships between team-level variables should be influenced by the team's progress over time (Mathieu et al., 2008). That is to say, that the magnitude of the relationship between an input, such as collective efficacy, and an output, such as performance, will most likely not remain stable over performance episodes. Furthermore, DeShon, Kozlowsk, Schmidt, Milner, and Wichmann (2004) propose a model of team-regulatory processes in which situational factors (i.e., performance feedback) affect team-level intentions (i.e., collective efficacy), which in turn affect team-oriented performance via actions (the authors specifically identify team strategy and team-focused effort as "actions," but teamwork behaviors could function in this role as well). Furthermore, since the collective efficacy to performance relationship is part of a deviation-amplifying spiral (Lindsley et al., 1995), the strength of the relationship should increase over time (this is the "amplifying" aspect of the model).

The amplification of the collective efficacy to performance relationship is expected to occur because team performance provides feedback on the team's ability

levels. This feedback functions as confirmatory behavioral evidence that the team is either succeeding or failing at their task (Lindsley et al., 1995). In the case of a team engaged in a positive spiral, their past success should raise their future confidence levels since they have confirmation of their ability to succeed at the task. Since teams that have higher levels of efficacy are more persistent in the face of adversity and set more challenging goals (Hodgest & Carron, 1992; Lichacz & Partington, 1996; Prussia & Kinicki, 1996), the higher levels of collective efficacy created by their performance feedback will enable them to increase their performance to an even higher level in the next performance episode (and vice versa for teams caught in negative performance spirals). Therefore, it is expected that the effect of collective efficacy on team performance will increase over time.

Hypothesis 3: The positive effect of collective efficacy on subsequent team performance will increase over time.

Performance as an Antecedent to Collective Efficacy

Bandura (1986, 1997) states that past performance should be the most powerful source of efficacy beliefs. This is because performance acts as a behavioral confirmation of whether the team has the ability to perform well or not (Lindsley et al., 1995). Without performance feedback, team members would have no evidence of how well their team performed and, therefore, would not have an objective metric that either confirmed or disconfirmed their efficacy beliefs.

Although the reciprocal relationship between collective efficacy and performance over time has been examined in the context of athletic teams (e.g., Feltz & Lirgg, 1998; Myers et al., 2004a; 2004b), whether this relationship transfers to a more typical work environment is unknown. Performance in all of these athletic teams was measured by game-time performance and collective efficacy was based on how team members thought they would do in each particular game. This differs from an organizational setting where the skills needed to succeed and ways to improve those skills are much more ambiguous than on a sports field (Cannon-Bowers & Bowers, 2006).

Thus, it is necessary to study the relationship in an organizational environment. For example, Myers and colleagues (2004a) found that in collegiate football teams, collective efficacy was positively predictive of subsequent performance; however, performance was a negative predictor of subsequent collective efficacy. The authors could not explain the latter finding and suggest that it may be due to the unique nature of the teams. Therefore, one must turn towards studies that focus on this relationship in the workplace to see how the reciprocal relationship may operate in that environment.

For example, Baker (2001) found that ratings of collective efficacy within teams changed over time and the level of those changes differed between groups. Baker suggests that performance feedback may explain these inconsistent changes between groups, but did not test this hypothesis. Therefore, it is necessary to confirm whether performance feedback does indeed influence subsequent collective efficacy and would therefore be responsible for variations in changes in collective efficacy in teams.

Lindsley and colleagues (1995) propose that spirals should exist in the relationship between collective efficacy and performance and that spirals may take on

one of three forms (i.e., a self-correcting spiral, an upward spiral, and a downward spiral). One of the main factors that the authors suggest could influence these spirals is performance information. In the current sample, teams receive consistent objective information regarding how their decisions affect hotel performance. Given the nature of this performance information, teams should respond by either rationalizing poor performance or altering strategies in order to correct their perforamnce, which would influence levels of collective efficacy. Therefore, performance is expected to serve as an antecedent to subsequent collective efficacy.

Hypothesis 4: Team performance will be positively related to subsequent collective efficacy.

Moderating effect of attributions

In their theoretical paper on efficacy spirals in teams, Lindsley and colleagues (1995) proposed that attributions would mediate the relationship between performance and subsequent collective efficacy in teams. While the current paper still proposes that attributions will exert an effect on the relationship between performance and subsequent collective efficacy, that effect is expected to be in the form of moderation, rather than mediation. At the individual level, there is strong empirical evidence for the moderating effects of attributions on an outcome (i.e., performance feedback) and the subsequent input of collective efficacy (e.g., Liu et al., 2014; Tay et al., 2006; Tolli & Schmidt, 2008; Silver et al., 1995). Furthermore, since individuals in a controlled environment with the same performance outcome can still make different attributions (i.e., internal or external

causal attributions; Tolli and Schmidt, 2008), there is limited support for a direct main effect of performance feedback on attributions.

Based on attribution theory (Weiner, 1986) and previous research, locus of causality attributions are expected to moderate the relationship between team performance and subsequent collective efficacy. Specifically, internal attributions are expected to strengthen the relationship whereas external attributions are expected to weaken the relationship. This is because internal attributions act as confirmation of team members' beliefs about their abilities (i.e., Liu et al., 2014; Tay et al., 2006) while external attributions reduce the link between performance and subsequent belief about abilities. For example, a high performing team attributing their performance to team members' abilities would strengthen subsequent collective efficacy as their past performance has essentially confirmed their beliefs about their abilities to accomplish the task (i.e., they did accomplish the task and that was because they had the knowledge and abilities to do so and therefore they will be able to accomplish the task again in the future). The inverse will be true for poor performing teams that make internal attributions (i.e., they did not accomplish the task and that is because their team is fundamentally lacking the ability to do so, therefore they do not believe they will be able to accomplish the task in the future).

Conversely, external attributions should weaken the link between performance and collective efficacy. If teams believe that their past performance is due to luck, for example, then their past performance will not be viewed as providing feedback on the team's ability to accomplish their task and therefore should have little effect on whether or not they believe they can accomplish the task in the future.

Hypothesis 5: The positive effect of team performance on subsequent collective efficacy will be moderated by locus of causality attributions such that the relationship will be stronger when team members' attributions about their performance are more internal than external.

The effect of performance on collective efficacy over time

Ilgen and colleagues (2005) discuss the paucity of research on the "OI" aspect of the IMOI framework. Yet, despite the overall lack of research in this area, these "finishing" relationships are important to understand as they mark the transition from one performance episode to the next (Ilgen et al., 2005). Furthermore, just as the magnitude of the relationship between "inputs" and "outputs" is expected to be affected by the progression of the team over time, so is the relationship between outputs (i.e., performance) and subsequent inputs (i.e., collective efficacy; Mathieu et al., 2008).

In the context of the current study, team performance and performance feedback are strongly linked; objective performance measures tell the team how they performed but also give feedback on the decisions they made in the previous round. A positive relationship has been found between performance feedback and collective efficacy (DeShon et al., 2004) and, as suggested by previous research (i.e., Ilgen et al., 2005; Mathieu et al., 2008) as well as by the deviation-amplifying spiral model (Lindsley et al., 1995), the strength of the relationship between team performance and subsequent collective efficacy should increase over time because continued performance feedback acts as ongoing confirmatory evidence of the team's ability (Lindsley et al., 1995). If a low collective efficacy team performs poorly, that poor performance should therefore

impact subsequent efficacy and if the team continues to perform poorly, team members should view that performance as an even stronger confirmation of their lack of ability to succeed (and vice versa for high collective efficacy teams). Therefore, over time, teams will place more weight on their performance feedback as a source of confirmatory behavioral evidence and the effect of performance on subsequent efficacy will increase.

Hypothesis 6: The positive effect of team performance on subsequent collective efficacy will increase over time.

The Reciprocal Relationship between Collective Efficacy and Performance

While both the relationships from collective efficacy to subsequent performance and performance to subsequent collective efficacy are expected to increase over time, Mathieu and colleagues (2008) propose that the relationship from outputs (i.e., performance) to subsequent inputs (i.e., collective efficacy) or mediators should be less malleable over time than the alternate relationships. A possible explanation for this may be that team members may make many different attributions that would all differentially affect the magnitude of the relationship between performance and subsequent efficacy (Liu et al., 2015; Tay et al., 2006; Tolli & Schmidt, 2008; Silver et al., 1995). Additionally, since these attributions may change over time, the relationship between performance and subsequent collective efficacy may be less stable that the relationship between collective efficacy and subsequent performance. It is not expected that boundary conditions will affect the collective efficacy to subsequent performance relationship in the same way as they will affect the performance to subsequent collective efficacy

relationship. Therefore, it is predicted that the magnitude of the relationship between collective efficacy and subsequent performance will be greater than the magnitude of the relationship between performance and subsequent collective efficacy.

Hypothesis 7: The collective efficacy to subsequent team performance relationship will be stronger than the team performance to subsequent collective efficacy relationship.

Collective Efficacy Spirals

Lindsley and colleagues (1995) note that the relationship between performance and efficacy is what defines spirals; that the relationships must be looked at together in order to identify the deviation. Therefore, while the main focus of the previous hypotheses are unidirectional, this hypothesis specifically examines the reciprocal and deviation-amplifying relationship between collective efficacy and performance, essentially combining the effects of Hypotheses 1, 3, 4, 6, and 7. The fully lagged design of the current study using four distinct time periods is ideal for identifying the existence of collective efficacy-performance spirals since Lindsley and colleagues define a spiral as "a pattern of consecutive increases (or decreases) in both perceived efficacy and performance over a minimum of three task attempts" (p. 650).

Furthermore, previous research supports the existence of efficacy-performance spirals at the individual level (Shea & Howell, 2000), yet these relationships have not yet been examined at the team level, as was originally proposed by Lindsley and colleagues (1995). However, there is strong empirical evidence of the isomorphism between

individual- and team-level relationships between efficacy and performance (e.g., Bandura 1997; Chen & Bliese, 2002; Chen et al., 2005; Gibson, 1999). Therefore, both positive and negative deviation-amplifying spirals are expected to exist between collective efficacy and team-level performance.

> *Hypothesis 8:* Teams will engage in efficacy spirals when they experience either high levels of collective efficacy and high subsequent team performance early in their lifespan (i.e., positive efficacy spirals) or low levels of collective efficacy and low subsequent team performance early in their lifespan (i.e., negative efficacy spirals).

Chapter 2

METHOD

Sample

The sample for this study was senior undergraduate hospitality management students at a large Mid-Atlantic university enrolled in an advanced hotel management course. Data were collected from seven sections of the course over two semesters. Sections were divided among three different instructors. Instructors placed students into teams formed around the second week of the semester, although this varied slightly depending on section. Additionally, there was variability in how teams were formed across different class sections. For example, in some sections, participants were placed on teams based on their performance in a knowledge assessment whereas in other sections students were placed on teams at random. Students were not allowed to self-select teams in any section. The mean response to a question about team member familiarity was 2.14 (on a 5 point scale where 1 = "not familiar at all" and 5 = "very familiar"), indicating that team members were, on average, somewhat familiar with each other before the start of the project but were not friends outside of class and likely did not have experience working together on class projects. The final sample was 215 individuals in 51 teams. Teams ranged in size from 3 to 6 students ($M_{\text{team size}} = 4.20$, $SD_{\text{team size}} = .74$). The average response rate was 84% at Time 1, 77% at Time 2, 82% at Time 3, and 745% at Time 4.

