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The Influence of Team Cohesion and Contextual Performance on Project Team Performance Over Time

A Thesis

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By

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In Loving Memory of

Peter F. Hornik “Papa”

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Biography

The author was born in Miami, Florida on June 23, 1993. She graduated from Timber Creek High School in 2011, in Orlando, Florida. She received her Bachelor of Science degree in Psychology with Minors in both statistics and leadership studies from the University of Central Florida (UCF) in May of 2015.

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Abstract

Theory and empirical research suggest that team cohesion and contextual performance relate to team performance. However, while general support exists for a team cohesion and contextual performance relationship, less is known about the how the relationship evolves over time. This study aimed to examine the extent to which team cohesion and contextual performance reciprocally relate over time. Data were collected from 245 individuals comprising 40 student project teams engaged in the Capsim business simulation over a 10-week quarter. Results supported hypothesis 1; based on a cross-lagged path model, a stronger relationship exists between contextual performance at time point 1 and cohesion at time point 2 than between cohesion at time point 1 and contextual performance at time point 2. However, hypothesis 2, which predicted the same relationship for time points 2 and 3, was not supported. Additional results reveal significant effects for control variables.

The Influence of Team Cohesion and Contextual Performance on Project Team Performance Over Time

Organizations have shifted from hierarchical to more team-based structures over the past few decades (Devine, Clayton, Philips, Dunford, & Melner, 1999; Mathieu, Maynard, Rapp, & Gilson, 2008), stressing the need for team effectiveness in order to drive performance and remain competitive. Organizations face increasing pressures, such as innovation demands and global expansion, which prompt these structural shifts (Kozlowski & Bell, 2003). The success of these team-based organizations is contingent on the ability of team members to effectively coordinate behaviors. These organizations also derive success from consistent, high-level team performance (Mathieu, Kukenberger, D'Innocenzo, & Reilly, 2015). In teams where coworkers are dependent on each other for optimal task performance, going beyond assigned duties to facilitate cooperation and support one another proves vital for ensuring team effectiveness. The overall objective of this study centers on understanding how emergent states may contribute to team effectiveness throughout time. This will be achieved by examining the interplay between contextual performance and team cohesion over time.

Researchers continue to recognize the importance of behaviors that exceed typical role expectations or role requirements that benefit the organization. Researchers define these behaviors as contextual performance (Katz & Kahn, 1978). Teams and team members are expected to not only perform at suitable levels, but to go above and beyond their specific job roles and execute tasks that may not be included in their job descriptions (Borman & Motowidlo, 1993). A team of individuals who tend to exhibit more contextual performance behaviors, may maximize its teamwork capabilities (LePine, Hanson, Borman, Motowidlo, 2000). This

conclusion stems from the idea that contextual performance impacts team processes, social, and psychological functioning (LePine et al., 2000).

In order to better understand team performance, it is essential to consider the dynamic processes that unfold over time (McGrath, 1990; Mohammed, Hamilton, & Lim, 2009; Morgan, Salas, & Glickman, 1993). For example, team cohesion describes group members' attraction to one another and their desire to remain on the team (Ehrhart & Naumann, 2004). A study by Mathieu and colleagues (2015) revealed that team cohesion and task performance were related positively, and mutually, to each other over time. Researchers often regard team cohesion as an important state that facilitates team performance (e.g., Beal, Cohen, Burke, & McLendon, 2003); however, empirical research is less consistent and indicates the performance and cohesion relationship varies considerably (Mathieu et al., 2015). One may argue that contextual performance behaviors facilitate team members' positive feelings toward their teammates and the team task, which fosters team cohesion.

Indeed, researchers identify a major limitation in the team cohesion literature as the failure to carefully consider the temporal nature of teams (Drescher, Burlingame, & Fuhriman, 2012). Team-level phenomena (e.g., performance, cohesion) moves from the individual level to the team level, and reflects upward temporal dynamics (Kozlowski, Gully, Nason, & Smith, 1999). The factor of time may influence the importance of various dimensions of teamwork in different phases (e.g., contextual performance, team cohesion) (Cronin, Weingart, & Todorova, 2011; Kozlowski & Ilgen, 2006; LePine et al., 2000). Groups progress through stages of development. In these stages, team members learn how to adapt to the environment through interpersonal knowledge (i.e., team formation), establish the nature of the team and focus on individual performance (i.e., task compilation), engage in personalized interactions and learn

how to coordinate with each other (i.e., role compilation), and create social networks to advance performance (i.e., team compilation) (Kozlowski et al., 1999). Each of these stages illustrate the importance of assessing contextual performance for team development in multiple phases. Ideally, team members adopt group norms and exhibit positive attitudes toward the team over time, which facilitates rapport necessary for task accomplishment (LePine et al., 2000).

This study measures team cohesion and contextual performance at three time points in order to examine changes in structural coefficients over time. Because of well-known changes in work environments, researchers now place a greater emphasis on contextual performance and teams (LePine et al., 2000). As effective contextual performance behaviors improve team's social and psychological environments, understanding how these behaviors relate to team cohesion over time is crucial for improving team development and multiple work elements (e.g., team selection, performance appraisals; LePine et al., 2000). Thus, this research examines the extent to which team cohesion and contextual performance reciprocally relate over time.

Contextual Performance

Campbell and colleagues (1990) identified two types of behaviors associated with job performance: behaviors unique to each job in an organization (i.e., task performance) and behaviors similar across all jobs (i.e., contextual performance). Taking this a step further, Motowidlo, Borman, and Schmit (1997) proposed individual differences influence task and contextual performance. Their theory assumes that job performance may be a function of both performance types, as well as factors outside of the individual. Thus, an individual's task performance may not fully capture the person's own contributions to team and/or organizational goals. Therefore, both contextual performance and task performance should be examined in research to understand an accurate representation of job performance. Moreover, contextual

performance reflects activities that support the organizational, social, and psychological environment (Borman & Motowildo, 1993). More specifically, contextual performance aids in team functioning through interpersonal helping, job dedication, and initiative (Morgeson, Reider, & Campion, 2005).

Behaviors associated with contextual performance are discretionary, interpersonal behaviors that enhance the context (Motowidlo & Van Scotter, 1994). Podsakoff and MacKenzie (1997) propose that contextual performance helps stabilize organizational performance and allows organizations to more effectively adapt to environmental changes. To maintain a competitive advantage, organizations concentrate on hiring and retaining inordinately helpful, involved, and cooperative workers (Katz, 1964). Researchers believe helping behaviors that are distinguished in contextual performance reduce turnover as a result of a more cohesive and cordial work environment (Podsakoff & Mackenzie, 1997).

Both exchange theory (Blau, 1964) and the norm of reciprocity (Gouldner, 1960) illustrate social interactions as a flow of open-ended exchanges, with both parties making contributions and receiving benefits (Kamdar & Van Dyne, 2007). Namely, contextual performance can influence outcomes; howbeit, contextual performance can be influenced as well. Researchers propose these "affect-driven" behaviors that encompass contextual performance fluctuate over time (Ilies, Scott, & Judge, 2006; Weiss & Cropanzano, 1996)**.** Weiss and Cropanzano (1996) explain how situations at work can influence contextual performance related behaviors. Additionally, these contextual performance behaviors have been described and modeled as reciprocal, and even as "socially contagious" (Andersson & Pearson, 1999).

Team performance relies on both taskwork and teamwork dimensions (Salas, Burke, & Cannon-Bowers, 2000; LePine et al., 2000). The distinction between teamwork and taskwork

appears similar to how Borman and Motowidlo (1993) categorize behaviors that contribute to contextual performance and task performance (LePine et al., 2000). In the past, researchers drew parallels between contextual performance and teamwork because both terms focus on behaviors important for creating an appropriate social context for teams, regardless of the task (LePine et al., 2000). Contextual performance and teamwork both revolve around activities that contribute to team effectiveness by improving the team's context (Lepine et al., 2000). Furthermore, Salas, Sims, and Burke (2005) frame teamwork as combined thoughts, actions, and feelings that are essential to promote the functioning of a team, to enhance vital outcomes such as coordination and achievement of task objectives. LePine and colleagues (2000) also frame teamwork in a similar manner to contextual performance, focusing on similarities such as supporting the overall social and emotional context during which a team accomplishes technical work. Overall, because of the team-level nature of this study and the similarities of these two constructs, the two terms are considered synonymous.

Contextual performance also relates to organizational citizenship behaviors (OCB), but differences should be noted. Contextual performance and OCB refer to similar behaviors but allude to a fundamental difference that supports the use of these two terms in separate circumstances (Motowidlo, 2000). Several studies looked at the differences and similarities between contextual performance and OCB to justify the distinction (LePine, Erez, & Johnson, 2002; Motowidlo, 2000; Podsakoff, MacKenzie, Paine, & Bachrach, 2000). The decisive difference is that contextual performance does not necessarily indicate that behaviors are by choice and unrewarded. Contextual performance behaviors may be listed as responsibilities in a job description in order to enhance the work environment, but individuals may choose to go above and beyond what is expected. Research suggests that employees are intrinsically

motivated as opposed to extrinsically motivated when engaging in OCB behaviors (Motowidlo, 2000; Podsakoff et al., 2000). On the other hand, contextual performance may stem from intrinsic or extrinsic motivation (Chiu & Chen, 2005; Hackman & Oldham, 1980; Edwards, Bell, Arthur, & Decuir, 2013). Organ (1997) recommended his early definition of OCB be redefined to better align with contextual performance, taking away the requirements that OCB be discretionary and unrewarded. However, past research lacks the acknowledgment of this newer definition (Motowidlo, 2000). Research demonstrates that OCB as an aggregate impacts organizational effectiveness (Schnake & Dumler, 2003). Evidence shows departments within the same organization can significantly differ in OCBs, suggesting unit-level effects (Schnake et al., 1995). Overall, empirical evidence suggests OCBs can be distinguished from contextual performance. Furthermore, benefits of studying contextual performance at the team-level exist.

Team Cohesion

Team cohesion is the degree to which members share a strong commitment to the purpose of the team, have strong group pride, and have interpersonal attraction towards one another; this reflects a unique bond within teams (Zaccaro, Rittman, & Marks, 2001; Beal et al., 2003). Team cohesion has been linked to team performance and related outcomes (Beal et al., 2003). Research has found cohesion and positive member attitudes significantly relate to one another (Greer, 2012). Moreover, team cohesion is likely to enhance viability, such that higher levels of cohesion encourage team members to continue working together (Bell & Marentette, 2011).

Cohesion represents a crucial element of team dynamics (Ehrhart & Naumann, 2004). Team cohesion varies with team context, inputs, processes, and outcomes (Marks et al., 2001). Organizational scholars have considered team cohesion an emergent state which develops over

time through team member interactions and attainment of team objectives (Marks, Mathieu, & Zaccaro, 2001). However, empirical research must now focus on understanding how cohesion evolves over time (Greer, 2012). Forming and maintaining positive relationships with team members can be difficult (Kozlowski & Chao, 2012). Team members interact over time, which may cause these perceptions and relationships to shift or evolve (Kozlowski & Chao, 2012). Measuring cohesion over time provides a better understanding of how it fluctuates throughout team phases (e.g., Kozlowski et al., 1999). The longitudinal nature of this study may elucidate the time it takes for cohesion to form in interdependent team project settings. Likewise, this understanding may also offer insights regarding when teams should engage in team building activities to maximize cohesion (Mathieu et al., 2015).

Dynamic cohesion-contextual performance relations

Team cohesion and team contextual performance should both be considered emergent properties of teams (Marks et al., 2001; Motowidlo et al., 1997; Weiss & Cropanzano, 1996). Interactions between team members and patterns of behaviors influence the evolution of these variables, ultimately shaping relationships in the team over time. However, the relationships between these variables may develop differently over time. Although research documents that team cohesion and performance are positively, reciprocally related over time (Mathieu et al., 2015), contextual performance has not specifically been examined in relation to cohesion over time.