The average age of respondents was 21.8 years old (SD_{age} = 1.95). The sample was fairly evenly split between male (44%) and female (56%) and was primarily Caucasian (70%).

Team Task

The students worked in teams over the course of three to four months on a hotel simulation. The simulation ran students through two to three years of hotel performance and allowed them to make decisions on a monthly basis. Teams engaged in the simulation during six to eight class periods, depending on the section. Although there was variation in the number of simulation years and class periods across sections, all sections performed the first year of the simulation over four consecutive class periods. There was also considerable variability in the time between the first and second year rounds of simulation sections based on class section. For example, one section took a single week break between simulation "years" whereas another section took a six-week break. The length of the breaks may have had differential effects on team processes. For these reasons, only data from these first four simulation periods (i.e., one simulated year) were used in the present study.

Simulation

Teams participated in a ten-week Hotel Operational Training Simulation (HOTS). HOTS is a computer-based simulation designed to teach hotel management concepts (e.g., finance operations, revenue management, sales and marketing, and customer care). The simulation cycles teams through three years of hotel performance and allows teams to make management-related decisions on a monthly basis. The course is designed to cover roughly three simulated months per class session. Each team's hotel begins in an identical position and then develops unique strengths and weaknesses based on the team's decisions. Teams make decisions in nine primary areas regarding the running of the hotel including hotel rates, revenue management, training spend, refurbishment, and capital expenditure. The simulation responds to the decisions by computing various forms of performance information, including metrics such as demand, cost, and profitability for the following month. This simulation is designed to mimic situations that hospitality management students will encounter in the workforce. Additionally, work related to the simulation accounted for approximately 50 percent of students' course grade (for most sections a portion of that 50 percent included peer evaluations that accounted for 10 percent of their final grade). Based on these percentages, students should have been strongly motivated to perform well and contribute to the team.

Procedure

Data were collected via paper-and-pencil surveys at five points throughout each semester. The first survey, measuring the demographic information (e.g., gender and ethnicity), and team emergent states (e.g., collective efficacy) was collected before they started their first in-class HOTS simulation. Surveys were administered at the beginning of every in-class HOTS period during the first year of the simulation and captured teamwork behaviors and attributions based on their experience in the previous class period as well as their collective efficacy for the upcoming class period. Performance information was gathered from the HOTS database after every in-class performance episode.

Measures

Collective efficacy

Collective efficacy was measured using an adapted version of Riggs and Knight's (1994) Collective Efficacy Beliefs Scale. The Collective Efficacy Beliefs Scale includes seven items such as, "the team I work with has above average ability" and "this team is not able to perform as well as it should" (reverse-coded). See Appendix B for the full list of items. The items were rated on a five-point scale where 1 = "Strongly Disagree" and 5 = "Strongly Agree." The scale had strong internal consistency across all four time points ($\alpha_{\text{Time 1}} = .91$; $\alpha_{\text{Time 2}} = .91$; $\alpha_{\text{Time 3}} = .93$; $\alpha_{\text{Time 4}} = .89$).

Teamwork behaviors

Teamwork behaviors were measured using 8 items from a behavioral observation scale developed by Taggar and Brown (2001). Participants were instructed to rate the frequency with which each of their team members engaged in behaviors such as "Volunteered to do work no one else wanted to do" and "Built on the group's ideas by offering solutions" (See Appendix B for a full list of items). The items were rated on a five-point scale where 1 = "Almost Never" and 5 = "Almost Always." Because participants were instructed to provide separate ratings for each of their team members, the reliability of the scale varied depending on which team member was rated; however, all of the ranges demonstrate that the scale generally had sufficient internal consistency across all four time points. ($\alpha_{Time\ 1}$ = .84 to .90; $\alpha_{Time\ 2}$ = .88 to .91; $\alpha_{Time\ 3}$ = .85 to .94; $\alpha_{Time\ 4}$ = .60 to .92).

Attributions

Attributions were measured using the three-item Locus of Causality subscale from the Causal Dimension scale (Russell, 1982), which prompted participants to think about the cause behind their HOTS performance during the previous class period and then answer questions about that cause using a nine-point scale with two opposing behaviors anchoring either end of the scale. A sample item from the Locus of Causality dimension is "Is the cause(s) something that: Reflects an aspect of yourself [*9*]//Reflects and aspect

of the situation [*I*].” A full list of items can be found in Appendix B. The Locus of Causality subscale is 3 items and generally had sufficient internal consistency across time points ($\alpha_{\text{Time 1}} = .79$; $\alpha_{\text{Time 2}} = .63$; $\alpha_{\text{Time 3}} = .74$; $\alpha_{\text{Time 4}} = .79$).

Performance

Team performance was assessed using the hotel metrics provided by the simulation based on the teams’ decisions. Three subject matter experts identified three performance outcomes that are key indicators of hotel performance: Net Income, Revenue Per Available Room (RevPAR), and Average Daily Rate (ADR). Due to the high correlations between Net Income and RevPAR (see Table 2), these metrics were standardized using z-scores and then averaged together to create a composite performance metric. Z-scores standardize scales to a mean of zero, and the score itself represents how many standard deviations the original value was from the mean (e.g., a z-score of .5 would indicate the original value was half od a standard deviation away from the mean in a positive direction). By converting both RevPar and Net Income to z-scores the metrics, which were originally on different scales, they become comparable and each contributes equally to the overall average of the created composite. The composite will be referred to as the Finance Composite. ADR was examined independently of this composite.

Chapter 3

RESULTS

Aggregation

All analyses were conducted at the team level. Attributions and teamwork behaviors were aggregated to the team-level via means. Because collective efficacy and interdependence are emergent states, adequate agreement must exist between team members in order to justify aggregating the measures to the team level (LeBreton & Senter, 2008). ICCs compare within-team and between team response variance (ICC(1)) and the reliability of team-level means (ICC(2); Bliese, 2002). The $r_{wg(j)}$ index assesses the level of agreement in the ratings of different team members and assumes that any variance in the ratings is due to error variance (James, Demaree, & Wolf, 1984; LeBreton & Senter, 2008).

For collective efficacy, the ICC(1) value was significant across all time points and between .15 to .23 (ranging from .15, $F = 1.72$, $p < .05$ at Time 4 to .23, $F = 2.23$, $p < .01$ at Time 2; see Table 1 for the full list of ICC(1) statistics), ICC(2) values ranged from .42 (Time 1) to .55 (Time 2 and Time 3; see Table 1 for full list). Finally, mean $r_{wg(j)}$ indices ranged from .86 (Time 1 and Time 2) to .90 (Time 3; see Table 1 for full list), indicating strong agreement between group members (LeBreton & Senter, 2008). Collectively, these aggregation statistics support aggregating collective efficacy to the team level using means.

INSERT TABLE 1 ABOUT HERE

Descriptive Statistics and Correlations

Table 2 provides descriptive statistics and correlation coefficients for all of the variables at the team level of analysis. All four time points of collective efficacy were positively correlated (ranging from $r = .41$, $p < .05$ to $r = .79$, $p < .01$). The correlation between each collective efficacy time point and the two subsequent teamwork behavior time points were positively and significantly correlated (ranging from $r = .29$, $p < .05$ to r $= .67$, $p < .01$). Collective efficacy was only correlated with subsequent locus of causality attributions at Time 1 ($r = .33$, $p < .05$). Interdependence was often significantly correlated with collective efficacy (significant correlations ranged from $r = .33$, $p < .05$ to $r = .60$, $p < .01$). There was only one significant correlation between collective efficacy and subsequent performance; Time 2 collective efficacy was negatively correlated with the Time 4 Finance Composite ($r = -.33$, $p >. 05$). There were no significant correlations between performance and subsequent collective efficacy across any of the time points.

Teamwork behaviors were significantly and positively correlated across most points (significant correlations range from $r = .43$, $p < .01$ to $r = .67$, $p < .01$). Teamwork behaviors were also positively and significantly correlated with interdependence across most time points (significant correlations range from $r = .32$, $p < .05$ to $r = .59$, $p < .01$).

Teamwork behaviors were not significantly correlated with any of the performance measures across any of the time points.

Locus of causality attributions (i.e., situational attributions, where high values indicate stronger internal causality attributions and lower values indicate stronger external causality attributions) were significantly and positively correlated with subsequent locus of causality attributions across all time points (ranging from $r = .37$, $p < .05$ to $r = .57$, $p < .01$). Locus of causality attributions were also positively and significantly correlated at Time 1 ($r = .50$, $p < .01$) and Time 3 ($r = .33$, $p < .05$). Locus of causality attributions and the Finance Composite were negatively correlated at Time 1 only ($r = -.34$, $p < .05$) and were not significantly correlated with ADR at any time point.

Interdependence was significantly and positively correlated across all time points (ranging from $r = .37$, $p < .05$ to $r = .71$, $p < .01$) and was also positively correlated with ADR at Time 2 ($r = .32$, $p < .05$) and Time 4 ($r = .43$, $p < .01$). ADR was significantly and positively correlated across all time points (ranging from $r = .69$, $p < .01$ to $r = .86$, $p < .01$); however it was only significantly correlated with the Finance Composite at Time 3 ($r = .51$, $p < .01$). As discussed in the Methods section, Net Income and RevPAR were significantly correlated across almost every combination of time points (ranging from $r = .34$, $p < .05$ to $r = .80$, $p < .01$), therefore the variables were standardized using z-scores and then a composite was created based on the mean of the z-scores. The Finance Composite was significantly and positively correlated with itself across all time points (ranging from $r = .47$, $p < .01$ to $r = .91$, $p < .01$).

INSERT TABLE 2 ABOUT HERE

Hypothesis Testing

Due to the multilevel nature of the dataset (i.e., 51 teams measured across 4 time points; 51 teams nested in 7 class sections; 7 class sections nested in 3 instructors), multilevel modeling was used to test the majority of the hypotheses. Hypotheses tested using multilevel modeling were tested using the lme4 package in R (Bates, Maechler, Bolker, & Walker, 2015). Level 1 was Time, Level 2 was team membership, Level 3 was class section, and Level 4 was instructor. Because there were no predictions at the class section or instructor levels, all of the variables were centered based on these levels in order to remove the variance contributed by these factors as well as increase the interpretability of the data (Firebaugh, 1978; Zhang, Zyphur, & Preacher, 2009). More specifically, variables were group mean centered around both instructor and setting. To calculate the centered variables, the group- and instructor-level means were subtracted from each group's score on the variable in question.

To analyze the multilevel models, each outcome was first examined using a null model. After the null model, hypotheses were tested by adding in predictors and comparing the fit statistics (i.e., Chi-squared) to the null model. When applicable,

moderating variables were added in the next model and, again, fit was compared to the previous best fitting model. For all hypotheses including team performance, two sets of models were examined: the first used ADR as the performance variable and the second used the Finance Composite (Net Income and RevPAR) as the performance variable.