Mathieu et al. (2015) found differences between the cohesion-performance relationship and performance-cohesion relationship. Which leads to the notion of contextual performance and team cohesion having a reciprocal relationship over time. First, team cohesiveness predicts OCBs (Karau & Hart, 1998) and contextual performance (Beal et al., 2003). Specifically, a team

member who feels their team is cohesive may be more inclined to help others on that team. Alternatively, contextual performance may engender a common sense of humanity in interpersonal relations and identity (e.g., Sun et al., 2007; Ehrhart et al., 2006). This may foster team cohesion through a sense of belonging. Accordingly, creating a supportive climate, one in which contextual performance behaviors are a norm, increases members' attachment towards the group (Mossholder, Settoon, & Henagan, 2005).

Social exchange theory suggests individuals calculate rewards and costs when determining their attitudes towards relationships (Emerson, 1976). High quality social exchange relationships motivate employees to engage in behaviors that drive the attainment of favorable outcomes for the organization. This happens because employees identify with the organization and feel an obligation to support it (Rhoades, Eisenberger, & Armeli, 2001). Specifically, the quality of social exchange between team members leads individuals to engage in different behaviors directed at that group (Cropanzano & Rupp, 2008). This research identifies the reciprocal relationship between team cohesion and contextual performance over time to further understand the changing nature of relationships within interdependent project teams. Examining the stability and magnitude of these relationships provides a greater understanding of the optimal time to focus on certain developmental efforts (e.g., team charters, performance appraisals, training interventions) to promote future team effectiveness (Mathieu et al., 2015; LePine et al., 2000).

Rationale

With teams and teamwork becoming more prevalent within organizations, research now increasingly focuses on studying teams outside of laboratory settings (Salas, Reyes, & McDaniel, 2018). Examining teams in such environments provides practical implications for optimizing

team-based practices (e.g., team training, incentives) within organizations (Salas et al., 2018). However, most research fails to recognize the dynamic nature of teams. Because of this, it is crucial that research focuses on studying teams in a "businesslike" setting, focusing on their dynamic nature while also examining performance (Salas et al., 2018). Researchers now consider temporal aspects in their research to better understand the reality of teams in various situations (e.g., corporate offices, military teams; Salas et al., 2018). In summary, we may understand how teams perform, but we require an understanding of *why* teams perform certain ways and which processes drive performance over extended periods of time.

No two teams are identical, and teams vary in different contexts (Salas et al., 2018). The relationship between contextual performance and cohesion may play out differently depending on the task of the team, the composition of individuals on the team, and team roles (LePine et al., 2000). The nature of this study, contains student project teams with unchanging membership, team incentives, and diverse individuals; this current research project contributes to the literature through a longitudinal examination of "businesslike" teams to shed light on influential changes that may contribute to positive team development.

Abundant research supports the basic idea that individuals are motivated to reciprocate positive treatment (e.g., Deckop, Cirka, & Andersson, 2003). Gouldner (1960) argues this idea of reciprocity stems from the motivation of fulfilling egoistic needs. By sharing good deeds, an individual increases the chances of receiving them in the future (Deckop et al., 2003). Blau (1964) also recognizes that when individuals are working in groups, normative responsibilities may generate indirect links of exchange where everyone ultimately benefits. This repetitive exchange of contextual performance behaviors and the development of this culture can contribute to team cohesion over time by strengthening interpersonal relationships.

Group cohesion has been linked to members displaying helping behaviors (Podsakoff, MacKenzie, & Bommer, 1996). Bolino, Turnley, Gilstrap, and Suazo (2010) argue that in a cohesive group, stronger feelings of attraction and loyalty exist, which promotes the willingness to help one another. In cohesive groups, contextual performance behaviors often become the norm (Bolino et al., 2010). Altogether, this highlights how emotional ties between group members (i.e., team cohesion) may contribute to the exchange of contextual performance behaviors.

Each team is a social system which requires team member to relate to one another for the system to thrive. As team members relate to one another and engage in behaviors, important emergent states and other outcomes emerge. Kozlowski and colleagues (1999) created a model of team compilation, which distinguishes the importance of distinct performance requirements during different stages of a team development, at the individual, dyadic, and team-level. Their efforts differentiate interpersonal activities from task activities in the group development sequence, stressing the importance of interpersonal interactions and member collaboration over time.

Researchers consider team cohesion and contextual performance emergent states (Marks et al., 2001) because these variables are formed through dynamic team member interactions. Increasingly, researchers focus on how psychological phenomena change and evolve over time (Braun, Kuljanin, & DeShon, 2013). As team members interact to complete interdependent work, their behavior and expectations towards one another may change over time (e.g., Adams, 1965), ultimately shaping their perceptions of the team and team cohesion. While behaviors and emergent states (e.g., team cohesion) are likely dynamically related to one another over time, limited empirical research on the topics exists. Thus, the primary contribution of this study

centers on understanding the dynamic nature of the relationship between contextual performance and team cohesion over time.

Behaviors on a team likely exert a strong influence on states. Specifically, I hypothesize the contextual performance and team cohesion association will be stronger than the team cohesion and contextual performance association at multiple time points. This is based on research findings which suggest contextual performance behaviors generate trust and interpersonal attraction (e.g., Sun et al., 2007). Trust and attraction are the basis of altruistic behavior; thus, contextual performance would lead to cohesion and team attachment (Lin & Peng, 2010). For example, teams whose members endorse team objectives, maintain positive attitudes, and help each other are more inclined to reciprocate these activities. This fosters a culture that promotes team cohesion. Work environments characterized by high levels of contextual performance create a collaborative environment and enhance the degree of coordination (Podsakoff & Mackenzie, 1997). This motivates members to be cohesive over time. Contextual performance behaviors refer to those through which an employee gives back to the organization. As such, researchers expect teams with higher contextual performance engender more cohesive work environments. This occurs through a strong sense of commitment to one another and the team mission (Zaccaro et al., 2001).

While this research focuses on team cohesion and contextual performance, controlling for variables expected to relate to these focal constructs proves fundamental. This allows for a more accurate understanding of the relationship between focal constructs (i.e., team cohesion and contextual performance). I expect teams with higher familiarity, task performance, and certain personality configurations will be more cohesive and exhibit greater contextual performance behaviors. First, familiarity with one's group members may affect contextual performance.

Research demonstrates situational factors account for variability in contextual performance (Beaty, Cleveland, & Murphy, 2001). Thus, familiarity amongst group members may lead to increased support and cooperation behaviors compared to groups whose members lack familiarity. Furthermore, a team's task performance impacts certain behaviors. Task performance positively relates to cohesion over time (Mathieu et al., 2015). As such, the team's level of performance may influence member behaviors. For example, lower performance may lead to individuals coming together and bonding while focusing on increasing performance or could lead to individual attributing the poor performance to other team members, leading to blaming and scapegoating behaviors (Mathieu et al., 2015).

Research on contextual performance suggests that personality characteristics strongly predict contextual performance (Borman & Motowidlo, 1993; Motowidlo & Van Scotter, 1994; Van Scotter & Motowidlo, 1996). Different personality dimensions (e.g., agreeableness, conscientiousness), and the relationship between individuals with different personality dimensions, should impact whether individuals engage in contextual performance behaviors and ultimately form a cohesive team. Hurtz and Donovan (2000) conducted a meta-analysis examining the Big Five personality dimensions and the contextual performance dimensions (i.e., job dedication, interpersonal facilitation). The authors found slight, positive correlations between the two contextual performance dimensions and conscientiousness and emotional stability. Overall, the Big Five personality dimensions, familiarity, and task performance will be included as control variables in analyses.

Hypotheses

In general, I predict that contextual performance and team cohesion will be reciprocally related over time, with contextual performance exerting a stronger influence on team cohesion

than team cohesion on contextual performance. I will test this across an early, midpoint, and end of a team project. Specifically, I predict:

> Hypothesis I: The relationship between contextual performance at the beginning of the project and team cohesion at the midpoint of the project will be stronger than the relationship between team cohesion at the beginning of the project and contextual performance at the midpoint of the project.
>
> Hypothesis II: The relationship between contextual performance at the midpoint of the project and team cohesion at the end of project will be stronger than the relationship between team cohesion at the midpoint of project and contextual performance at the end of project.

Methods

A Priori Power Analysis

An a priori power analysis was conducted to determine the power of my intended sample size and anticipated effect sizes for the intended analysis, a cross-lagged panel structural equation model (SEM). To run the power analysis, a simulated a cross-lagged panel was run using the lavaan package in R. The structural paths were specified and indicated the expected population parameters for each path based on theoretical and empirical considerations (Mathieu et al., 2015; Hetzler, 2007; Motowidlo & Van Scotter, 1994). Although a standardized path coefficient of .75 was found between team cohesion and contextual performance in sports teams (Aoyagi, Cox, & McGuire, 2008), a moderate effect size was used (.35), since teams varied in terms of team size and context (Rice & Harris, 2005). Due to the lack of empirical research on the variables of interest and the control variables in team contexts, a small to moderate effect size for personality (.20 divided by each personality dimension; Rice & Harris, 2005), and a small

effect size for familiarity was used (.1; Rice & Harris, 2005). A sample size of 60 teams was estimated to be feasible within the thesis time frame (see Appendix A for model with hypothesized coefficients).

A simulation was conducted that randomly selected a sample of 60 teams from a larger population, with the specified parameter values for the structural paths between the variables. This process was repeated 1000 times, and found that, given the anticipated sample size and anticipated effect sizes, the coefficients could be detected 67% of the time when contextual performance was the outcome variable and 65% of the time when team cohesion was the outcome variable. Therefore, the Type II errors of the study are estimated to be 33% and 35% for when contextual performance and team cohesion are outcomes based on the anticipated sample size. Although this is less than the ideal Type II error of .20 (Cohen, 1992), 67% and 65% statistical power is greater than the typical power level observed in the psychology literature (i.e., Szucs & Ioannidis, 2017), despite the difficult to acquire population (i.e., teams). These power estimates suggest the study is more likely than not to reject the null hypothesis if there is a non-zero effect. Also, conservative estimates of the effect sizes were used, and therefore the Type II error estimate may also be conservative.

Participants

Participants were both undergraduate and graduate students enrolled in a business course at a large Midwestern University. As part of the course, students participated in a mandatory team-based project developed by Capsim. Participation in the research (e.g., completing surveys) was voluntary, with participants able to opt out of the study at any time. Data collection for the purposes of the thesis ended after the fall quarter of 2019, resulting in a team-level sample size of 40 (individual $n = 245$). Overall, the response rate was high. Out of 250 students, 245 responded,

with only one team opting out of participation. Data collection is ongoing for the larger project, with the goal of collecting data on 60 teams.

Age of the participants ranged from 20 years to 55 years (M = 24, SD = 4.27). Participants were 49% males (N=121), 32% females (N=78), and 19% chose not to answer or were absent from class at the time of the demographic survey (N=46). For ethnicity, 48% categorized themselves as Caucasian/White (N=118); 11% categorized themselves as Hispanic/Latinos (N=28); 10% categorized themselves as Asian or Asian American (N=24); 5% categorized themselves as African American/Black (N=13); 41% categorized themselves as American Indian or Alaska Native (N=1); and 25% categorized themselves as other, chose not to respond, or were absent from class at the time of the survey (N=61). The majority of participants were undergraduates with 67% (N= 163); 15% reported themselves as graduate students (N= 37); and 18% chose not to respond, chose other, or were absent from class at the time of the demographic survey (N=45) (See Appendix B for full demographic scale). The majority of students either did not know each other at all or did not know each other well prior to the beginning of this course/quarter (64%; N=157). 16% of the students (N=40) either knew each other somewhat well, well, or very well (See Appendix C for familiarity scale). Teams ranged in size from 4 to 8 members (M = 6.10, SD = 1.10).

Procedure

Data were collected from teams across four, 10-week academic quarters. The business simulation lasted a total of about five weeks (give or take one week), depending on the instructor and their preference of how many decision points to have. For most classes, one to two strategic decisions were made in the first two weeks to allow participants to familiarize themselves with

the simulation process. For the remaining three weeks, two strategic decisions were made per week, for a total of eight decisions throughout the simulation.

Data were collected at three time points during the quarter for each team. At time point 1, an explanation of the study was provided and consent from participants was obtained (see Appendix D for full consent form). From participants who gave consent, individual difference variables were collected, as well as survey measures (i.e., personality, familiarity, team cohesion, contextual performance). The business simulation required teams to work through about eight rounds. In each round, teams made critical business decisions to drive their performance. Time point 1 occurred approximately 3-5 weeks into the quarter after training on the Capsim simulation ended. This training included a number of full-team practice rounds prior to the actual team performance period. Because teams worked together for a few weeks, they were able to rate the cohesion and overall contextual performance of their team. Time point 2 occurred about 6-8 weeks into the quarter, and was midway through the project after 4-5 rounds of the simulation had been completed. Team cohesion and contextual performance were collected at Time point 2. Time point 3 occurred about 9-10 weeks into the quarter, and during the last two rounds of the simulation (i.e., 7-8 rounds). Team cohesion and contextual performance were collected at time point 3, as well as demographic data. The specific week of the academic quarter the surveys were distributed varied depending on when the instructor chose to start the simulation. It should be noted that summer classes differed with the amount of times classes met during the week and how long the quarter lasted. Data from seven teams were gathered from summer courses. These courses still participated in the same simulation, but the calendar week in which they participated in the simulation differed. Time point 1 occurred two weeks into the quarter, time point 2 occurred three weeks into the quarter, and time point 3 occurred five weeks into the quarter. The

time points were still at the start of the project (before the first performance round but after teams trained and completed practice rounds), middle (i.e., after 4-5 performance rounds), and the end (i.e., after 7-8 performance rounds). Figure 1 summarizes how the protocol was administered across the three time points.

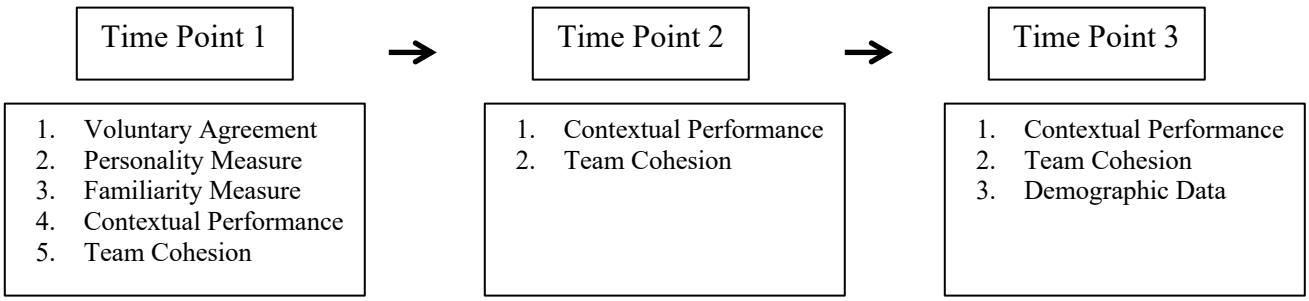

Figure 1. Summary of the Protocol Across Three Time Points.

The Business Simulation. The Capsim business simulation (Smith, 2009) is an important component of the management strategy course. Each team acts as a top management team in charge of an electronic sensor manufacturing company. All teams are responsible for creating a coordinated business strategy across multiple functional areas (e.g., human resources, production, finance) inside their organization. Teams make critical decisions to accomplish the ultimate goal of maximizing organizational performance. All teams must make about eight important operational decisions over the course of roughly eight fiscal years in the simulation. Subsequently, teams received reports from the simulation containing feedback on how the decision altered the organization's performance (e.g., stock price). This simulation has been used in previous research (Fisher et al., 2012; Dierdorff et al., 2011; Mathieu & Schulze, 2006). This simulation is considered an evolving, intimate project for students (Mathieu & Schulze, 2006). Because the simulation is designed to demonstrate the active nature of the business world with dealings such as customer pressures, the simulation provides high-fidelity action, including

threats that real-life managerial teams face (Fisher et al., 2012). Researchers regard teamwork as essential for successful simulation projects.

Measures

Contextual Performance. Contextual performance was reported by individual team members using a scale based on Motowidlo and Van Scotter's (1994) 16-item scale, but adapted to the team context by Hetzler (2007). The scale had a team referent. I removed one item that did not pertain to a student team sample. See Appendix E for the scale. The scale measured both interpersonal facilitation and job dedication aspects of contextual performance. Items were responded to on a 5-point scale (1 = *not at all likely*; 5 = *extremely likely*). Responses to the scale items were aggregated across dimensions to arrive at a scores for each team member. Internal consistency reliability at time point 1 was $\alpha = .90$; time point 2 was $\alpha = .92$; and time point 3 was $\alpha = .93$. Omega coefficients were also run using the psych package and omega function in R. Omega coefficients prove advantageous over alpha, making less assumptions and overcoming problems associated with alphas (Dunn, Baguley, & Brunsden, 2013). Specifically, Omega hierarchical examines the uni-dimensionality (ω_h) and omega total (ω_t) examines the total reliability of a test. Time point 1 showed $\omega_t = .92$ and $\omega_h = .66$; time point 2 was $\omega_t = .94$ and $\omega_h = .73$; and time point 3 was $\omega_t = .95$ and $\omega_h = .79$. Consistent with a referent shift approach, the team mean was used to represent team-level contextual performance by aggregating the individual responses for teams (Chan, 1998).

Team Cohesion. Team cohesion was measured using Mathieu's (1991) 6-item measure (See Appendix F for full scale). This scale measures task and interpersonal cohesion. Items were responded to on a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*). An example item measuring interpersonal cohesion was "There is a feeling of unity and cohesion in my team." An

example item from measuring task cohesion was "members of my team share a focus on our work." For the purposes of this study, the dimensions were aggregated for an overall score for the team. Internal consistency reliability at time point 1 was $\alpha = .90$; time point 2 was $\alpha = .90$; and time point 3 was $\alpha = .92$. Time point 1 showed $\omega_t = .94$ and $\omega_h = .72$; time point 2 was $\omega_t = .94$ and $\omega_h = .79$; and time point 3 was $\omega_t = .96$ and $\omega_h = .77$. Consistent with a referent shift approach, the team mean was used to represent team-level cohesion (Chan, 1998).

Control Variables. Familiarity, task performance, and personality variables were measured as control variables. To measure familiarity, participants were asked, "Overall, how well did you know your team members before this class?" Ratings were made on a 5-point scale (1 = not at all to 5 = very well; Fisher, Bell, Dierdorff, & Belohlav, 2012; see Appendix C for measure). Mean levels were used to aggregate familiarity to the team level for each team.

The 20-Item Mini-IPIP was used to measure personality (see Appendix G for full scale). This measure is a short form of the 50-item International Personality Item Pool—Five-Factor Model measure (Goldberg, 1999; Donnellan, Oswald, Baird, Lucas, 2006). The Mini-IPIP is a useful and practical tool that taps into the Big Five personality constructs and has been found to be nearly as good as the longer 50-item IPIP-FFM scales (Goldberg, 1999; Donnellan et al., 2006). Although shorter in length than the IPIP-FFM scales, the Mini-IPIP had respectable (i.e., well above .60) internal consistencies, reliability, and validity (Donnellan et al., 2006). Ratings were made on a 5-point scale asking the extent each statement described them. An example item includes, "Feel others' emotion." Internal consistency reliability for extraversion captured by the Mini IPIP was $\alpha = .81$, $\omega_t = .90$, and $\omega_h = .77$; conscientiousness was $\alpha = .68$, $\omega_t = .73$, and $\omega_h = .63$; intellect was $\alpha = .76$, $\omega_t = .82$, and $\omega_h = .68$; agreeableness was $\alpha = .81$, $\omega_t = .86$, and $\omega_h = .73$; and neuroticism was $\alpha = .64$, $\omega_t = .70$, and $\omega_h = .64$. Additive effects were expected for the

personality traits on team cohesion and contextual performance, such that as team member's scores increased team cohesion and contextual performance were expected to increase. Thus, mean levels for each team were used to aggregate each personality dimension to the team level. A meta-analysis found support for the relationships between several team composition variables and team performance when the team composition was represented as the team mean (Bell, 2007).

Task performance was operationalized as each team's performance on the business simulation captured at each strategic decision. These complex decisions incorporated actual organizational issues such as human resources, finance, and production (Ellington & Dierdorff, 2014). Accordingly, these are appropriate representations of problems that occur within organizations, illustrating how decisions can impact an organization's performance (Dierdorff et al., 2011). Each time point had a combined overall maximum number of points that could be earned, which represented how well the company was operating at that time. Task performance was pulled from the corresponding three time points when contextual performance and cohesion was measured (i.e., beginning, middle, end). This served as a control variable because differing relationships have been found between team performance and team cohesion over time (e.g., Mathieu et al., 2015).

Results

Preliminary Analyses

A number of preliminary analyses were run prior to testing hypotheses. First, since the focal variables were aggregated to the team level, ICC(1), ICC(2), and r_{wg} were run on team cohesion and contextual performance. Second, because established scales were adapted, factor analysis was used to ensure the intended factor structure of the measures. Third, because data

were collected across multiple time points, measurement invariance over time was examined. These preliminary analyses are detailed next.

Aggregation Support and Assumptions. Team cohesion and contextual performance were anticipated to be shared team-level constructs (Bliese, 2000). Thus, I calculated ICC(1), ICC(2), and r_{wg} (Bartko, 1976) to examine the appropriateness of aggregating the individual responses to the team-level. ICC(1) is a measure of between group variability and ICC(2) is a measure of within group consistency (Bliese, 2000; James, Demaree, & Wolf, 1984). Additionally, r_{wg} is a measure of within-group agreement and was calculated by contrasting the observed group variance and the expected random variance for each team, for the theoretical distribution according to best practices (Bliese, 2000). Although there is no "cut-off" per se, .70 for median r_{wg} values and ICC(2) values, and above a .05 threshold for ICC(1) is traditionally considered sufficient empirical justification for aggregation (Grawitch, Munz, Elliott, & Mathis, 2003). Because there were a few instances of item-level nonresponse for contextual performance, mean item imputation was used (Roth, Switzer, & Switzer, 1999).

For time point 1, analyses revealed an r_{wg} median value of .97, ICC(1) = .07, and ICC(2) = .30 for contextual performance, and an r_{wg} median value of .95, ICC(1) = .18, and ICC(2) = .56 for cohesion. For time point 2, analyses revealed an r_{wg} median value of .98, ICC(1) = .13, and ICC(2) = .45) for contextual performance, and an r_{wg} median value of .96, ICC(1) = .18, and ICC(2) = .57 for cohesion. Lastly, for time point 3, analyses revealed an r_{wg} median value of .98, (ICC(1) = .15, and ICC(2) = .51 for contextual performance, and an r_{wg} median value of .97, ICC(1) = .26, and ICC(2) = .66 for cohesion. For r_{wg} and ICC(1), both contextual performance and cohesion meet the appropriate cut-off scores at each time point. Moreover, none of the ICC(2) statistics meet the .70 cutoff score; however, Allen and O'Neill (2015) examined 109

field studies and found an average aggregation value of .60 (*SD*= .16) for ICC(2). Overall, there is support for aggregation to the team-level for this current study.

Assumptions were tested prior to hypothesis testing. An important assumption of a cross-lag panel analysis is that variables of interest are measured at the same time at each time point, known as synchronicity (Kearney, 2016; Kenny & Harackiewicz, 1979). Additionally, important SEM data assumptions say data should be independent (see ICC and r_{wg}) and scores on predictors should be reliable (no error) (Kline, 2012). Accounting for stability should be included in the model. This assumes that, over time, there are no differences between individuals. In other words, past behavior is the best indicator of current behavior; it is the relationship of one variable at multiple time points (autocorrelation). Accordingly, the path model for this study considers the previous time point as a predictor of the next for both contextual performance and team cohesion.

Factor Analyses. Because the measures used to study the variables of interest were from established scales, confirmatory factor analyses (CFA) were run to determine alignment of items to the appropriate factors for the measurement models. Results were used to ensure the data supported the measurement structure of the scales and to determine if any items should be trimmed from the scales. Hooper and colleagues (2008) described guidelines for determining appropriate model fit. Table 1 shows various model fit indices and the desired threshold for each. While additional fit indices exist, only five, those most commonly used, were chosen for simplicity. Absolute fit indices determine how well the data fits the model (McDonald & Ho, 2002). Incremental fit indices compare the chi-squared value to a baseline model.