Hypothesis 1

Hypothesis 1 predicted that collective efficacy would be positively related to subsequent performance. When ADR was used as the performance measure, the model including collective efficacy as a predictor was a better fit than the null model (X^2_1 = 123.38, $p < .001$); however, collective efficacy was not significantly related to ADR (coefficient = .163, $p > .05$; Table 3). When the Finance Composite was used as the dependent variable, again, the model including collective efficacy as a predictor was a better fit than the null model (X^2_1 = 123.38, $p < .001$); however, collective efficacy was also not significantly related to the Finance Composite (coefficient = .122, > .05; Table 3). Therefore, Hypothesis 1 was not supported.

INSERT TABLE 3 ABOUT HERE

Hypothesis 2

Hypothesis 2 predicted that the relationship between collective efficacy and performance would be mediated by teamwork behaviors such that (a) collective efficacy would be positively related to teamwork behaviors, (b) teamwork behaviors would be positively related to subsequent performance, and (c) collective efficacy would have a positive indirect effect on subsequent performance. To test multilevel mediation, Hayes (2013a) recommended using Monte Carlo confidence intervals to produce confidence intervals based on simulations of the distribution of the indirect effect (i.e., collective efficacy on performance through teamwork behaviors). These relationships were tested using the PROCESS macro for SPSS (Hayes, 2013b). Collective efficacy had a positive effect on teamwork behaviors (coefficient = .360, $p < .001$; 95% CI = .183 to .429; Tables 5 and 6); therefore Hypothesis 2a was supported. When ADR was used as the performance variable, teamwork behaviors had a direct effect on ADR (Table 4); however, this effect was negative which was not the expected direction (coefficient = -5.47, $p < .01$; 95% CI = -10.05 to -1.43; Table 4); therefore Hypothesis 2b was not supported. The direct effect of collective efficacy on ADR was not significant (coefficient = 2.04, $p > .05$; 95% CI = -1.52 to 5.60; Table 4); but the indirect effect was, although the relationship was negative and therefore does not support Hypothesis 2c (effect = -1.76, 95% CI = -3.55 to -.54; Table 4).

When the Finance Composite was used as the outcome, neither the direct effect of teamwork behaviors nor collective efficacy on the Finance Composite were significant (Table 4). Additionally, the indirect effect of collective efficacy on the Finance

Composite as also non-significant (effect = .000, 95%CI = -.101 to .090; Table 4). Therefore, Hypothesis 2 was not supported.

INSERT TABLE 4 ABOUT HERE

Hypothesis 3

Hypothesis 3 predicted that the strength of the relationship between collective efficacy would increase over time. To test this, the main effect of collective efficacy was entered in the first model, the main effect of time was added in the second model, and the interaction between collective efficacy and time was added in the third model. The difference between the null model and Model 1 is the same as it was for Hypothesis 1. When using ADR as the outcome, Model 2 (main effect of Time added in) was a better fit than Model 1 ($X^2_1 = 50.31$, $p < .001$) and time was negatively predictive of ADR (coefficient = -3.95, $p < .001$; Table 3). Finally, the interaction between time and collective efficacy was added to the model and Model 3 was not a better fit to the data as compared to Model 2 ($X^2_1 = .052$, $p > .05$); while the main effect of time was still significant (coefficient = -3.96, $p < .001$; Table 3) the moderating effect of time was not (coefficient = -.253, $p > .05$; Table 3).

When using the Finance Composite as the outcome, Model 2 was a better fit than Model 1($X^2_1 = 19.75$, $p < .001$) and the main effect of time on the Finance Composite

was significant and positive (coefficient = 2.34, $p < .001$; Table 3). When the interaction between time and collective efficacy was added in Model 3, the model was not a better fit than Model 2 ($X^2_1 = .747$, $p > .05$). Additionally, while the main effect of time was still significant (coefficient = .242, $p < .001$), the interaction between time and collective efficacy was not (coefficient = - .101, $p > .05$). Therefore, Hypothesis 3 was not supported.

Hypothesis 4

To test the lagged hypotheses (Hypotheses 4, 5, and 6), the data were restructured so that subsequent collective efficacy was on the same line as prior performance. The hypotheses were then tested across three periods. Hypothesis 4 predicted that performance would be positively related to subsequent collective efficacy. When ADR was used as the performance measure, the model including ADR as the predictor did not fit the data better than the null model ($X^2_1 = 1.26$, $p > .05$), additionally the effect of ADR on collective efficacy was not significant (coefficient = .000, $p > .05$; Table 5). When the Finance Composite was used as the predictor, the model was also not a better fit than the null model ($X^2_1 = 1.28$, $p > .05$) and the Finance Composite did not have a significant effect on collective efficacy (coefficient = .005, $p > .05$; Table 5). Therefore, Hypothesis 4 was not supported.

INSERT TABLE 5 ABOUT HERE

Hypothesis 5

Hypothesis 5 predicted that the relationship between performance and collective efficacy would be moderated by locus of causality attributions. Model 1 was the model tested in Hypothesis 4 (performance as a predictor), Model 2 added the main effect of locus of causality, and Model 3 added the interaction between performance and locus of causality. Because Model 1 was not a better fit than the null model (see Hypothesis 4), Model 2 was compared against the null model (rather than Model 1). When ADR was used as the performance metric, Model 2 was a better fit to the data than the null model ($X^2_2 = 25.95$, $p < .001$) and locus of causality attributions had a positive effect on collective efficacy (coefficient = .038, $p < .01$; Table 5). When the interaction between locus of causality and ADR was added in Model 3, Model 3 did not fit the data better than Model 2 ($X^2_1 = 1.89$, $p > .05$). Additionally, while the main effect of locus of causality was still significant (Table 5), the interaction between locus of causality and ADR was not (coefficient = -.001, $p > .05$; Table 5).

When the Finance Composite was used as the performance metric, Model 2 was a better fit to the data than the null model ($X^2_2 = 25.94$, $p < .001$) and the main effect of locus of causality on collective efficacy was significant (coefficient = .038, $p < .001$; Table 5). When the interaction between the Finance Composite and locus of causality

was added in Model 3, the model was not a better fit than Model 2 ($X^2_1 = .487$, $p > .05$) and although the main effect of locus of causality was still significant (Table 5), the interaction term was not (coefficient = .007, $p > .05$; Table 5). Therefore, Hypothesis 5 was not supported.

Hypothesis 6

Hypothesis 6 predicted that the positive effect of performance on collective efficacy would increase over time. Model 1 was the model tested in Hypothesis 4 (performance as a predictor). Model 2 added the main effect of time, and Model 3 added the interaction between performance and time. Because Model 1 was not a better fit than the null model (see Hypothesis 4), Model 2 was compared against the null model, rather than Model 1. When ADR was used as the performance metric, Model 2 was not a better fit than the null model ($X^2_2 = 1.62$, $p > .05$) and the main effect of time on collective efficacy was not significant (Table 6). The interaction term was entered in Model 3 and Model 3 was not a better fit than the null model ($X^2_3 = 2.35$, $p > .05$) and the interaction term was not significant (coefficient = -.003, $p > .05$; Table 6).

When the Finance Composite was used as the performance metric, Model 2 was not a better fit to the data than the null model ($X^2_2 = 1.80$, $p > .05$) and the main effect of time on collective efficacy was not significant (Table 6). The interaction term was added in Model 3 and Model 3 was not a better fit than the null model ($X^2_3 = 2.39$, $p > .05$). Additionally, the interaction between the Finance Composite and time was not significant (coefficient = .036, $p > .05$; Table 6). Therefore, Hypothesis 6 was not supported.

INSERT TABLE 6 ABOUT HERE

Hypothesis 7

Hypothesis 7 predicted that the collective efficacy to performance relationship would be stronger than the performance to collective efficacy relationship. As neither the main effect of collective efficacy on performance (Hypothesis 1) nor the main effect of performance on collective efficacy (Hypothesis 4) were significant, no additional tests were conducted for Hypothesis 7 and Hypothesis 7 was not supported.

Hypothesis 8

Hypothesis 8 predicted that efficacy spirals would exist, such that teams that begin with positive collective efficacy and positive performance will see increased gains over the course of their lifespan and teams that begin with negative collective efficacy and negative performance will see increased losses over the course of their lifespan. As neither Hypothesis 3 (the strength of the relationship between collective efficacy and performance will increase over time) nor Hypothesis 6 (the strength of the relationship between performance and collective efficacy will increase over time) were supported, initial evidence suggested that spirals did not exist.

However, the sign test, as an additional analysis, was conducted to examine the existence of spirals. The sign test is a parametric test that examines the dependences of data by taking the differences between paired values. The signs of each pair are then examined and the number of pairs with positive or negative differences are compared using a binomial test with the probability for positive and negative signs both equal to .05 (zero-differences are not considered; Siegel, 1951). In the case of testing the spiral hypothesis, the directionality of the differences between collective efficacy at Time 1 and Time 2, at Time 2 and Time 3, and Time 3 and Time 4 was considered for each team. The difference between ADR values and Finance Composite values for each set of times was also considered. Teams that received all positive differences for collective efficacy and either performance metric would have been evidence of a positive spiral and teams that received all negative differences for collective efficacy and either performance metric would have been evidence of a negative spiral. The number of teams that exhibited this pattern (all positive or all negative differences across six pairs) would have been compared to the probability that this pattern occurred by chance. However, no team in the sample exhibited either all positive or all negative changes; therefore, Hypothesis 8 was not supported.

Ancillary Analyses

Due to the general lack of support for many of the hypothesized relationships, ancillary analyses were conducted in an attempt to better understand the relationships

between the variables of interest. These analyses primarily focused on relationships between collective efficacy and other variables (i.e., conscientiousness and interdependence) that have been established in the literature as well as further examining unexpected relationships that were revealed in the initial analyses (i.e., the main effect of attributions. Specifically, the additional analyses included: examining interdependence as a moderator between both the collective efficacy to performance and performance to collective efficacy relationships; examining conscientiousness as a moderator between collective efficacy and performance; the mediating effect of locus of causality attributions in the performance to subsequent collective efficacy relationship; and using serial mediation as an alternate way to test for the existence of spirals in the data. Each is described below.

Interdependence as a moderator between collective efficacy and performance

Given the lack of significant main effects, it is possible that other factors, such as interdependence, influenced the relationships between collective efficacy and subsequent performance as well as performance and subsequent collective efficacy. Interdependence may be a critical boundary condition of these relationships because if team members did not work closely together and instead each focused on a single aspect of their performance, the effect of collective efficacy on performance would be attenuated (it is possible that self-efficacy may matter more in this type of situation). Additionally, if only a subset of team members worked together, the collective efficacy perceptions of those team members may have mattered more than the collective efficacy perceptions of the

non-contributing team members. In this case low interdependence would again attenuate the relationships between collective efficacy and performance (in both directions).

Interdependence was measured using an eight-item scale developed by Pearce and Gregersen (1991). Sample items include "I work closely with team members in doing my work" and "I frequently must coordinate my efforts with others." See Appendix B for a full list of items. Items were rated using a 5-point Likert scale where 1 = "Strongly Disagree" and 5 = "Strongly Agree." The interdependence scale had sufficient internal consistency across all four time points ($\alpha_{\text{Time 1}} = .76$; $\alpha_{\text{Time 2}} = .78$; $\alpha_{\text{Time 3}} = .73$; $\alpha_{\text{Time 4}} = .81$). The interdependence was included in the surveys that students took before each HOTS class period and, as with teamwork behaviors and attributions, asked about their experience in the previous HOTS session.