Table 1.

Ideal Model Indices

Model Indices	Type of Fit Index	Ideal

Model Chi-square (χ^2)	Absolute fit	Lower value; p-value to be non-significant
Root Mean Square Error of Approximation (RMSEA)	Absolute fit	≤ .05 good fit .05-.08 adequate fit ≥ .10 poor fit
Standardized Root Mean Square Residual (SRMR)	Absolute fit	<.10 favorable <.08 desired
Comparative Fit Index (CFI)	Incremental fit	>.95 → good fit .90-.95 → acceptable
Tucker-Lewis (TLI)	Incremental fit	Closer to 1

First, a CFA model was run for the Mini IPIP. Results of this CFA are reported in Table 2. Items with factor loadings less than .50 on a single factor were deleted, along with items that cross-loaded (i.e., items that loaded onto more than 1 factor above .32) (Worthington & Whittaker, 2006; Ford, MacCallum, & Tait, 1986; Osborne, Costello, & Kellow, 2008). This decision rule resulted in the deletion of one item from the neuroticism scale (N4) prior to forming the scores for each individual. The deletion of N4 resulted in increased reliability of α = .68.

Table 2.

Factor Loadings for Mini IPIP

Item Name	Latent variable	Item	Factor Loading	Standardized Factor Loadings
E1	Extraversion	Am the life of the party.	1	.63
E2	Extraversion	Don't talk a lot. (R)	1.22	.74
E3	Extraversion	Talk to a lot of different people at parties	1.14	.68
E4	Extraversion	Keep in the background. (R)	1.5	.83
C1	Conscientiousness	Get chores done right away.	1	.57

C2	Conscientiousness	Often forget to put things back in their proper place. (R)	1.13	.67
C3	Conscientiousness	Like order.	.67	.51
C4	Conscientiousness	Make a mess of things. (R)	.87	.62
A1	Agreeableness	Sympathize with others' feelings	1	.81
A2	Agreeableness	Am not interested in other people's problems. (R)	.92	.66
A3	Agreeableness	Feel others' emotions.	1.10	.78
A4	Agreeableness	Am not really interested in others. (R)	.75	.63
I1	Intellect	Have a vivid imagination.	1	.64
I2	Intellect	Am not interested in abstract ideas. (R)	.94	.65
I3	Intellect	Have difficulty understanding abstract ideas. (R)	.86	.6
I4	Intellect	Do not have a good imagination. (R)	1.11	.78
N1	Neuroticism	Have frequent mood swings.	1	.67
N2	Neuroticism	Am relaxed most of the time. (R)	.82	.58
N3	Neuroticism	Get upset easily.	.89	.69
N4	Neuroticism	Seldom feel blue. (R)	.39	.29

Note. (R) indicates reverse scored; A= Agreeableness; I= Intellect; E= Extraversion; N= Neuroticism; C= Conscientiousness. All factor loadings were significant with *p*-value=0.

Because the literature endorses a 2-factor model for team cohesion, CFA models were run on 2 factors for each time point (see Appendix H, indicating appropriate factor loadings for two factors). Results show the data taps into the two intended dimensions of interpersonal cohesion and task cohesion. Chi-squared difference tests were computed to determine the appropriate number of factors to retain for hypotheses testing (e.g., a model with 1 factor versus a model with 2 factors). Results were significant, showing a two-factor model explained the data best at each time point. Time point 1: $\chi^2(1) = 91.38$, $p < .001$; time point 2: $\chi^2(1) = 107.21$, $p < .001$; time point 3: $\chi^2(1) = 121.28$, $p < .001$. For the purposes of this thesis, only interpersonal

cohesion will be used from this point on. This is done because this dimension more closely maps onto the rationale and hypothesized relationship between team cohesion and contextual performance. Contextual performance refers to behaviors that correspond to supporting the social context (LePine et al., 2000); this gives reasoning to believe contextual performance and interpersonal cohesion may reveal a stronger relationship. Reliability for interpersonal cohesion at all three time points were adequate; time point 1: $\alpha = .88$; time point 2: $\alpha = .89$; and time point 3: $\alpha = .93$.

For contextual performance, the literature argues for both 1 and 2 dimensions (Van Scotter & Motowidlo, 1996; Edwards et al., 2013; Hetzler, 2007). However, because this scale was adapted to the team-level and which items fall under which dimensions are not explicit in the literature, a Principal Component Analysis (PCA) was run to determine the number of factors and the associated items to factors. Data across all three time points were collapsed. The component matrix revealed a two-factor model with cross loadings (see Table 3). Items that cross loaded were deleted (i.e., CP2, CP6, CP10, and CP11). Factors should have at least two items that are high loading onto the factor; thus, factor two will not be considered (Nunnally & Bernstein, 1994).

Table 3.

Factor loadings for Contextual Performance, All Time Points

Name	Latent variable	Item	Factor 1	Factor 2
CP1	Contextual Performance	Complies with instructions even when the instructor or other group members are absent?	.7	
CP2	Contextual Performance	Cooperates with each other?	.73	.41
CP3	Contextual Performance	Persists in overcoming obstacles to complete a task?	.73	
CP4	Contextual Performance	Volunteers for additional work or responsibilities?	.74	

CP5	Contextual Performance	Follows the rules of the project and avoid shortcuts?	.69	
CP6	Contextual Performance	Takes on more challenging tasks?	.74	-.39
CP7	Contextual Performance	Offers to help each other with their work?	.73	
CP8	Contextual Performance	Pays close attention to details?	.73	
CP9	Contextual Performance	Defends the course instructor's decisions?	.59	
CP10	Contextual Performance	Is courteous to each other?	.57	.58
CP11	Contextual Performance	Support and encourage each other when there is a problem?	.69	.43
CP12	Contextual Performance	Takes the initiative to solve problems?	.78	
CP13	Contextual Performance	Exercises personal discipline and self-control?	.72	
CP14	Contextual Performance	Tackles difficult assignments enthusiastically?	.75	
CP15	Contextual Performance	Volunteer to do more than they should for the benefit of the group?	.72	

Note. Results from PCA.

Measurement Invariance. Because cohesion and contextual performance were collected at multiple time points, measurement invariance was examined to determine the stability over time (Maynard, Luciano, D'Innocenzo, Mathieu, & Dean, 2014). Similar to the methods of Maynard et al., (2014), both configural (i.e., similar number of factors and items over time) and metric models (e.g., adding in a constraint of similar factor loadings over time) were examined evaluating the three time points simultaneously.

First, for team cohesion, a configural invariance model was conducted examining a one factor model factor with the same factor loading patterns. Following this, a metric factorial invariance model was examined with factor loadings constrained to be equal. A chi-squared difference test was computed between these two models, revealing significance ($\chi^2(10) = 26.68$, $p < .01$). This indicates constraining factor loadings to be equal fits the data worse. However, the

configural model was found to be non-significant (χ^2= 414.31, $p < .05$, CFI = .85, TLI = .74, RMSEA = .27; SRMR = .07), which shows team cohesion operates differently across time points (Vandenberg & Lance, 2000). Since the literature argues for team cohesion having two dimensions (Mathieu, 1991), a two-factor model was also run indicating the same chi-square difference test results between the configural invariance model and metric invariance model ($\chi^2(8) = 22.05$, $p < .01$). The configural invariance model was significant with the exception of RMSEA (χ^2= 94.44, $p < .05$, CFI = .97, TLI = .95, RMSEA = .12; SRMR = .03). This shows that across time points, students may use the same factor structure (i.e., two factors) when thinking about cohesion (Vandenberg & Lance, 2000).

Contextual performance was also collected at three time points. Thus, measurement invariance was examined to determine if there were differences across time points (Maynard et al., 2014). First a configural invariance model was conducted examining one factor and the same factor loading patterns (χ^2= 998.06, $p < .05$, CFI = .84, TLI = .81, RMSEA = .17; SRMR = .07). Following this, a metric factorial invariance model was examined with factor loadings constrained to be equal (χ^2= 1029.12, $p < .05$, CFI = .84, TLI = .83, RMSEA = .11; SRMR = .08). A chi-squared difference test was computed between these two models, revealing non-significance ($\chi^2(28) = 31.09$, $p > .05$. Taking this a step further, a strong factorial invariance model was run, constraining factor loadings and intercepts to be equal (χ^2= 1089.21, $p < .05$, CFI = .83, TLI = .84, RMSEA = .11; SRMR = .08). A comparison between the metric and strong factorial invariance models were run, revealing a significant difference between the models ($\chi^2(20) = 60.09$, $p < .05$). With the lower fit indices, we cannot assume contextual performance is being measured similarly across time points.

Since contextual performance will be evaluated with the four items deleted for hypothesis testing, this was taken into consideration when determining measurement invariance across the three time points. With the four items deleted for contextual performance, a configural invariance model was once again conducted examining one factor and the same factor loading patterns at each time point (χ^2= 410.29, $p < .05$, CFI = .91, TLI = .88, RMSEA = .10; SRMR = .05). Following this, a metric factorial invariance model was examined with factor loadings constrained to be equal (χ^2=429.29, $p < .05$, CFI = .91 TLI = .90, RMSEA = .10; SRMR = .06). A chi-squared difference test was computed between these two models, and indicated the models were not significantly different from one another ($\chi^2(20) = 19.00$, $p > .05$. To further examine measurement invariance across time points adding an additional constraint, a strong factorial invariance model was run, constraining factor loadings and intercepts to be equal (χ^2= 476.91, $p < .05$, CFI = .90, TLI = .90, RMSEA = .10; SRMR = .07). A comparison between the metric and strong factorial invariance models showed a significant difference between models $\chi^2(20) = 47.62$, $p < .05$. Overall, support exists for comparing factors and factor loadings across time points, following the deletion of the four items. This demonstrates the scale performs similarly across time points (Vandenberg & Lance, 2000).

Overall, the preliminary analyses suggest support for aggregation. Factor analyses uncovered necessary scale trimming (i.e., trimmed neuroticism and contextual performance scales) prior to hypothesis testing. Also, preliminary analyses revealed that team cohesion is measured by two factors. For the purposes of this study, only the facet closest to the theorized effect of interest (i.e., interpersonal cohesion) will be used for further analyses. Lastly, analyses revealed the extent to which measures are comparable across time; demonstrating the deleted scale items may have been the reason for longitudinal measurement inequivalence (Vandenberg

& Lance, 2000). Table 4 displays descriptive statistics for study variables with appropriate scale modifications.

Table 4

Means, Standard Deviations, and Correlations of Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Team Size	6.08	1.10															
2. Agreeableness	3.28	0.33	-.23														
3. Extraversion	2.84	0.42	.03	.31*													
4. Conscientious	3.23	0.32	.24	-.18	-.09												
5. Neuroticism	2.21	0.35	.19	-.23	-.10	-.04											
6. Intellect	3.09	0.33	-.26	.14	.16	-.25	-.12										
7. Familiarity	1.76	0.93	-.50**	.32*	-.05	-.15	-.10	-.04									
8. CP1	3.94	0.30	.18	.19	.41**	.15	.02	.01	-.16								
9. CP2	4.25	0.37	.17	.10	.12	.21	-.03	-.05	-.25	.52**							
10. CP3	4.38	0.35	.11	.03	.19	.18	-.18	.12	-.38*	.53**	.71**						
11. TC1	3.78	0.50	-.44**	.42**	.32*	-.04	-.26	.18	.26	.53**	.35*	.42**					
12. TC2	4.25	0.51	-.13	.16	.27	.07	.02	.08	.09	.46**	.75**	.50**	.66**				
13. TC3	4.40	0.54	-.13	.09	.25	-.06	-.22	.19	.01	.37*	.57**	.69**	.59**	.70**			
14. PerformamceTP1	0.00	1.00	-.18	-.16	.06	.26	-.02	-.17	-.05	.13	.01	-.05	.03	.05	-.02		
15. PerformanceTP2	0.00	1.00	-.00	-.20	.00	.24	-.09	-.15	.15	.19	-.09	-.26	.20	.15	.01	.53**	
16. PerformanceTP3	0.00	1.00	.17	-.05	-.03	.20	.21	-.14	.25	.23	.06	-.18	.18	.28	-.03	.20	.71**

Note. M and *SD* are used to represent mean and standard deviation, respectively. CP indicates contextual performance; TC represents interpersonal team cohesion; TP indicates time point. * indicates $p < .05$. ** indicates $p < .01$

Hypotheses Testing

Measurement Model. Hypotheses 1 and 2 predicted that the contextual performance → team cohesion relationships will be stronger than the team cohesion → contextual performance relationships. Hypothesis 1 and 2 were tested with cross-lagged panel analysis at the team level (Kenny, 1975; Mathieu et al., 2015) within the SEM framework. Specifically, the hypotheses can be identified by comparing the relative magnitude of the parameter estimates (Mathieu et al., 2015). The model and hypothesized relationships are presented in Figure 2. Personality, familiarity, and task performance were included as control variables.

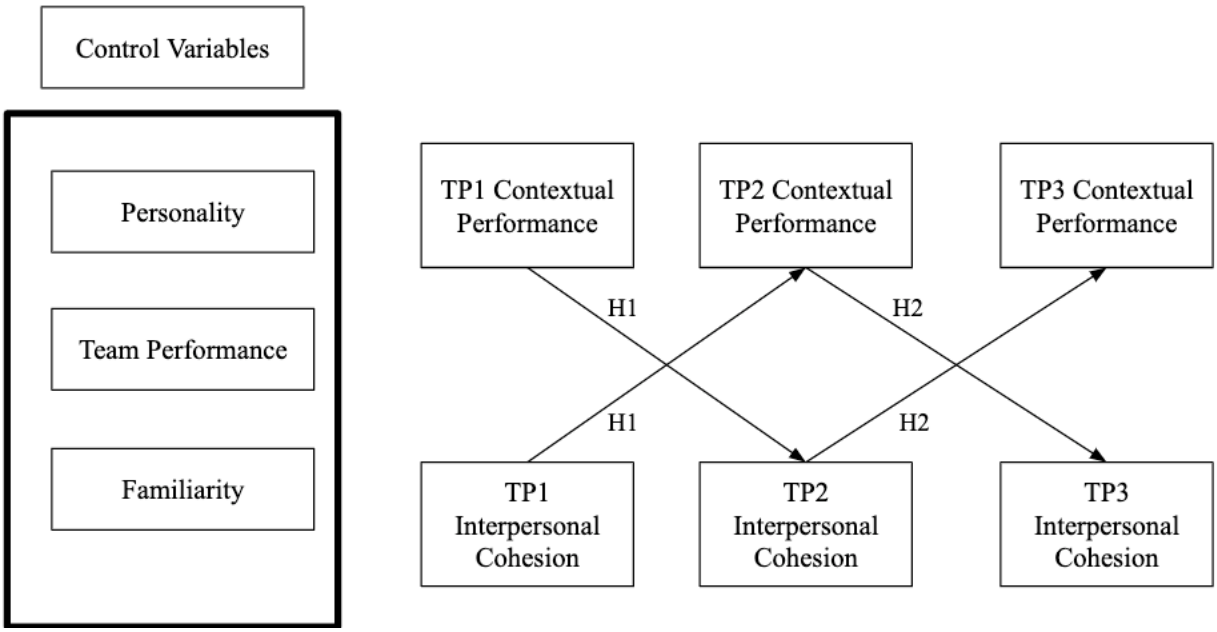

Figure 2. Cross-Lag Panel Analysis Model with Hypothesized Paths. TP= Time point.

Because of the limited sample size, three different models were estimated to determine the significance of the control variables on the hypothesized paths in order to retain the suitable control variables when testing hypotheses (i.e., personality variables, task performance at time point 1 and 2, and familiarity). Additionally, a valid measurement model was needed in order to test it structurally; thus, model fit was assessed, and modifications were considered. Examination

of the first model shows neuroticism as the only personality variable significantly related to a hypothesized variable – cohesion – at time point 3 (see Figure 3 for significant path coefficients for personality variables only; see Appendix I for all path coefficients and standard errors). Additionally, model fit was low; thus, model modifications to increase fit called for interpersonal cohesion at time point 2 to covary with contextual performance at time point 2. This modified model fit significantly better ($\chi^2(1) = 39.82$, $p < .001$), with fit indices demonstrating adequate fit with the exception of TLI and RMSEA ($\chi^2 = 9.10$, $p > .05$, CFI = .964, TLI = .70, RMSEA = .18; SRMR = .03). For hypothesis testing, only the significant path from neuroticism to interpersonal cohesion will be used, along with the appropriate model modifications. This shows team-level average neuroticism is negatively, significantly related to interpersonal cohesion at time point 3.

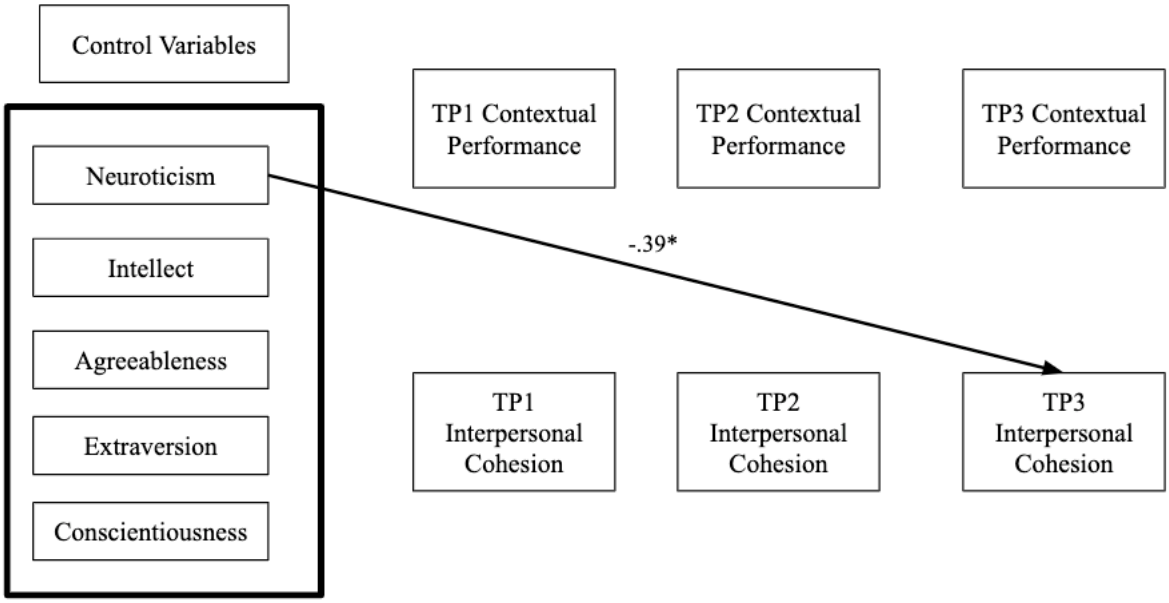

Figure 3. Controlling for Personality Variables. TP= Time point; ** = path significant at the two-tailed $p < .01$ level; * = path significant at the two tailed $p < .05$ level. $N = 40$ teams.

The next model controlled for team performance. Team performance at time point 1 was a control for contextual performance and interpersonal cohesion at time point 2. Team performance at time point 2 was a control for contextual performance and interpersonal cohesion

at time point 3. A significant path was found from team performance at time point 2 to contextual performance at time point 3 (see Figure 4 for significant path coefficients for team performance only; see Appendix J for all path coefficients and standard errors). Additionally, model fit was low; thus, model modifications to increase fit called for interpersonal cohesion at time point 2 to covary with contextual performance at time point 2. This model fit significantly better ($\chi^2(1) = 33.03$, $p < .001$), with model fit indices showing adequate fit with the exception of TLI and RMSEA ($\chi^2= 19.46$, $p < .05$, CFI = .92, TLI = .78, RMSEA = .19; SRMR = .07). For hypotheses testing, only the significant path from team performance at time point 2 to contextual performance was used, along with the appropriate model modifications. This shows team performance at time point 2 is negatively, significantly related to contextual performance at time point 3.

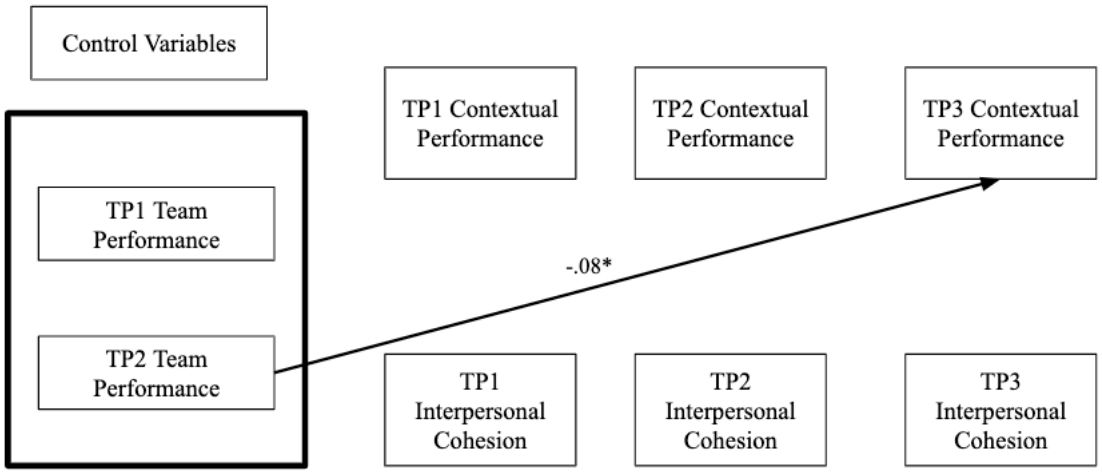

Figure 4. Controlling for Team Performance. TP= Time point; ** = path significant at the two-tailed $p <$ .01 level; * = path significant at the two tailed $p < .05$ level. $N = 40$ teams.

The last model controlled for familiarity at time point 2 and 3. A significant path was found from familiarity to contextual performance at time point 3 (see Figure 5 for significant path coefficients for familiarity only; see Appendix K for all path coefficients and standard

errors). Additionally, model fit was low; thus, model modifications to increase fit called for interpersonal cohesion at time point 2 to covary with contextual performance at time point 2. This model fit significantly better ($\chi^2(1) = 34.52$, $p < .001$), with model fit indices showing adequate fit with the exception of TLI and RMSEA ($\chi^2 = 11.87$, $p < .05$, CFI = .95, TLI = .76, RMSEA = .22; SRMR = .06). For hypotheses testing, only the significant path from familiarity to contextual performance at time point 3 was used, along with the appropriate model modifications. This shows average team-level familiarity is negatively, significantly related to contextual performance at time point 3.

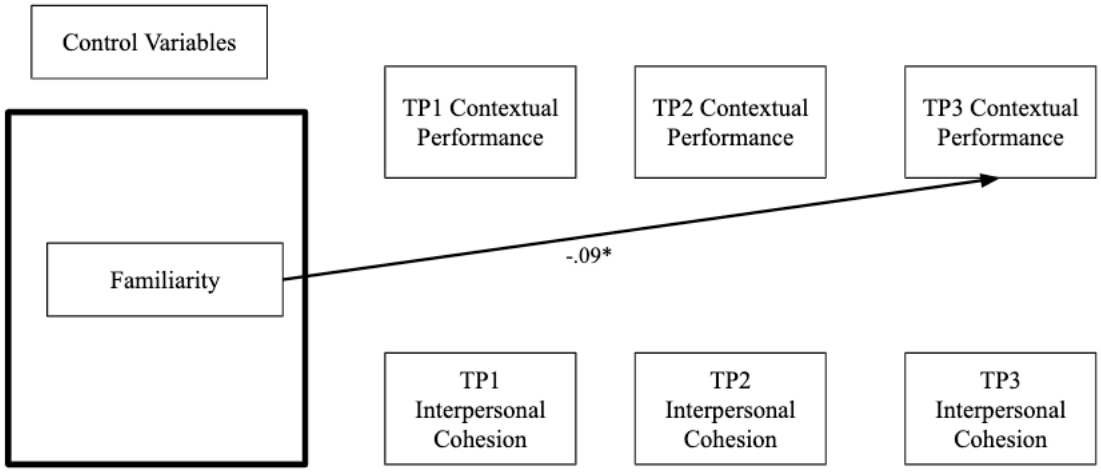

Figure 5. Controlling for Familiarity. TP= Time point; ** = path significant at the two-tailed $p < .01$ level; * = path significant at the two tailed $p < .05$ level. $N = 40$ teams.