Interdependence was also aggregated to the team level by means. For interdependence, the ICC(1) values ranged from .05 to .12 and were only significant at Time 3 (.12, $F = 1.58$; $p < .05$; see Table 1 for full list). Additionally, ICC(2) values were low, ranging from .21 (Time 1) to .37 (Time 4; see Table 1 for full list). However, since the $r_{wg(j)}$ indices ranged from .91 (Time 2 and Time 4) to .93 (Time 1 and Time 3), indicating very strong agreement between team members (LeBreton & Senter, 2008), interdependence was aggregated to the team level using means.

To test the moderating role of interdependence, three models were tested in addition to the null model. Model 1 was the same model that was used in Hypothesis 1 (collective efficacy as a predictor), Model 2 added the main effect of interdependence, and Model 3 added the interaction between collective efficacy and interdependence. As

discussed in the section testing Hypothesis 1, Model 1 was a better fit than the null model for both ADR and the Finance Composite.

When ADR was used as the performance metric, Model 2 was a better fit to the data than Model 1 ($X^2_1 = 206.94$, $p < .001$); however, the main effect of interdependence on ADR was not significant (Table 7). When the interaction term was added in Model 3, Model 3 was a better fit than Model 2 ($X^2_1 = 5.03$, $p < .05$; Table 7) and the interaction between collective efficacy and interdependence was significant (coefficient = -12.32, $p < .05$; Table 7). The interaction between collective efficacy and interdependence on ADR was graphed (Figure 2). A simple slopes test indicated that when interdependence was low (-1 SD), the relationship between collective efficacy and team performance was marginally significant and trended positively ($t = 1.87$, $p = .06$. When there was high interdependence (+1 SD), the relationship between collective efficacy on team performance was also marginally significant, but trended negatively ($t = -1.93$, $p = .06$. Interestingly, team performance was the highest for teams that did not work together closely (low interdependence) but were still confident they could accomplish their task (high collective efficacy) and for teams that did work together closely (high interdependence) and were not confident that they could accomplish their task (low collective efficacy).

When the Finance Composite was the dependent variable, Model 2 was a better fit than Model 1 ($X^2_1 = 68.86$, $p < .001$), but the main effect of interdependence on the Finance Composite was not significant (Table 7). When the interaction term was added in Model 3, Model 3 was not a better fit to the data than Model 2 1 ($X^2_1 = .305$, $p > .05$) and the interaction between collective efficacy and interdependence was not significant

(coefficient = .256, $p > .05$; Table 7). Therefore, there was no significant interaction between collective efficacy and interdependence when the Finance Composite was used as the performance metric.

INSERT TABLE 7 ABOUT HERE

INSERT FIGURE 2 ABOUT HERE

Interdependence as a moderator between performance and collective efficacy

Interdependence was also examined as a moderator of the relationship between performance and collective efficacy. Model 1 was tested in Hypothesis 4 (performance as a predictor). Model 2 added the main effect of interdependence, and Model 3 added the interaction between interdependence and performance. Because Model 1 was not a better fit than the null model (see Hypothesis 4), Model 2 was compared against the null model, rather than Model 1. When ADR was used as the performance metric, Model 2 was a better fit than the null model ($X^2_2 = 10.23$, $p < .01$) and interdependence had a positive effect on collective efficacy (coefficient = .359, $p < .05$; Table 8). When the interaction term was added in Model 3, Model 3 was not a better fit than Model 2 ($X^2_1 = 1.62$, $p > .05$) and the interaction term was not significant (coefficient = -.013, $p > .05$; Table 8).

When the Finance Composite was used as the performance metric, Model 2 was a better fit than the null model ($X^2_2 = 10.25$, $p < .01$) and the main effect of interdependence on collective efficacy was significant (coefficient = .360, $p < .01$; Table 8). When the interaction term was added in Model 3, the model was not a better fit than Model 2 ($X^2_1 = .226$, $> .05$) and the interaction term was not significant (coefficient = .045, $p > .05$; Table 8). These analyses indicate that, while interdependence has a positive main effect on collective efficacy, there was no interaction between either performance metric and collective efficacy.

INSERT TABLE 8 ABOUT HERE

Conscientiousness as a moderator between collective efficacy and performance

It is also possible that team-level conscientiousness may serve as a moderator of the collective efficacy to performance relationship. Since high levels of conscientiousness are indicative of individuals who are "responsible, careful, persevering, orderly, cautious, planful, hardworking, and achievement-oriented" (Mount & Barrick, 1995, p. 164), high levels of this personality trait may be necessary in order to translate high collective efficacy beliefs into actual performance. Furthermore, since previous research has found positive relationships between conscientiousness and performance-related behaviors such

as, goal-directed behaviors, work motivation, and willingness to take on additional work (Barrick & Mount, 1993; Judge & Ilies, 2002; Podsakoff, MacKenzie, Paine, & Bacharach, 2000), teams with low levels of conscientiousness may find it difficult to perform well, regardless of collective efficacy beliefs.

Conscientiousness was measured when participants filled out the first survey using a ten-item scale from IPIP (Goldberg et al., 2006). Sample items include "I pay attention to details" and "I often forget to put things back in their proper place" (reverse-coded). See Appendix B for a full list of items. Items were rated using a 5-point Likert scale where 1 = "Strongly Disagree" and 5 = "Strongly Agree." The scale had sufficient reliability (α= .82) and was aggregated to the team level using means.

To test the moderating effect of conscientiousness on the relationship between collective efficacy and performance, three models were tested in addition to the null model. Model 1 was the same model that was used in Hypothesis 1 (collective efficacy as a predictor), Model 2 added the main effect of conscientiousness, and Model 3 added the interaction between collective efficacy and conscientiousness. As was discussed in the section testing Hypothesis 1, Model 1 was a better fit than the null model for both ADR and the Finance Composite.

When ADR was used as the performance metric, Model 2 was not a better fit to the data than Model 1 ($X^2_1 = .220$, $p > .05$) and the main effect of conscientiousness on ADR was not significant (Table 9). When the interaction term was added in Model 3, Model 3 was not a better fit to the data than Model 1 ($X^2_2 = 1.50$, $p > .05$) and the interaction term was not significant (coefficient = .72, p > .05; Table 9). These results do not support a moderating effect on the relationship between collective efficacy and ADR.

When the Finance Composite was used as the performance metric, Model 2 was not a better fit to the data than Model 1 ($X^2_1 = .011$, $p > .05$) and the main effect of conscientiousness on the Finance Composite was not significant (Table 9). When the interaction term was added in Model 3, Model 3 was not a better fit to the data than Model 1 ($X^2_2 = .029$, $p > .05$) and the interaction term was not significant (coefficient = .03, $p > .05$; Table 9). These results do not support a moderating effect on the relationship between collective efficacy and the Finance Composite.

INSERT TABLE 9 ABOUT HERE

The mediating effect of attributions

Although locus of causality attributions did not moderate the performance to subsequent collective efficacy relationship that was predicted in Hypothesis 5, hypothesis testing did reveal that locus of causality attributions had a main effect on collective efficacy, indicating that it may instead serve as a mediator in the performance to subsequent collective efficacy relationship.

There has been inconsistency in the literature regarding whether attributions act as a mediator or moderator of the performance to efficacy relationship. This paper originally took the perspective that performance would not cause attributions (i.e., teams could have low performance and internal attributions, low performance and external attributions,

high performance and internal attributions, or high performance and external attributions) and therefore, attributions would not act as a mediator of the relationships but rather as a moderator, explaining possible boundary conditions of the relationship between performance and collective efficacy. While the moderator perspective is supported by previous research (e.g., Liu et al., 2014; Tay et al., 2006; Thomas & Mathieu, 1994; Tolli & Schmidt, 2008), there is an alternate perspective that views attributions as a mediator, rather than moderator. The mediation perspective suggests that information (i.e., performance feedback) acts as an antecedent to attributions and that behavior (i.e., how a person acts in responds to attributions), affect (i.e., how internal thoughts may vary based on attributions), and expectancy (i.e., motivation) all follow as direct consequences of attributions (Kelly & Michaela, 1980). Although efficacy is not categorized as a form of affect, it does fit into Kelly and Michaela's definition of internal thoughts, suggesting that efficacy beliefs may be directly affected by prior attributions. Based on this, it is therefore unsurprising that the current study found a main effect of locus of causality attributions on subsequent efficacy beliefs.

The mediating effect of attributions was tested using the same method as Hypothesis 2: Monte Carlo confidence intervals to produce confidence intervals based on simulations of the distribution of the indirect effect (i.e., collective efficacy on performance through teamwork behaviors) using the PROCESS macro for SPSS (Hayes, 2013b). When ADR was used as the performance variable, it did not have a significant effect on attributions (coefficient = 4.60, $p > .05$; 95% CI = -.64 to 5.47). There was a significant main effect of attributions on collective efficacy (coefficient = .04, $p < .05$; 95% CI .021 to .84). The direct effect of ADR on collective efficacy was not significant

(coefficient = 2.40, $p > .05$; 95% CI = -1.41 to 4.52) and neither was the indirect effect (effect = .94; 95% CI = -.27 to 4.13).

When the Finance Composite was used as the independent variable, the effect of Finance Composite on attributions was non-significant (coefficient = 3.26, $p > .05$; 95% CI = -1.52 to 4.62). The effect of attributions on collective efficacy was the same as it was for the ADR analyses. Both the direct and indirect effects of the Finance Composite on subsequent efficacy were non-significant (direct effect coefficient = .245, $p > .05$; 95% CI = -2.14 to 2.26; indirect effect = 1.02; 95% CI = -1.63 to 2.74). These analyses do not support the mediating effect of attributions in the relationship between performance and collective efficacy.

Testing the existence of spirals using serial mediation

Serial mediation was used as an alternative test for the spiral hypothesis (Hypothesis 8). Serial mediation allows for testing the effect of an independent variable (i.e., initial collective efficacy) on a dependent variable (i.e., final performance) through a series of causally related mediators (i.e., the performance to collective efficacy to performance, etc. measures). Serial mediation has been used as a test of spirals in previous empirical studies (e.g., Ferguson & Peterson, 2015). However, since the current study has too many mediators to fit into the current commonly used program for serial mediation (the PROCESS macro for SPSS; Hayes, 2013b), it was not selected as the primary test of the spiral hypothesis. Despite this shortcoming, serial mediation provides

an alternate, if imperfect, test for spirals and may reveal relationships that were not clear in the initial analyses.

Serial mediation can also be tested using the PROCESS macro (Hayes, 2013b); however, this method is not ideal suited for this sample. For example, it does not take into account the multilevel nature of the data, although centering the variables based on class section and instructor should remove the variance of those factors and increase the interpretability. Additionally, the PROCESS macro only allows testing four serial mediator variables at once. This means that the entire model cannot be tested and rather two sets of serial mediation were examined. The first tested Time 1 collective efficacy (independent variable), Time 1 performance (mediator 1), Time 2 collective efficacy (mediator 2), Time 2 performance (mediator 3), Time 3 collective efficacy (mediator 4) and Time 3 performance (dependent variable). The second tested Time 2 collective efficacy (independent variable), Time 2 performance (mediator 1), Time 3 collective efficacy (mediator 2), Time 3 performance (mediator 3), Time 4 collective efficacy (mediator 4), and Time 4 performance (dependent variable). These shortcomings are why serial mediation was not selected as the primary method for testing Hypothesis 8, but was tested in an ancillary capacity.