Cross-Lagged Path Model. Preliminary analyses provided guidance for model modifications for hypothesis testing. This includes: (1) modification of scales, (2) significant paths to include for control variables, (3) and model modifications necessary for appropriate model fit (i.e., interpersonal cohesion at time point 2 to covary with contextual performance at time point 2). This path analysis compares cross-lagged relationships between contextual performance and interpersonal cohesion (Kearney, 2016). The model presented assumes that

stability is solely a function of the previous time point (Kearney, 2016), such that interpersonal cohesion and contextual performance should be predicted by the earlier measurement of the same variable in the previous time point (e.g., contextual performance at time point 1 predicts contextual performance at time point 2). Cross-lagged panel analysis effectively describes delayed relationships between two or more variables. For instance, comparing the relative sizes of the cross-lagged coefficients (Kearney, 2016). In this study for example, the relationships between contextual performance at time point 1 and interpersonal cohesion at time point 2, and between contextual performance at time point 2 and interpersonal cohesion at time point 3. Similarly, the relationship of interpersonal cohesion at time point 1 and contextual performance at time point 2 and the relationship of interpersonal cohesion at time point 2 and contextual performance at time point 3. In sum, hypotheses are tested by calculating the relationship between contextual performance and interpersonal cohesion while accounting for the autoregressive effects, significant control variables at the appropriate time points, and model modifications necessary for appropriate model fit. The sample size only reached 40 teams, resulting in a much lower sample than anticipated from the a priori power analysis. As a result, analyses focus on parameter descriptives, as opposed to the significance of parameter estimates. Data will continue to be collected to increase power for future analyses.

Specifically, the model allowed for interpersonal cohesion at time point 2 to covary with contextual performance at time point 2. Additionally, model modifications called for neuroticism regressing on contextual performance at time point 3 and performance at time point 2 regressing on contextual performance at time point 2. Following these additions, the model fit indices showed adequate fit with the exception of TLI and RMSEA (χ^2= 25.84, $p > .05$, CFI = .91, TLI = .79, RMSEA = .18; SRMR = .07). Figure 6 illustrates the path model containing all paths tested.

Hypothesis 1 predicted that the relationship between contextual performance at the beginning of the project and team cohesion at the midpoint of the project would be stronger than the relationship between team cohesion at the beginning of the project and contextual performance at the midpoint of the project. In support of hypothesis 1, the relationship between contextual performance at time point 1 and interpersonal cohesion at time point 2 was .27 (95% confidence interval (CI): [-.19, .73]), as compared to the relationship of interpersonal cohesion at time point 1 and contextual performance at time point 2 of .10 (95% CI: [-.13, .32]). However, it should be noted that neither path was statistically significant (i.e., contextual performance time point 1 to cohesion time point 2: $p = .26$; cohesion time point 1 to contextual performance time point 2: $p = .40$).

Furthermore, hypothesis 2 was not supported. The relationship between contextual performance at time point 2 and interpersonal cohesion at time point 3 was .12 (95% CI: [-.34, .59]), as compared to the relationship of interpersonal cohesion at time point 2 and contextual performance at time point 3 of .15 (95% CI: [-.07, .36]). Furthermore, neither path was statistically significant (i.e., contextual performance time point 2 to cohesion time point 3: $p = .60$; cohesion time point 2 to contextual performance time point 3: $p = .18$). All paths contained 0 between the lower confidence interval and the upper confidence interval (see Appendix L for all path coefficients and standard errors).

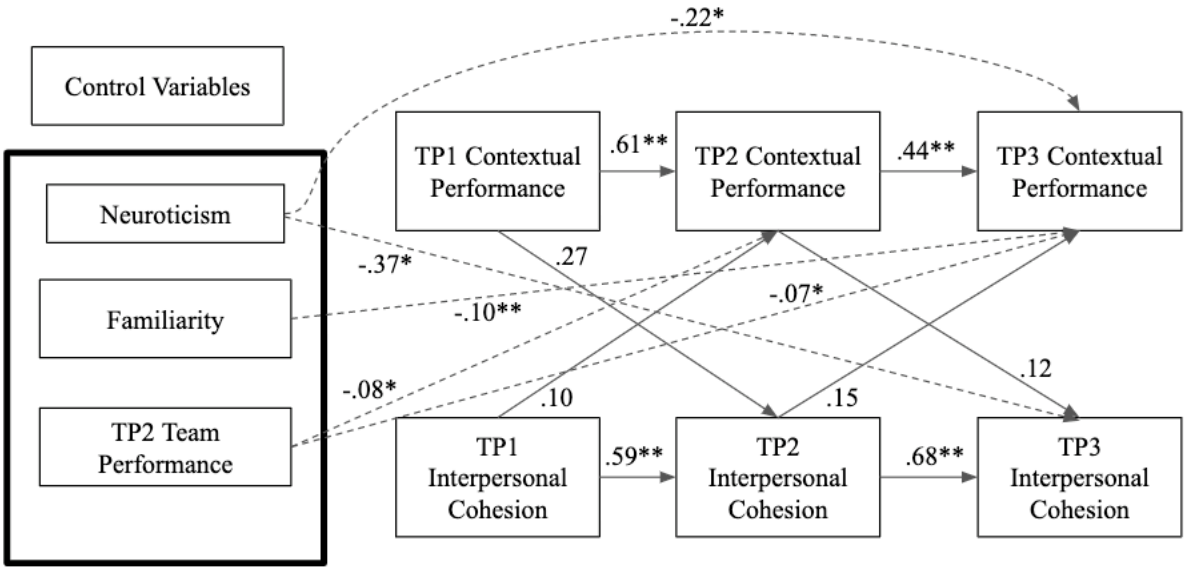

Figure 6. Path Model. TP= Time point; ** = path significant at the two-tailed $p < .01$ level; * = path significant at the two tailed $p < .05$ level. $N = 40$ teams. Dash lines represent control variable paths.

Due to the small sample size and therefore lower power than anticipated, this prompted exploratory analyses on the hypothesized relationships. These analyses compared correlations for the hypothesized paths to determine if any significant differences between the bivariate relationships existed. First, correlations were computed for the hypothesized paths and comparisons of non-overlapping correlations based on dependent groups were examined for hypothesis 1 and 2. The package cocor was used in R. This test is used when comparing two samples from the same group with no variables in common. The alternative hypothesis was one-sided (e.g., the contextual performance at time point 1 and interpersonal cohesion at time point 2 relationship is stronger than the interpersonal cohesion at time point 1 and contextual performance at time point 2 relationship) with a .05 alpha level. The correlation between contextual performance at time point 1 and interpersonal cohesion at time point 2 was $r(38) = .46$, $p < .01$. The correlation between interpersonal cohesion at time point 1 and contextual performance at time point 2 was $r(38) = .35$, $p < .05$. The null hypothesis was not rejected with a

p=.23; therefore, the comparison of these two correlations revealed no significant differences. Examination of hypothesis 2 shows the correlation between contextual performance at time point 2 and interpersonal cohesion at time point 3 was $r(38) = .57$, $p < .01$. The correlation of interpersonal cohesion at time point 2 and contextual performance at time point 3 was $r(38) = .50$, $p < .01$. Again, the null hypothesis was not rejected with a p=.28; consequently, the comparison of these two correlations revealed no significant differences. Results uncover that, when not considering other variables using a cross-lagged path model (e.g., task performance, familiarity), the relationship between contextual performance and interpersonal cohesion does not significantly differ across time.

Discussion

Organizations are increasingly turning to teams to achieve their organizational goals (Kozlowski & Bell, 2013; LePine et al., 2000). Behaviors that contribute to the psychological environment can aid in enhanced outcomes (e.g., team effectiveness). The purpose of this study was to examine team cohesion and contextual performance over time by evaluating the reciprocal relationship and the strength of these variables over time.

Theoretical Implications

It was hypothesized that contextual performance at time point 1 and 2 would have a stronger relationship with cohesion (interpersonal cohesion was examined) at time points 2 and 3. Hypothesis 1 was supported while hypothesis 2 was not. Supporting hypothesis 1, the strongest coefficient found was between contextual performance at time point 1 and interpersonal cohesion at time point 2. This relationship noticeably decreased over time. On the other hand, the interpersonal cohesion and contextual performance relationship increased over time. Analyses revealed the relationship between interpersonal cohesion at time point 2 and

contextual performance at time point 3 was larger than the relationship between contextual performance at time point 2 and interpersonal cohesion at time point 3. Overall, the hypotheses were not statistically significant. However, this may be telling for future research, as it demonstrates contextual performance may have a stronger influence on interpersonal cohesion but an opposite effect toward the end of project completion. This finding may originate from the idea that team cohesion needs time to develop and solidify to have an impact (Mathieu et al., 2015). Accordingly, this may impact future research around team development to provide insights on how to better manage teams. The pattern of results warrants additional research of understanding how behaviors and emergent states coevolve, especially through midpoint transitions (Gersick, 1988; e.g., Mathieu et al., 2015).

The contextual performance and team cohesion relationship does not evolve without being influenced by other variables; notably, several of the control variables were significantly related to both interpersonal cohesion and contextual performance. Specifically, neuroticism negatively related to both interpersonal cohesion and contextual performance at time point 3. Familiarity negatively related to contextual performance at time point 3. Team performance negatively related to both contextual performance at time point 2 and 3.

First, it is not surprising that neuroticism negatively related to contextual performance and interpersonal cohesion. We expect that higher levels of neuroticism on a team, lead individuals to engage in fewer contextual performance behaviors. This ultimately impacts whether a team feels cohesive (Hurtz & Donovan, 2000; Shaw, 1976). The norm of reciprocity (Gouldner, 1960) speaks to individuals interacting, such that individuals should reciprocate positive interactions and behaviors. However, a team with higher levels of neuroticism may inhibit this reciprocation. This occurs because highly neurotic teams experience increased

conflict stemming from neurotic norms (e.g., more hostility) (Bradley, Klotz, Postlethwaite, & Brown, 2013; Deckop et al., 2003). As noted by LePine et al. (2000), not all personality variables impact a team environment in the same way. Although it seems surprising other personality variables did not demonstrate significant paths with the hypothesized variables, the context (e.g., student project teams) and the combination of other individual differences may contribute to this finding (LePine et al., 2000; Hackman, 1992). Other variables that could contribute to the hypothesized paths could include collectivism, preference for teamwork, and the group design (Bell, 2007; Hackman, 1992). Researchers find these variables impact team performance (Bell, 2007; Hackman, 1992). Ultimately, these variables may impact whether someone engages in contextual performance behaviors or feels their team is cohesive.

Familiarity was negatively related to contextual performance at time point 3. This suggests that those who were more familiar with each other perceived their team to engage in less contextual performance behaviors by the end of the project. When considering situational strength theory, this result is particularly interesting as previous research suggests the opposite effect. In “strong” situations, individuals form expectations regarding how to behave; as time increases, individuals better understand how to act interpersonally (Mischel, 1977; Harrison, Mohammed, McGrath, Florey, & Vanderstoep, 2003; Beaty et al., 2011). Alternatively, in a “weak” situation, expectations regarding how to behave are ambiguous (Mischel, 1977; Beaty et al., 2011). Accordingly, it was expected that those who knew each other before the start of the project (e.g., a stronger situation) would be more inclined to perform contextual performance behaviors toward the team. This happens because team member expectations exist regarding suitable behaviors. Nonetheless, the fact that this negative relationship was significant at the last time point tells us that those who are more familiar with each other may not feel the need to

continue to engage in contextual performance behaviors by the end of the project. Through a groups development, those who felt more comfortable with each other may not have seen the benefit of engaging in such behaviors.