When using ADR as the performance metric, none of the relationships between the independent variable and mediator 1, mediator 1 and mediator 2, mediator 2 and mediator 3, mediator 3 and mediator 4, or mediator 4 and the dependent variable were significant (Table 10 and Table 11). The only significant relationships in the model were between each ADR time point and the one preceding it and each collective efficacy time point and the one preceding it (Table 10 and Table 11). Additionally, none of the indirect

effects in the model were significant. A similar pattern of results was found when the Finance Composite was used as the performance metric (Table 12 and Table 13). Moreover, none of the indirect effects in the model were significant when the Finance Composite was used in place of ADR. These additional analyses do not provide support for Hypothesis 8.

INSERT TABLE 10 ABOUT HERE

INSERT TABLE 11 ABOUT HERE

INSERT TABLE 12 ABOUT HERE

INSERT TABLE 13 ABOUT HERE

Table 1. *Aggregation Statistics for Collective Efficacy and Interdependence*

	ICC(1)	F value	ICC(2)	Mean $R_{wg(j)}$
Time 1 Collective Efficacy	0.21	2.12**	0.53	0.86
Time 2 Collective Efficacy	0.23	2.23**	0.55	0.86
Time 3 Collective Efficacy	0.22	2.20**	0.55	0.90
Time 4 Collective Efficacy	0.15	1.72*	0.42	0.88
Time 1 Interdependence	0.05	1.22	0.21	0.93
Time 2 Interdependence	0.09	1.40	0.28	0.91
Time 3 Interdependence	0.12	1.58*	0.37	0.93
Time 4 Interdependence	0.06	1.29	0.22	0.91

Note. $n_{Time\ 1} = 180$; $n_{Time\ 2} = 141$; $n_{Time\ 3} = 176$; $n_{Time\ 4} = 136$

*p < .05, two-tailed; **p < .01, two tailed

Table 2. *Descriptive Statistics and Correlations*

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. T1 Collective Efficacy	3.65	0.54	--															
2. T2 Collective Efficacy	3.66	0.56	.72**	--														
3. T3 Collective Efficacy	3.79	0.55	.67**	.74**	--													
4. T4 Collective Efficacy	3.87	0.50	.67**	.41*	.79**	--												
5. T1 Teamwork Behaviors	3.40	0.39	.41*	.53**	.34*	.10	--											
6. T2 Teamwork Behaviors	3.56	0.47	.29*	.33*	.67**	.52**	.56**	--										
7. T3 Teamwork Behaviors	3.64	0.38	.26	.02	.46**	.60**	.34	.67**	--									
8. T4 Teamwork Behaviors	3.70	0.48	.30	.30	.37*	.40*	.45*	.43**	.49**	--								
9. T1 Locus of Causality	14.95	2.80	.33*	.36*	.35*	.34	.32	.28	-.07	.23	--							
10. T2 Locus of Causality	14.46	2.29	.19	.25	.24	.22	.37*	.33*	.15	.07	.57**	--						
11. T3 Locus of Causality	15.23	3.14	.24	.20	.27	.41**	.32	.25	.38*	.16	.48**	.52**	--					
12. T4 Locus of Causality	14.52	2.53	-.13	-.06	.13	.11	-.06	.31	.16	.07	.42*	.52**	.43*	--				
13. T1 Interdependence	3.65	0.32	.17	.18	.20	.31	.24	.45**	.41*	.38*	.11	-.17	.15	-.08	--			
14. T2 Interdependence	3.64	0.36	.33*	.38*	.60**	.49**	.42**	.53**	.52**	.36*	.20	.22	.30	.01	.51**	--		
15. T3 Interdependence	3.72	0.33	.27	.11	.33*	.38*	.27	.35*	.53**	.48**	.01	.08	.22	.06	.51**	.71**	--	
16. T4 Interdependence	3.64	0.36	.28	.19	.38*	.44**	.38*	.37*	.56**	.59**	.36*	-.01	.22	.12	.37*	.53**	.54**	--
17. T1 Average Daily Rate	89.56	18.90	.26	.09	.21	.22	.00	.12	.05	.32*	.31	-.09	-.26	.03	.07	.30*	.24	.49**
18. T2 Average Daily Rate	85.00	15.43	.22	.06	.19	.17	-.05	.04	.10	.23	.24	-.18	-.12	-.08	.01	.32*	.21	.46**
19. T3 Average Daily Rate	81.91	13.85	.16	-.07	.22	.21	-.09	.09	.11	.12	.03	-.28	-.10	-.08	-.03	.35*	.13	.40**
20. T4 Average Daily Rate	78.28	15.38	.18	-.07	.27	.28	-.05	.24	.24	.18	.18	-.22	-.15	.02	-.06	.27	.10	.43**
21. T1 Net Income	8593	81247	.04	-.14	.10	.12	-.18	.14	.23	.04	-.22	-.35*	-.22	-.20	.01	.00	.07	.05
22 T2 Net Income	63307	56043	.22	.02	.10	.21	.12	.06	.24	-.01	-.17	-.22	.00	-.18	.00	.09	.02	.26
23. T3 Net Income	119412	66980	-.16	-.28	-.04	-.03	-.05	.07	.06	-.14	-.08	-.25	-.10	-.06	-.03	.06	-.05	.08
24. T4 Net Income	56376	55167	-.21	-.26	-.26	-.06	.03	-.01	.09	.00	-.21	-.22	-.06	.00	-.04	-.25	-.16	.11
25. T1 Rev PAR	35.85	9.50	-.03	-.17	.03	-.08	-.22	.03	-.03	-.21	-.33*	-.41**	-.36*	-.21	-.12	-.15	-.09	-.10
26. T2 Rev PAR	43.68	10.07	-.06	-.11	-.05	-.06	.10	.08	-.01	-.08	.00	-.26	-.03	-.05	.00	-.12	-.16	.01
27. T3 Rev PAR	63.41	16.25	-.16	-.29	-.12	-.10	.06	.02	-.03	-.10	.02	-.36*	-.07	-.03	-.04	-.03	-.18	.17
28. T4 Rev PAR	39.41	10.97	-.25	-.34*	-.24	-.04	.03	.00	.07	-.25	.00	-.20	.07	.15	-.03	-.22	-.22	.09
29. T1 Finance Composite	0.00	0.87	.00	-.19	.08	.03	-.24	.09	.12	-.09	-.34*	-.43**	-.31*	-.23	-.07	-.09	-.01	-.02
30. T2 Finance Composite	0.00	0.88	.09	-.05	.03	.08	.12	.08	.13	-.05	-.09	-.28	-.02	-.14	.00	-.02	-.07	.16
32. T3 Finance Composite	0.00	0.93	-.17	-.30	-.08	-.07	.01	.05	.01	-.13	-.03	-.33*	-.09	-.05	-.04	.02	-.12	.14
33. T4 Finance Composite	0.00	0.91	-.25	-.33*	-.27	-.06	.03	-.01	.09	-.13	-.11	-.23	.00	.08	-.04	-.26	-.21	.11

Note. n = 51; Rev PAR = revenue per available room; Finance Composite = composite created from Net Income and Rev PAR

* p < .05, two-tailed; ** p < .01, two-tailed

Table 2. *Descriptive Statistics and Correlations continued*

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. T1 Collective Efficacy															
2. T2 Collective Efficacy															
3. T3 Collective Efficacy															
4. T4 Collective Efficacy															
5. T1 Teamwork Behaviors															
6. T2 Teamwork Behaviors															
7. T3 Teamwork Behaviors															
8. T4 Teamwork Behaviors															
9. T1 Locus of Causality															
10. T2 Locus of Causality															
11. T3 Locus of Causality															
12. T4 Locus of Causality															
13. T1 Interdependence															
14. T2 Interdependence															
15. T3 Interdependence															
16. T4 Interdependence															
17. T1 Average Daily Rate	--														
18. T2 Average Daily Rate	.86**	--													
19. T3 Average Daily Rate	.69**	.83**	--												
20. T4 Average Daily Rate	.76**	.84**	.86**	--											
21. T1 Net Income	-.03	-.02	.08	.27	--										
22 T2 Net Income	.04	.15	.31*	.39**	.59**	--									
23. T3 Net Income	.09	.15	.49**	.37**	.23	.42**	--								
24. T4 Net Income	-.12	-.11	.09	.18	.37**	.55**	.44**	--							
25. T1 Rev PAR	-.03	-.05	.16	.16	.52**	.45**	.47**	.39**	--						
26. T2 Rev PAR	-.17	-.19	.13	.07	.41**	.56**	.59**	.49**	.72**	--					
27. T3 Rev PAR	.11	.12	.46**	.34*	.27	.45**	.74**	.45**	.56**	.82**	--				
28. T4 Rev PAR	-.14	-.18	.11	.13	.34*	.50**	.52**	.65**	.59**	.80**	.77**	--			
29. T1 Finance Composite	-.03	-.04	.14	.25	.87**	.60**	.40**	.44**	.87**	.65**	.48**	.53**	--		
30. T2 Finance Composite	-.08	-.02	.25	.26	.57**	.88**	.57**	.59**	.66**	.88**	.72**	.74**	.70**	--	
32. T3 Finance Composite	.11	.14	.51**	.38**	.27	.47**	.93**	.48**	.55**	.75**	.93**	.69**	.47**	.69**	--
33. T4 Finance Composite	-.14	-.16	.11	.17	.39**	.58**	.53**	.91**	.54**	.71**	.67**	.91**	.53**	.73**	.65**

Note. n = 51; Rev PAR = revenue per available room; Finance Composite = composite created from Net Income and Rev PAR

* p < .05, two-tailed; ** p < .01, two-tailed

Table 3. *Main effect of Collective Efficacy on Performance and Interaction between Collective Efficacy and Time*

	Outcome Variable: ADR								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Collective Efficacy	.163	.985	.165	.285	1.63	1.75	3.18	2.21	1.44
Time				-3.95	.507	-7.80***	-3.96	.509	-7.77***
Interaction									
CE X Time							-.253	1.13	-.224
	Outcome Variable: Finance Composite								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Collective Efficacy	.122	.134	.907	.051	.132	.388	.188	.204	.924
Time				.234	.053	4.57***	.242	.053	4.55***
Interaction									
CE X Time							-.101	.115	-.872

Note. n =51; ADR = Average Daily Rate; CE = Collective efficacy
*p < .05, two-tailed; **p < .01, two-tailed; ***p < .001, two-tailed

Table 4. *Mediation of Teamwork Behaviors*

	Model using ADR				
Predictor Variable	Coefficient	*SE*	*t* value	LL CI	UL CI
Outcome: Teamwork behaviors					
Collective Efficacy	.306	.062	4.91***	.183	.429
Outcome: ADR					
Collective Efficacy	2.04	1.80	1.13	-1.52	5.60
Teamwork Behaviors	-5.74	2.12	-2.63**	-10.05	-1.43
Total Effect Model (Outcome: ADR)					
Collective Efficacy	.282	1.07	.165	-3.08	3.65
	Effect	*SE*		LL CI	UL CI
Indirect Effect of CE on ADR	-1.76	.750		-3.55	-.540

	Model using Finance Composite				
Predictor Variable	Coefficient	*SE*	*t* value	LL CI	UL CI
Outcome: Teamwork behaviors					
Collective Efficacy	.306	.062	4.91***	.183	.429
Outcome: Finance Composite					
Collective Efficacy	.106	.152	.695	-.195	.406
Teamwork Behaviors	.002	.184	.010	-.362	.366
Total Effect Model (Outcome: Finance Composite)					
Collective Efficacy	.106	.141	.766	-.172	.384
	Effect	*SE*		LL CI	UL CI
Indirect Effect of CE on Finance Composite	.000	.048		-.101	.090

Note. n =51; LL CI = lower limit of 95% confidence interval; UL CI = upper limit of 95% confidence interval; ADR = Average Daily Rate; CE = collective efficacy
*p < .05, two-tailed; **p < .01, two-tailed; ***p < .001, two-tailed

Table 5. *Main Effect of Performance on Collective Efficacy and Interaction between Performance and Locus of Causality*

	Outcome Variable: Collective Efficacy								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
ADR	.000	.003	.064	.000	.003	-.100	.001	.003	.156
Locus of Causality Attributions				.038	.014	2.77***	.044	.014	3.05**
Interaction									
ADR x LoC Attributions							-.001	.001	-1.36

	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Finance Composite	.005	.033	0.140	.004	.031	.120	-.002	.032	-.070
Locus of Causality Attributions				.038	.014	2.80***	.040	.014	2.87**
Interaction									
FC x LoC Attributions							.007	.010	.687

Note. n =51; ADR: Average Daily Rate; FC = Finance Composite; LoC Attributions = Locus of Causality Attributions
*p < .05, two-tailed; **p < .01, two-tailed; ***p < .001, two-tailed

Table 6. *Interaction between Performance and Time on Collective Efficacy*

	Outcome Variable: Collective Efficacy								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
ADR	.000	.003	.064	.001	.004	.293	.003	.004	.680
Time				.021	.036	.593	.016	.037	.445
Interaction									
ADR x Time							-.003	.004	-.840
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Finance Composite	.005	.033	.140	-.030	.059	-.517	-.089	.097	-.912
Time				.042	.059	.720	.059	.063	.933
Interaction									
FC x Time							.036	.048	.753

Note. n =51; ADR = Average Daily Rate; FC = Finance Composite
all *t* values were n.s.

Table 7. *Interaction between Collective Efficacy and Interdependence on Performance*

	Outcome Variable: ADR								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Collective Efficacy	.163	.985	.165	.045	1.92	.023	-.434	1.93	-.226
Interdependence				4.06	2.82	1.44	3.61	2.80	1.29
Interaction									
CE X Interdependence							-12.32	5.42	-2.27*
	Outcome Variable: Finance Composite								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Collective Efficacy	.122	.134	.907	.117	.151	.770	.127	.153	.832
Interdependence				-.050	.227	-.221	-.044	.228	-.191
Interaction									
CE X Interdependence							.256	.462	.555

Note. n =51; ADR = Average Daily Rate; CE = collective efficacy

* $p < .05$, two-tailed

Figure 2. *Interaction between Collective Efficacy and Interdependence on ADR*

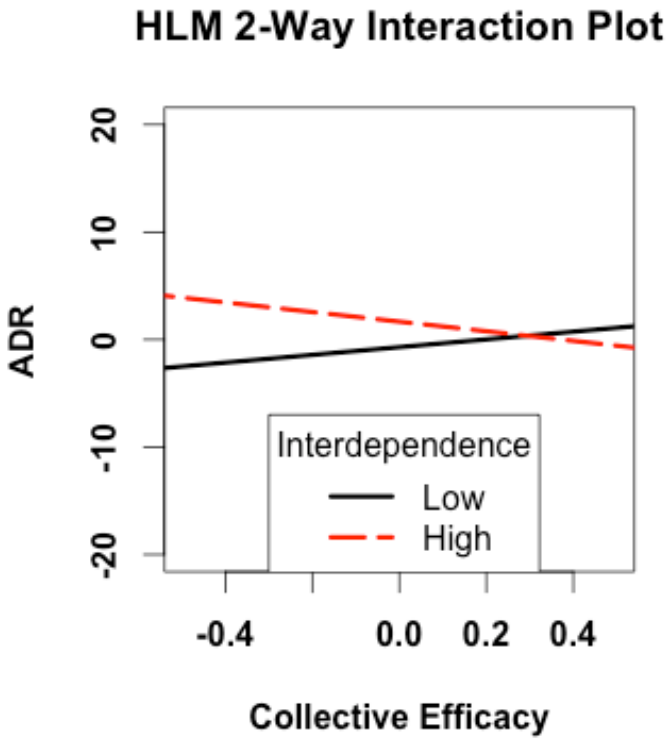

Table 8. *Interaction between Performance and Interdependence on Collective Efficacy*

	Outcome Variable: Collective Efficacy								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
ADR	.000	.003	.064	.000	.003	.051	-.001	.003	-.167
Interdependence				.359	.117	3.07*	.351	.117	2.99**
Interaction									
ADR X Interdependence							-.013	.011	-1.26
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Finance Composite	.005	.033	.140	.004	.033	.123	.005	.033	.158
Interdependence				.360	.117	3.07*	.353	.118	2.99**
Interaction									
FC X Interdependence							.045	.095	.470

Note. n =51; ADR = Average Daily Rate; FC = Finance Composite

*p < .05, two-tailed; ** p < .01, two-tailed

Table 9. *Interaction between Collective Efficacy and Conscientiousness on Performance*

	Outcome Variable: ADR								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Collective Efficacy	.163	.985	.165	.559	1.75	.319	-.963	11.92	-.081
Conscientiousness				-4.18	3.49	-1.20	-4.15	3.52	-1.18
Interaction									
CE X Conscientiousness							.727	5.63	.129
	Outcome Variable: Finance Composite								
	Model 1			Model 2			Model 3		
Predictor Variable	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value	Coefficient	*SE*	*t* value
Main effect									
Collective Efficacy	.122	.134	.907	.125	.135	.926	.055	.890	.062
Conscientiousness				.028	.238	.117	.030	.240	.124
Interaction									
CE X Conscientiousness							.034	.424	.081

Note. n =51; ADR = Average Daily Rate; CE = collective efficacy
all *t* values were n.s.

Table 10. *Results of First Serial Mediation Model Using ADR (Collective Efficacy Time 1 to Performance Time 3)*

	Outcome: Time 3 ADR														
	Time 1 ADR (M1)			Time 2 CE (M2)			Time 2 ADR (M3)			Time 3 CE (M4)			Time 3 ADR (DV)		
Predictor Variable	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value
Main effect															
Time 1 Collective Efficacy	2.84	3.98	.7123	.685	.120	5.73***	-2.87	2.90	-0.99	.281	.106	1.76	1.66	3.72	.447
Mediators															
Time 1 ADR (M1)				.002	.005	.440	.401	.090	4.68***	-.002	.006	-.363	-.147	.132	-1.11
Time 2 Collective Efficacy (M2)							1.38	2.90	0.477	.537	.158	3.41**	-6.87	4.07	-1.69
Time 2 ADR (M3)										-.003	.009	-.374	-.675	.203	3.33**
Time 3 Collective Efficacy (M4)													5.94	3.78	.447
Total R^2		.013			.479			.387			.559			.298	
F		.507			71.01***			7.56***			11.11***			2.87*	
ΔR^2					.466			-.092			.172			-.261	

Note. n =51; ADR = Average Daily Rate; CE = collective efficacy

*p < .05, two-tailed; ** p < .01, two-tailed; ***p < .001, two-tailed

Table 11. *Results of Second Serial Mediation Model Using ADR (Collective Efficacy Time 2 to Performance Time 4)*

	Outcome: Time 4 ADR														
	Time 2 ADR (M1)			Time 3 CE (M2)			Time 3 ADR (M3)			Time 4 CE (M4)			Time 4 ADR (DV)		
Predictor Variable	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value
Main effect															
Time 2 Collective Efficacy	-.973	3.14	-.310	.725	.140	5.18***	-3.89	3.96	-.983	-.185	.155	-1.19	-6.83	3.34	-2.05
Mediators															
Time 2 ADR (M1)				-.005	.008	-.681	.630	.170	3.81***	-.002	.008	-.218	.242	.164	1.48
Time 3 Collective Efficacy (M2)							4.77	3.75	1.27	.799	.149	5.37***	9.70	4.44	2.18*
Time 3 ADR (M3)										-.003	.007	-0.478	.291	.151	1.93
Time 4 Collective Efficacy (M4)													-1.83	3.96	-.460
Total R^2		.003			.481			.345			.613			.456	
F		.096			13.87***			5.09**			11.08***			4.53**	
ΔR^2					.478			-.136			.268			-.157	

Note. n =51; ADR = Average Daily Rate; CE = collective efficacy

*p < .05, two-tailed; ** p < .01, two-tailed; ***p < .001, two-tailed

Table 12. *Results of Serial Mediation Model Using the Finance Composite (Time 1 Collective Efficacy to Time 3 FC)*

	Outcome: Time 3 Finance Composite														
	Time 1 FC (M1)			Time 2 CE (M2)			Time 2 FC (M3)			Time 3 CE (M3)			Time 3 FC (DV)		
Predictor Variable	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value
Main effect															
Time 1 Collective Efficacy	-.113	.140	-.808	.691	.120	.575***	.001	.173	.005	.310	.153	2.03	-.208	.211	-.986
Mediators															
Time 1 FC (M1)				-.003	.138	-.022	.451	.140	3.12**	.202	.144	1.40	-.701	.194	-3.62**
Time 2 Collective Efficacy (M2)							.076	.170	.443	.523	.153	3.42**	-.554	.230	-2.40*
Time 2 FC (M3)										.032	.148	.216	1.54	.193	7.53***
Time 3 Collective Efficacy (M4)													.305	.221	.180
Total R^2		.017			.476			.216			.585			.660	
F		.652			16.82***			3.31*			12.33***			12.22*	
ΔR^2					.459			-.260			.369			.075	

Note. n =51; FC = Finance Composite; CE = collective efficacy

*p < .05, two-tailed; ** p < .01, two-tailed; ***p < .001, two-tailed

Table 13. *Results of Serial Mediation Model Using the Finance Composite (Time 2 Collective Efficacy to Time 4 FC)*

	Outcome: Time 4 Finance Composite														
	Time 2 FC (M1)			Time 3 CE (M2)			Time 3 FC (M3)			Time 4 CE (M4)			Time 4 FC (DV)		
Predictor Variable	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value	Coeff	*SE*	*t* value
Main effect															
Time 2 Collective Efficacy	-.064	.174	-.365	.740	.139	5.34***	-.269	.295	-.914	.192	.157	-1.22	-.131	.173	-.755
Mediators															
Time 2 FC (M1)				.155	.143	1.09	1.22	.222	5.50***	.113	.167	.680	.686	.180	3.80***
Time 3 Collective Efficacy (M2)							-.058	.278	-.209	.785	.147	5.36***	-.211	.220	-.941
Time 3 FC (M3)										-.079	.098	-.803	.080	.106	.752
Time 4 Collective Efficacy (M4)													.310	.203	1.53
Total R^2		.004			.492			.543			.614			.641	
F		.133			14.55***			11.46***			11.13***			9.63***	
ΔR^2					.488			.051			.071			.027	

Note. n =51; FC = Finance Composite; CE = collective efficacy

*p < .05, two-tailed; ** p < .01, two-tailed; ***p < .001, two-tailed

Chapter 4

DISCUSSION

The purpose of the current study was to examine the reciprocal and dynamic relationship between collective efficacy and team performance as mediated by teamwork behaviors and moderated by attributions. This study sought to expand the collective efficacy and team literatures in several ways. First, while many studies have examined the effect that collective efficacy has on team performance (e.g., Baker, 2001; Feltz & Lirgg, 1998; Hodges & Carron, 1992; Gibson, 1999; Tasa et al., 2007), few have examined the effect that performance has on subsequent collective efficacy, particularly in an organizational context. Much of the limited work examining the relationship between performance and subsequent collective efficacy has taken place in an athletic context, focusing on sports teams and game-time performance (e.g., Feltz & Lirgg, 1998; Meyers et al., 2004a; Meyers et al., 2004b). Therefore the generalizability of their findings to an organizational context was previously unexamined.