Lastly, team performance at time point 2 negatively related to contextual performance at time point 2 and 3. This is somewhat surprising because contextual performance behaviors should be particularly important toward the end stages of group development (LePine et al., 2000). This finding may indicate teams that are performing better over time feel less obligation to engage in such behaviors. Over time, teams develop norms and focus on achieving set goals to drive performance. Contextual factors such as the time in the quarter in which constructs were measured may contribute to this finding as well. For instance, toward the end of a quarter, classes are more intense, with higher workloads. Therefore, when teams are performing well, individuals may not behave in ways that would usually improve team effectiveness, since they feel those behaviors are no longer necessary (Hetzler, 2007).

Applied Implications

Hypotheses 1 was supported. A stronger relationship emerged between contextual performance at timepoint 1 and interpersonal cohesion at time point 2 than between interpersonal cohesion at time point 1 and contextual performance at time point 2. This finding demonstrates the importance of organizational teams first creating an environment of fulfilling contextual performance behaviors rather than trying to jump-in and create a cohesive team off the bat (LePine et al., 2000). The notion that cohesive teams may still form counterproductive work behaviors supports this finding (Stogdill, 1972). In the beginning of team development, individuals acquire interpersonal knowledge, gain shared perceptions of the climate, and form group norms (Kozlowski et al., 1999). These contextual performance behaviors may be stressed

during training or the creation of team charters. Furthermore, these behaviors may be required for performance management purposes at the start of a team project (LePine et al., 2000).

Moreover, hypothesis 2 was not supported; a reverse effect was found. Interpersonal cohesion at time point 2 had a stronger relationship with contextual performance at time point 3 than the reverse relationship. Nonetheless, this may shed light on the importance of maintaining cohesion and contextual performance over time within teams. This finding also highlights the importance of continued efforts to build cohesion throughout the duration of the project. Around the midpoint, team members work to reach goals, roles are identified, and personalized interactions are formed (Kozlowski et al., 1999). Building cohesion may aid in the development of contextual performance behaviors even toward the end of the project. This may ultimately increase team performance (Mathieu et al., 2015).

An additional implication of this study revolves around the consideration of team composition. Negative relationships between neuroticism, and both cohesion and contextual performance at time point 3, demonstrations the configuration of teams should be carefully considered. Furthermore, the management of these teams over time must also be a focus. Consider the previously mentioned notion that teams are social systems, in which individuals are inputs. Interactions and behaviors feed into critical outcomes over time. If a team creates neurotic norms throughout its lifecycle, individuals may perceive the team as less cohesive or these norms could impact positive actions towards one another. The exchanges of these positive behaviors, known as contextual performance, will decrease because individuals feel their actions will not be reciprocated. Thus, team members may not see a benefit of engaging in contextual performance behaviors (Blau, 1964; Deckop et al., 2003). In some cases, individuals may belong to a team which displays negative behaviors (e.g., high hostility, conflict). Understanding how to

manage these behaviors may prove beneficial for creating highly cohesive teams (Kozlowski et al., 1999). Team interventions and trainings are seen as viable options for managing toxic behaviors. An understanding of the stages of group development at which teams should address these toxic behaviors ensures permanent harm is not inflicted on a team's social and psychological climate (Kozlowski et al., 1999; LePine et al., 2000).

Along these lines, this study suggests that the influence of situational factors on team processes over time. The negative relationship between team performance at time point 2 with contextual performance at both time point 1 and 2 demonstrates this impact. This finding suggests that how a team is performing at the middle of the project (i.e., as opposed to the beginning), may influence whether individuals feel the need to engage in behaviors that enhance the social environment. This is a potential consideration that teams may address during team trainings. Additionally, as teams complete small project tasks and work toward short-term goals, reminding individuals to engage in behaviors that support the overall environment proves vital. Taking this a step further, including contextual performance behaviors in the job description and as criteria for performance appraisals may motivate employees to consistently engage in such behaviors.

Additionally, teams with higher average familiarly were less likely to engage in contextual behaviors. Overall, the importance of a team's environment, and its temporal nature, are important considerations when simultaneously studying team dynamics and team performance (Kozlowski et al., 1999; Salas et al., 2018). Team members with familiarity may withdraw from performing behaviors that enhance the environment. Thus, ensuring individuals still understand how their behaviors impact the response of other individuals' behaviors is critical to promote the exhibition of behaviors that benefit social environment (Goulder, 1960).

Consistent with social exchange theory (Emerson, 1976), organizational teams must be aware of the implications associated with forming teams based on member familiarity. This grouping may negatively impact the social environment in which teams work, such that members engage in fewer helping behaviors beyond what is expected (e.g., in job descriptions).

Strengths and Limitations

This research has several strengths including the use of a high-fidelity business simulation, the collection of variables over time, and a high response rate. First, with the amplified need for teamwork skills in organizations, business schools include team-based business simulations into courses to provide students the required expertise for a competitive employment edge (Hasen, 2006). Business simulations provide opportunities to not only gain the knowledge and skills for making business decisions, but also the skills for effectively working on a team. The Capsim simulation used in this study is one of the leading business simulations utilized in business schools (Chasteen, Szot, & Teach, 2018). This simulation also engages students in competitive, yet collaborative, businesslike work. Tasks in this simulation contain both proximal goals and an overall distal goal, which motivate students toward continuous improvement. This ensures teams use appropriate strategies for effectively completing complex tasks (Latham & Seijts, 1999).

The longitudinal design of this study forms another strength. For a study to be considered longitudinal, there should be at least three time points at which the variables of interest are measured (Pitariu & Ployhart, 2010). Collecting data longitudinally allowed the ability to examine how relationships between variables changed over time. This study collected data at three time points in order to examine the coevolution of team cohesion and contextual performance. Additionally, the longitudinal aspect allowed for the testing of control variables as

they interacted with the main variables over time. The temporal nature of this project takes into consideration the dynamic nature of teams by accounting for unstable environmental demands, changing relationships, and regular interactions. This longitudinal design revealed when the relationships between contextual performance and cohesion were stronger and at which point the control variables demonstrated significant relationships with these focal constructs over time.

Another strength of this study is the high response rate. Survey responses were collected in-person with paper and pencil. This allowed for a higher response rate as this method eliminated the possibility of technical issues. Additionally, students were given the opportunity to complete the surveys before class. However, one entire team did not participate in the research project. Furthermore, one team on which data were collected was composed of only two individuals. With the variables of interest aggregated to the team-level, individual responses are expected to be similar to the extent they may be considered identical (Bliese, 2000). To this point, missing responses from individuals on one team should not unfavorably impact the examination of team-level constructs. Additionally, researchers suggest average organizational survey response rates fall around 50% (Baruch & Holtom, 2008). The 98% response rate in this study clearly surpasses the average organizational survey response rate of 50%. Thus, the response rate achieved in this study indicates an additional strength.

There are several limitations to this study which may inform future research. First, the sample size needed for adequate power was not reached, even with a high response rate. Thus, this provides limited statistical power for discovering true effects. An a priori power analysis was conducted prior to the study in order to determine the desired sample size for acceptable power. This analysis showed 60 teams were needed to attain a range of power between 65%-67% for hypothesized paths. Since data collection was completed at the end of the fall quarter, this study

ended with a sample size of 245 students comprising 40 teams. These efforts did not provide adequate power. Accordingly, this may have contributed to the lack of significant findings between hypothesized variables. A larger sample size ensures higher power, which, in this study, may have resulted in greater confidence in the findings. However, considering the challenges associated with collecting team-level data over time, the sample size achieved provided some promising results. For example, the findings regarding the control variables across time points and the support for hypothesis 1. The low sample size and high number of variables specified in the path model call the authenticity of the conclusions into question (Bearden, Sharma, & Teel, 1982). Overall, this points to the need for a larger sample size. As such, data collection will continue until the intended sample size is collected.

The use of student project teams comes with limitations. The use of student project teams may not completely represent the nature of organizational work teams. This may limit the potential for generalizability. However, the use of student teams allowed for high structure, in terms of unchanging membership after the formation of initial teams and control of extraneous variables (e.g., task switching) (Mathieu et al., 2015). While these student teams may not fully mirror organizational project teams, students engaged in a high-fidelity simulation wherein they received feedback on decisions made throughout the duration of the project. The final project grade operated as the reward toward which students directed their efforts (Mathieu et al., 2015). This suggests students were motivated to interact in order to successfully complete project deliverables.

Lastly, this study was correlational. Without a manipulation and random assignment, causal claims cannot be made. Despite this limitation, the purpose of a cross-lagged panel analysis is to determine relationships between variables across time (Selig & Little, 2012). This

study examined the longitudinal associations between variables. These findings serve as a basis for future research in determining casual relationships with an appropriately designed study.

Future Directions

In this section, I identify a few potential areas in which future research investigations may focus to build upon this study. One area for future research centers around understanding the emergence of team cohesion and contextual performance. This study aggregates these variables to the team-level. However, researchers may want to consider these variables at the individual-level to examine the emergence from the individual-level to the team-level. Bottom-up emergence occurs over time when the interaction of individuals causes a lower-level, individualistic phenomenon to form into a collective, team-level phenomenon (Kozlowski & Klein, 2000). An understanding of the variability and stability of these variables provides insights regarding how teams socially develop over time. Kozlowski and Chao (2012) pointed out that a team member can influence the way team cohesion emerges and its dynamics. This occurs because interactions over time are dynamic and may impact individuals' feelings or perceptions. With various factors impacting emergence, it is beneficial to understand the contingencies that shape relational constructs, such as contextual performance and team cohesion. This understanding may guide the management of interpersonal relationships in teams (Kozlowski & Chao, 2012).

To this point, the methods utilized in this study inhibit causal conclusions. Actions such as manipulation, interventions, or treatments allow for causal inferences. Therefore, an extension of this study may include a manipulation in the design to determine causal relationships between contextual performance and team cohesion, and to further investigate the dynamic nature of these variables. For example, the creation of an intervention which alters emergence patterns across

variables may provide insights into how to more effectively manage and lead teams (Kozlowski & Chao, 2018). Nonetheless, this study provides a promising starting point for exploring the effects of familiarity, personality, and task performance on contextual performance and cohesion over time; along with the reciprocal relationship of contextual performance and cohesion over time.

Conclusion

This study examined the extent to which interpersonal cohesion and contextual performance are reciprocally related over time. Teams behave differently based on environmental factors (e.g., task demands) throughout time. The nature of this study examined teams that participated in a businesslike simulation, which contained both distal and proximal goals over time. Specifically, results supported hypothesis 1; based on a cross-lagged path model, a stronger relationship exists between contextual performance at time point 1 and cohesion at time point 2 than between cohesion at time point 1 and contextual performance at time point 2. However, hypothesis 2, which predicted the same relationship for time points 2 and 3, was not supported. Supplementary results reveal significant effects for control variables and no significant differences between hypothesized paths when comparing correlations.