Second, beyond simply studying the reciprocal relationship between collective efficacy and performance, this study investigated how the relationship changes over time, particularly in the context of deviation-amplifying spirals. Drawing on the previously untested propositions of Lindsley and colleagues (1995) as well as previous research at the individual-level (e.g., Shea & Howell, 2000), the current study examined the dynamic

effects of the collective efficacy-performance relationship over time. This was explored in three ways: determining if the strength of the relationship between collective efficacy and subsequent performance increased over time; determining if the strength of the relationship between performance and subsequent collective efficacy increased over time; and determining whether deviation-amplifying spirals were present in the collective efficacy-performance relationship.

Third, this study looked beyond simple main effects in the collective efficacy-performance relationship by including both mediators (teamwork behaviors) and moderators (locus of causality attributions) in the model. Building on the untested propositions of Lindsley and colleagues (1995), teamwork behaviors were investigated as a mediator of the relationship between collective efficacy and performance. Although previous research has provided preliminary support for the mediating role of teamwork behaviors (Porter et al. 2011; Tasa et al., 2007), no current studies have examined the relationships using the fully cross-lagged design that is employed in the present study. Furthermore, the present study also examined boundary conditions of these relationships by focusing on the moderating effect of locus of causality attributions on the relationship between performance and subsequent collective efficacy. Whereas there is support for this mechanism in athletic teams (e.g., Allen et al., 2009; Dithurbide et al., 2009), these relationships have not been studied in a business environment, as was simulated in the current study.

While many of the hypotheses were not supported, results provided some insights into the relationship between collective efficacy, teamwork behaviors, and performance,

as well as the effect of attributions on collective efficacy and the interactive effect of interdependence on the relationship between collective efficacy and performance.

Collective Efficacy, Performance, and Teamwork Behaviors

Collective efficacy was predicted to have a positive effect on performance, and the effect was expected to be mediated by teamwork behaviors. Despite significant relationships between collective efficacy and teamwork behaviors and between teamwork behaviors and performance, there was no evidence of an indirect effect of collective efficacy on performance. Moreover, while the positive relationship between collective efficacy was in the expected direction, the relationship between teamwork behaviors and performance (operationalized by the ADR metric) was unexpectedly negative. This finding is contrary to previous research, which has found a positive effect of teamwork behaviors on team performance (e.g., Aubé & Rousseau, 2005; Hoegl et al., 2004; Rapp & Mathieu, 2007).

One possible explanation for this finding may be due to the unique nature of the team task. The HOTS Simulation requires teams to make hotel decisions in a variety of distinct categories such as food and beverage, advertising, and staffing. In some sections, the course instructor required that teams delegate the management of each specific category to one team member (so Team Member 1 might be in charge of food and beverage decisions, Team Member 2 may be in charge of advertising decisions, and Team Member 3 may be in charge of staffing decisions). Other instructors did not impose

this requirement on teams, but it is possible that some teams in these sections may have elected to use a similar delegation strategy.

For teams that delegated decisions to team members based on categories, an increased level of teamwork behaviors might have been indicative of a lack of knowledge or expertise in the team. That is to say, if each team member felt confident in their ability to make decisions for their category, they would not need to consult other team members or engage in discussion regarding those decisions. Therefore, teams that did engage in higher levels of teamwork behaviors may have done so because individual decision makers were not as adept at deciding how to manage their given categories. In this case, the increased teamwork behaviors would be symptomatic of a general lack of knowledge or expertise in the team (or in particular team members). It then follows that teams with members that had lower levels of knowledge, or teams that spent too much time discussing potential decisions with their team members, may make poorer decisions, thus leading to decreased levels of team performance.

Teamwork behaviors, such as backing up behaviors, are expected to help long-term team performance since these behaviors help to develop task-relevant knowledge (Kozlowski & Ilgen, 2006; Porter et al., 2011). However, it is possible that, due to the time constraints in the current task, teams that started with lower or disproportionate levels of task knowledge may not have had enough time to see the positive effects of teamwork behaviors. Furthermore, if there were teams that had more consistently high levels of task knowledge at the beginning of the project (and therefore may not have needed to engage in as many teamwork behaviors due to a delegation strategy), the

advantage that this would create over the low- or disproportionate-knowledge teams may have been too large to overcome. This is supported by previous research, which found that, while the lower-knowledge recipients may benefit from teamwork behaviors, the higher-knowledge team members that are assisting with these behaviors may neglect their own work as a result of helping their team members (Barnes, Hollenbeck, Wagner, DeRue, Nahrgangm & Schwind, 2008), which would negatively impact team behaviors. Additionally, Barnes and colleagues (2008) found that the recipients of these behaviors decreased their taskwork in subsequent performance episodes, suggesting that once team members start to engage in too may teamwork behaviors, certain members may become too reliant on the assistance of their team members.

Locus of Causality Attributions of Collective Efficacy

While there was no significant main effect of performance on collective efficacy (Hypothesis 4) nor a significant interaction between performance and locus of causality attributions on collective efficacy (Hypothesis 5), the analysis did reveal a significant positive main effect of locus of causality attributions on collective efficacy. Although this relationship was not originally predicted, the finding does support the broader notion that attributions are important for understanding changes in efficacy beliefs.

Lindsley and colleagues (1995) proposed that efficacy-performance spirals would continue based on a combination of internal, stable, and uncontrollable attributions. The current study only examined the effects of locus of causality attributions because of the data collection demands of collecting longitudinal data over four surveys. However, it is possible that the relationship between performance, collective efficacy, and attributions may be more complex and require the existence of all three conditions (internal, stable, and uncontrollable) rather than just one. Previous research supports the effects of stability attributions on the relationship between efficacy and goal achievement at the individual level (Thomas & Mathieu, 1994). Additionally, in their athletic team sample, Allen and colleagues (2009) found that locus of causality and stability attributions worked together to explain the effects of performance on subsequent efficacy (i.e., when high performing teams made internal and stable attributions they reported higher level of collective efficacy). Based on this previous research, a plausible explanation is that attributions do moderate the relationship between performance and subsequent collective efficacy, but that the effects of attributions beyond just locus of causality must be examined to see this effect.

Relationship between Collective Efficacy and Performance Over Time

The results also indicate that time did not moderate the relationship between collective efficacy and subsequent performance (Hypothesis 3), nor did time moderate the

relationship between performance and subsequent collective efficacy (Hypothesis 6). These null findings may also be due to the unique nature of the task. Results revealed that time had a negative main effect on ADR and a positive main effect on the Finance Composite. These findings suggest that these relationships may be more nuanced than was originally predicted as ADR generally decreased overtime whereas the Finance Composite generally increased over time. When participants were filling out collective efficacy questions, there is no way of knowing how individual participants operationalized team performance in their minds (i.e., if "performance" was based on ADR, one or both of the Finance Composite factors, or other variables not included in the study). Because participants did not receive grades based on their hotels' objective performance, it is unlikely that there was a shared mental model regarding what was most indicative of performance. Inconsistencies in individual operationalizations of hotel performance may, therefore, have mitigated the main effect relationships between collective efficacy and performance (in both directions) and likewise would have lessened the likelihood of finding significant interactions between these variables and time.

For example, in a team of four people, it is possible that team members 1 and 2 may have viewed ADR as the main indicator of hotel performance whereas team members 3 and 4 may have viewed the Finance Composite factors as the main indicators of hotel performance when they were filling out the collective efficacy measure. If ADR decreased from Time 1 to Time 2, team members 1 and 2 may have experienced a similar decrease in efficacy beliefs; however, if the Finance Composite factors increased between

Time 1 and Time 2, team members 3 and 4 may have experienced a positive increase in efficacy beliefs over that time period. In a scenario like this, there would be a link between performance and efficacy, but due to differing beliefs regarding what captured performance for each team member, the effects would not be reflected in the data. Moreover, even if all team members held similar beliefs of what indicated performance for their hotel, between-team differences may wash out the effects in a similar way. Since there is no way of knowing what was a salient indicator of performance for each participant (and if this was stable over time), it is not possible to test the plausibility of this explanation in the current sample.

This explanation may also provide insight into why there was no evidence for the existence of spirals. Different operationalizations of "performance" within- or between-teams may have negated any effects of collective efficacy on subsequent performance or performance on subsequent efficacy. Moreover, it is possible that the complex nature of deviation-amplifying spirals cannot be fully captured in empirical research. While the present study focused only on the alternating main effects between collective efficacy and performance over subsequent performance episodes, it is likely that a variety of other factors may have influenced the likelihood that spirals would occur. Lindsley and colleagues (1995) proposed a complicated model of spirals with a variety of mediators and moderators. It could be that spirals only exist in teams where all of these factors occur simultaneously. More advanced statistical methods need to be developed in order to capture the effects of many mediators and moderators occurring consistently over time. Therefore, it is possible that efficacy-performance spirals exist but that the conditions

under which they operate may be strict and rare so that spirals only occur on occasion and a much larger sample size would be needed in order to capture their existence.

The Moderating Effect of Interdependence

Ancillary analyses revealed the moderating effect of interdependence on the relationship between collective efficacy and ADR (but not the Finance Composite) performance. For low interdependence teams, collective efficacy had a positive relationship with performance, and for high interdependence teams, collective efficacy had a negative relationship with performance. That is, the highest performing teams had either low interdependence and high collective efficacy or high interdependence and low collective efficacy. Although this finding might seem counterintuitive at first, a similar dynamic may have occurred as in the explanation for teamwork behavior findings.

It is possible that high performing teams were those that took a delegation strategy. Teams that successfully implemented a delegation strategy did not need to rely on team members frequently in order to make decisions for their specific areas and accomplish their tasks (hence, low interdependence). Therefore, low interdependence teams that did think they could accomplish their tasks (high collective efficacy) performed well, and teams that did not think they could accomplish their tasks (low collective efficacy) did not perform well.

Understanding the effect of collective efficacy on performance for high interdependence teams is more challenging. Previous research has found that, in general, teamwork behaviors have a positive impact on performance because the interaction allows team members to learn from each other and improve over time (Kozlowski & Ilgen, 2006; Porter et al., 2011). It may be that teams with low collective efficacy, who were unsure about their team's ability to succeed, engaged in interactions in a productive way, geared towards improving overall team performance. Conversely, teams with high interdependence and high collective efficacy may have been over-confident about their teams ability to perform and may have then engaged in less productive interdependent behaviors that caused team members to become reliant on each other rather than pushing them towards gaining more task relevant knowledge (Barnes et al., 2008). The current study did not capture specific information about task-relevant knowledge for team members and, therefore, cannot test if teams with less task-relevant knowledge engaged in more interdependent behaviors as a whole nor if having low collective efficacy pushed team members to increase their task-relevant knowledge more than teams with high collective efficacy. Thus, further research is needed to test this post hoc speculation. Additionally, Goncalo and colleagues (2010) found that when collective efficacy occurs early in a team's lifespan, it negatively impacts performance since teams do not engage in process conflict, which can be beneficial to early-stage teams. It is possible that similar mechanisms may have occurred in the current study, with high collective efficacy teams not engaging in beneficial forms of conflict.

Limitations and Future Research

As with all research, the findings of this study were bounded by limitations; however, the strengths of a simulation-based design should also be acknowledged. Mathieu, Kukenberger, D'Innocenzo, and Reilly (2015) used a similar simulation-based study to examine the reciprocal relationship between team cohesion and performance. Mathieu and colleagues (2015) note that the strengths of a classroom-based simulation study include many of the same benefits of a laboratory-based study (in terms of structure and consistency) while still mimicking a "real world" environment that is complex and where performance has actual implication (i.e., course grades). Yet, despite these potential benefits of simulation-based studies, there are also shortcomings.

First, although all sections of the course followed the same basic structure for the HOTS simulation, there were differences based on course section, such as the way that teams were formed, the requirement that teams were given with regard to their team structure (i.e., mandating a delegation structure versus not requiring any specific team structure), and different changes in the settings of the program. While centering the data based on instructor and class section as well as including both of these in the multilevel models eliminated variance due to these discrepancies, generalizing about results is difficult given that teams experienced different environments depending on their class section.

Second, although class performance is tied to students' grades, actual hotel performance was not related to their grades. Instead, HOTS-related grades were based on

other elements, such as annual business plans that teams wrote together and submitted before each HOTS "year". Since hotel performance was not directly tied to teams' class performance, some team members may have lacked motivation when completing the actual simulation. Additionally, as students did not receive any benefits for filling out the surveys (such as extra credit) they also may have not been very conscientious when responding to the surveys, which would affect the quality of the data.

Third, filling out very similar (and at times, identical) surveys on a frequent basis (i.e., twice a week for two and half weeks), may have contributed to survey fatigue in the respondents. Survey fatigue occurs when respondents tire of taking surveys and can lead to ambivalence in responding, lower response rates, and less conscientious responding (Adams & Umbach, 2012; Porter, Whitcomb, & Weltzer, 2004). Previous research supports the existence of survey fatigue in student populations, particularly when multiple surveys are administered to the same group of students (Porter et al., 2004). Future research could combat this by including attention checks to make sure that students are responding thoughtfully, slightly altering the format of each survey so that it is not predictable (e.g., putting scales in different orders), and incentivizing student respondents (e.g., by providing extra credit).

Additionally, several respondents indicated that they found the wording of the attributions scale confusing. The anticipation of having to fill out this scale in every survey may have contributed to survey fatigue as respondents might have been frustrated when seeing the scale on each survey. In the future, the standardized wording in the

instructions could easily be changed to be more user-friendly and alternate instructions could be pilot-tested to ensure that they are as clear as possible.

In addition to rectifying these shortcomings, future research could also focus on testing the mechanism underlying the negative relationship between teamwork behaviors and performance as well as the interaction between collective efficacy and interdependence on performance. It was suggested that these findings might be explained by two key factors: the structure of teams (i.e., if they took a delegation strategy) and task-relevant knowledge of team members (as well as how this knowledge may have changed over time as a result of team member interactions). Measuring these constructs in the future could confirm whether they are indeed responsible for the unexpected findings in the current study.

Finally, future research should ensure that all team members have a consistent frame-of-reference for what constitutes team performance when they are asked to respond to items referring to their performance (e.g., collective efficacy items). As the results revealed, one measure of performance increased over time (the Finance Composite) whereas the other measure decreased over time (ADR). Since teams were only asked about performance in a general sense, it is unclear whether team members viewed performance as only one of these metrics, a combination of the two, or other hotel metrics that were not included in the study. Because of this inconsistency, explaining the relationship between collective efficacy and performance (as well as the relationships between other variables and performance) was not straightforward.

Conclusion

In conclusion, the results of this study highlight the need for future research to examine the complicated and dynamic relationship between collective efficacy and performance over multiple performance episodes. As there were no significant main effects of either collective efficacy on subsequent performance or performance on subsequent collective efficacy, further research is needed in order to gain a fuller understanding of the mechanisms underlying the potential collective efficacy-performance relationships.

Additionally, this research supports the notion that the dynamic efficacy-performance relationship and possible existence of deviation-amplifying spirals is complex. Factors such as interdependence, teamwork behaviors, attributions, and others not identified in the current study, may act as mediators or moderators of the relationship. A more nuanced understanding of these complex relationships will be necessary to fully understand how collective efficacy and performance interact over time.

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Appendix A: Study Model

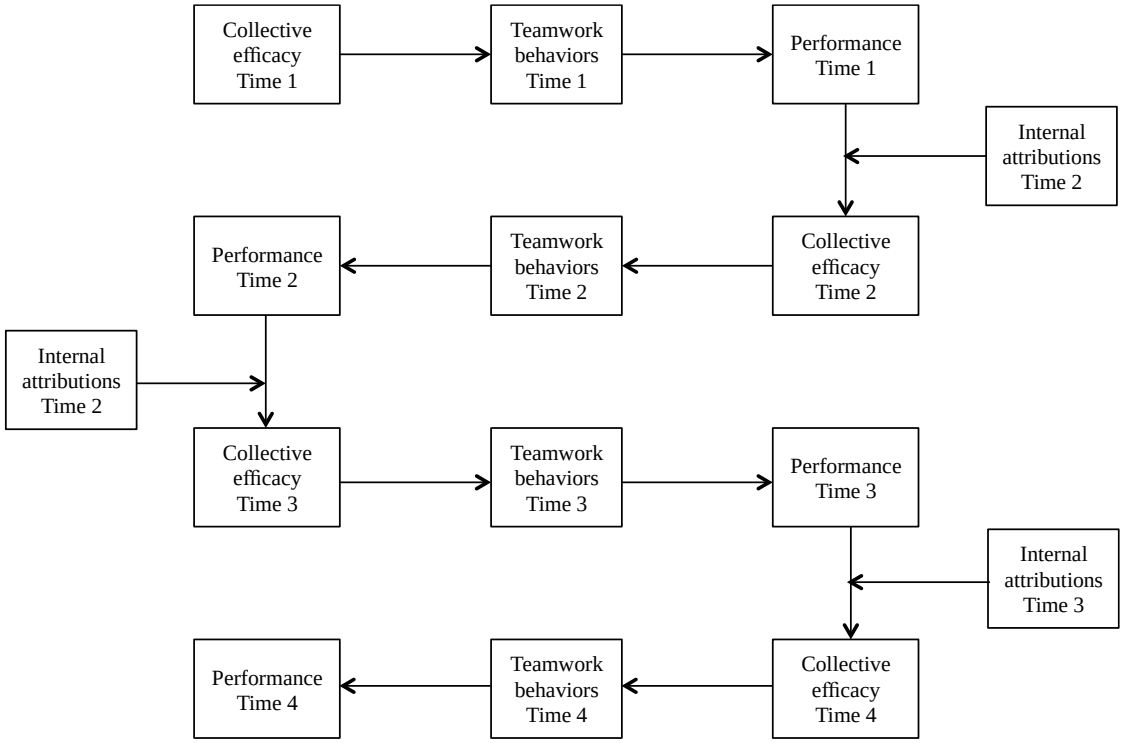

Figure 1. *Study model*

Appendix B: Measures

Collective Efficacy (Riggs & Knight, 1994)

1. The team I work with has above average ability
2. This team is poor compared to the other teams in the class
3. This team is not able to perform as well as it should
4. The members of this team have excellent job skills
5. Some members of this team should be removed due to lack of ability
6. This team is not very effective
7. Some members of this team cannot do their jobs well

Locus of Causality Attributions (Russel, 1982)

Instructions: Think about the reasons behind your teams' hotel performance **last class period**. The items below refer to your impressions or opinions of this cause or causes of your performance. Circle one number for each of the following questions.

Is the cause(s) something:

1.	That reflects an aspect of yourself	9 8 7 6 5 4 3 2 1	Reflects an aspect of the situation
2.	Over which others have control	9 8 7 6 5 4 3 2 1	Over which others have no control
3.	Something about you	9 8 7 6 5 4 3 2 1	Something about others

Teamwork Behaviors (Tagger & Brown, 2001)

1. Carefully listened to what others are saying
2. Dominated the discussion
3. Used humor to create a positive team atmosphere
4. Took the lead in coming up with ideas
5. Asked others what they think
6. Clarified and explained issues when someone did not understand
7. Volunteered to do things no one else wanted to do
8. Built on the group's ideas by offering solutions

Task Interdependence (Pearce & Gregersen, 1991)

1. I work closely with team members in doing my work
2. I frequently must coordinate my efforts with others
3. My own performance is dependent on *receiving* accurate information from team members
4. The way I perform my assignment has a significant impact on team members
5. My assignment requires me to *consult with team members* fairly frequently
6. I work fairly independently of my team members
7. I can plan my own work with little need to coordinate with team members
8. I rarely have to *obtain information* from team members to complete my work

Conscientiousness (Goldberg et al., 2006)

1. Am always prepared
2. Pay attention to details
3. Get chores done right away
4. Like order
5. Follow a schedule
6. Am exacting in my work
7. Leave my belongings around
8. Make a mess of things
9. Often forget to put things back in their proper place
10. Shirk my duties

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Fitzgerald, D. R., LaPort, K., Conway, J., & Boyce, A. (April 2015). *Applicant reactions: Forced-choice personality assessments featuring social desirability matched statements.* Poster presented at the annual meeting of the Society for Industrial and Organizational Psychology, Philadelphia, PA.

Mohammed, S., Livert, D., **Fitzgerald, D. R.**, & Alipour, K. (April 2015). *In sync in the kitchen? Temporal diversity in chef teams.* Poster to be presented at the annual meeting of the Society for Industrial and Organizational Psychology, Philadelphia, PA.

Mohammed, S., Alipour, K., Martinez, P., Livert, D. & **Fitzgerald, D.** (August 2014). *Conflict in the kitchen: Temporal diversity and temporal disagreements in chef teams.* Paper presented at the annual meeting of the Academy of Management, Philadelphia, PA.
*** Winner of the Conflict Management Division's Best Paper " Conflict in Context" Award for the 2014 Academy of Management conference**

Fitzgerald, D. R., & Grandey, A. A. (May 2014). *Managed heart vs. mind: When are financial rewards more controlling?* (Co-chair). Symposium presented at the annual meeting of the Society for Industrial and Organizational Psychology, Honolulu, HI.

Fitzgerald, D. R., Mohammed, S., & Okudan-Kremer, G. (May 2014). *Decision making style diversity and faultlines in teams*. Poster presented at the annual meeting of the Society for Industrial and Organizational Psychology, Honolulu, HI.