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Appendix A

Model with Hypothesized Coefficients

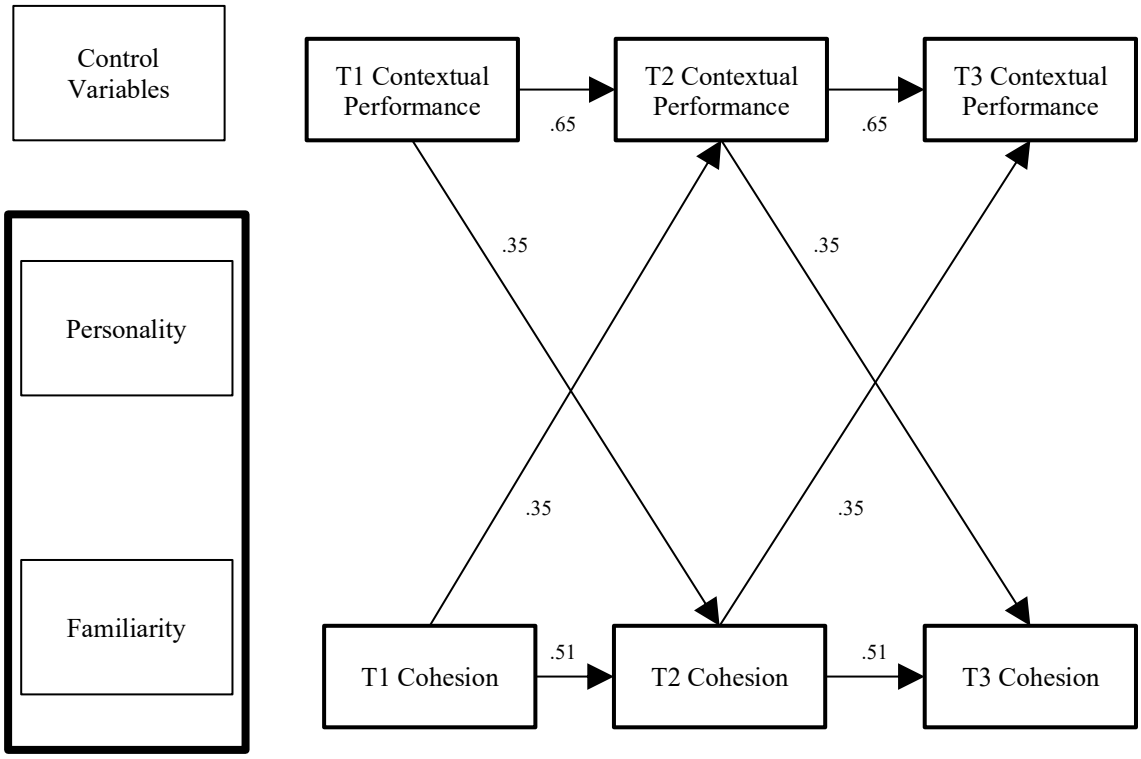

Figure. Model with Coefficients. *Note.* Coefficients for different personality dimensions: Extraversion: .04, Conscientiousness: .04, Agreeableness: .04, Neuroticism: .04, Openness to Experience: .04; Familiarity coefficient: .1; Coefficient for task performance: .12

Appendix B

Participant Demographic Questions

Participant Demographic Questions.

What is your age?

Sex:
- Male
- Female

Final score on Capsim Project: _____

Race/ethnicity:
- American Indian or Alaska Native
- Black or African American
- White
- Asian or Asian American
- Hispanic or Latino
- Other (please specify):

Graduate or undergraduate student _____

Appendix C

Familiarity Measure

Overall, how well did you know your team members before this class?

1	2	3	4	5
Not at all	Not well	Somewhat well	Well	Very Well

1. _____ How well did you know your team members before this class?

Appendix D

Information Sheet for Participation in Research Study

INFORMATION SHEET FOR PARTICIPATION IN RESEARCH STUDY

The Influence of Psychological Collectivism and Emergent States on Project Team Effectiveness Over Time

Principal Investigator: Melissa Hornik (graduate student)

Institution: DePaul University, USA

Faculty Advisor: Suzanne Bell, Ph.D., Psychology department

We are conducting a research study because we are trying to learn more about team dynamics and performance. We are asking you to be in the research because you are participating in a class project that contains The Capsim business simulation. Participants must be over 18 years of age, and enrolled in an undergraduate or graduate level business course at DePaul University. If you agree to be in this study, you will be asked to fill out multiple surveys throughout this project. These surveys will have questions about your teams progress and yourself (like personality questions and values), where you will just need to indicate a number on a scale that applies to you. We will also collect some personal information about you such as age, sex, race, and your final score on The Capsim simulation project. These surveys will be collected in class on paper. If there is a question you do not want to answer, you may skip it.

This study will take 10-20 minutes of your time over 3 time points for a total of 45 minutes. The time points will be as follows: (1) now, after the second strategic decision, (3) after the fifth strategic decision and (4) after the project is completed (week 10 of the quarter). Research data collected from you will be kept confidential. You will be coming up with a team name that will reported on the surveys along with an identifier code which will be the last four digits of your phone number in order for individuals and teams to be linked tot each time point. Teams will not be able to be identified through with their team name.

Your participation is voluntary, which means you can choose not to participate. There will be no negative consequences if you decide not to participate or change your mind later after you begin the study. Once you submit your responses, you will still be able to withdraw your data at anytime, if you wish to. Your decision whether or not to be in the research will not affect your grade in this class. If you wish to not participate you are able to work on something else while research participants complete the surveys.

You will be entered in a drawing to win a $40 amazon gift cards for your participation in the research. You will be notified by email and sent a gift card electronically about a week after the completion of the project. I hope to have 300 participants.

You must be age 18 or older to be in this study. This study is not approved for the enrollment of people under the age of 18.

If you have questions, concerns, or complaints about this study or you want to get additional information or provide input about this research, please contact Melissa Vazquez, 3212875363, mvazqu33@depaul.edu

If you have questions about your rights as a research subject, you may contact Susan Loess-Perez, DePaul University's Director of Research Compliance, in the Office of Research Services at 312-362-7593 or by email at sloesspe@depaul.edu. You may also contact DePaul's Office of Research Services if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.

You will be given a copy of this information for your records

By completing the survey you are indicating your agreement to be in the research.

Signature: _____

Printed Name: _____

Date: _____

Email address: _____

Appendix E

Adapted Contextual Performance Measure

Please rate your team by responding to each statement with the most appropriate answer. While your team is performing, how likely is it that your team…

1	2	3	4	5
Not at all likely	Not likely	Somewhat likely	Likely	Extremely likely

1. ____ Complies with instructions even when the instructor or other group members are absent?

2. ____ Cooperates with each other?

3. ____ Persists in overcoming obstacles to complete a task?

4. ____ Volunteers for additional work or responsibilities?

5. ____ Follows the rules of the project and avoid shortcuts?

6. ____ Takes on more challenging tasks?

7. ____ Offers to help each other with their work?

8. ____ Pays close attention to details?

9. ____ Defends the course instructor's decisions?

10. ____ Is courteous to each other?

11. ____ Support and encourage each other when there is a problem?

12. ____ Takes the initiative to solve problems?

13. ____ Exercises personal discipline and self-control?

14. ____ Tackles difficult assignments enthusiastically?

15. ____ Volunteer to do more than they should for the benefit of the group?

Appendix F

Team Cohesion Measure

Rate the extent you agree with each item.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

1. ____ There is a feeling of unity and cohesion in my team.

2. ____ There is a strong feeling of belongingness among my team members.

3. ____ Members of my team feel close to each other.

4. ____ Members of my team share a focus on our work.

5. ____ My team concentrates on getting things done.

6. ____ My team members pull together to accomplish work.

Appendix G

20-Item Mini IPIP

Please rate the extent to which each item describes you.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

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

Appendix H

Factor Loadings for Two-Dimensional Team Cohesion Model

Time point	Item	Task	Interpersonal
1	There is a feeling of unity and cohesion in my team.		.83
1	There is a strong feeling of belongingness among my team members.		.91
1	Members of my team feel close to each other.		.79
1	Members of my team share a focus on our work.	.86	
1	My team concentrates on getting things done.	.78	
1	My team members pull together to accomplish work.	.84	
2	There is a feeling of unity and cohesion in my team.		.83
2	There is a strong feeling of belongingness among my team members.		.91
2	Members of my team feel close to each other.		.87
2	Members of my team share a focus on our work.	.83	
2	My team concentrates on getting things done.	.80	
2	My team members pull together to accomplish work.	.87	
3	There is a feeling of unity and cohesion in my team.		.92
3	There is a strong feeling of belongingness among my team members.		.92
3	Members of my team feel close to each other.		.89
3	Members of my team share a focus on our work.	.87	
3	My team concentrates on getting things done.	.86	
3	My team members pull together to accomplish work.	.81	

Note. No items loaded onto multiple factors (e.g., a .15 difference from largest factor loading; Worthington & Whittaker, 2006). Standardized factor loadings presented for CFA.

Appendix I

Parameter Estimates and Standard Error for Figure 3 (Controlling for Personality)

Path Coefficients and Standard Error for Figures 3

Outcome variable	Regression or covariance	Estimate	Path coefficient	Standard error	Z-value	P-value
TC2	Regression	TC1	.72	.15	4.74	0
TC2	Regression	CP1	.11	.25	.44	.66
TC2	Regression	Agreeableness	-.18	.20	-.92	.36
TC2	Regression	Extraversion	.10	.16	.61	.54
TC2	Regression	Conscientious	.13	.19	.70	.48
TC2	Regression	Neuroticism	.28	.18	1.56	.12
TC2	Regression	Intellect	-.01	.18	-.03	.98
CP2	Regression	TC1	.11	.13	.8	.42
CP2	Regression	CP1	.58	.22	2.70	.01
CP2	Regression	Agreeableness	.01	.17	.05	.97
CP2	Regression	Extraversion	-.10	.14	-.71	.48
CP2	Regression	Conscientious	.14	.17	.87	.39
CP2	Regression	Neuroticism	-.01	.15	-.08	.94
CP2	Regression	Intellect	-.04	.16	-.26	.80
TC3	Regression	TC2	.63	.17	3.64	0
TC3	Regression	CP2	.24	.23	1	.32
TC3	Regression	Agreeableness	-.22	.18	-1.19	.23
TC3	Regression	Extraversion	.08	.15	.54	.59
TC3	Regression	Conscientious	-.23	.18	-1.25	.21
TC3	Regression	Neuroticism	-.39	.17	-2.33	.02
TC3	Regression	Intellect	.17	.18	.95	.34
CP3	Regression	TC2	-.08	.12	-.67	.50
CP3	Regression	CP2	.74	.16	4.75	0
CP3	Regression	Agreeableness	-.12	.12	-1.02	.31

CP3	Regression	Extraversion	.11	.10	1.15	.25
CP3	Regression	Conscientious	.05	.12	.41	.68
CP3	Regression	Neuroticism	-.15	.11	-.134	.18
CP3	Regression	Intellect	.16	.17	1.39	.17
TC2	Covariance	CP2	.09	.02	3.93	0
TC3	Covariance	CP3	.04	.01	3.11	0

Note. TC= interpersonal cohesion; CP= contextual performance

Appendix J

Parameter Estimates and Standard Error for Figure 4 (Controlling for Team Task Performance)

Path Coefficients and Standard Error for Figures 4

Outcome variable	Regression or covariance	Estimate	Path coefficient	Standard error	Z-score	P-value
TC2	Regression	TC1	.59	.14	4.19	0
TC2	Regression	CP1	.26	.24	1.11	.27
TC2	Regression	Team Performance TP1	.01	.06	.14	.89
CP2	Regression	TC1	.07	.12	.63	.53
CP2	Regression	CP1	.59	.20	2.94	0
CP2	Regression	Team Performance TP1	-.02	.05	-.40	.69
TC3	Regression	TC2	.70	.18	3.87	0
TC3	Regression	CP2	.10	.68	.41	.68
TC3	Regression	Team Performance TP2	-.05	.06	-.78	.44
CP3	Regression	TC2	.03	.11	.24	.81
CP3	Regression	CP2	.63	.15	4.05	0
CP3	Regression	Team Performance TP2	-.08	.04	-1.95	.05
TC2	Covariance	CP2	.09	.02	3.79	0
TC3	Covariance	CP3	.05	.02	3.22	0

Note. TC= interpersonal cohesion; CP= contextual performance; TP=time point

Appendix K

Parameter Estimates and Standard Error for Figure 5 (Controlling for Familiarity)

Path Coefficients and Standard Error for Figures 5

Outcome variable	Regression or covariance	Estimate	Path coefficient	Standard error	Z-score	P-value
TC2	Regression	TC1	.61	.15	3.95	0
TC2	Regression	CP1	.24	.25	.93	.35
TC2	Regression	Familiarity	-.03	.07	-.35	.73
CP2	Regression	TC1	.17	.13	1.34	.18
CP2	Regression	CP1	.44	.21	2.16	.031
CP2	Regression	Familiarity	-.10	.06	-1.73	.08
TC3	Regression	TC2	.67	.20	3.34	0
TC3	Regression	CP2	.14	.28	.48	.63
TC3	Regression	Familiarity	-.01	.08	-.18	.86
CP3	Regression	TC2	.07	.12	.52	.60
CP3	Regression	CP2	.55	.18	3.12	0
CP3	Regression	Familiarity	-.09	.05	-2.04	.04
TC2	Covariance	CP2	.09	.02	3.83	0
TC3	Covariance	CP3	.06	.02	3.33	0

Note. TC= interpersonal cohesion; CP= contextual performance; TP=team performance

Appendix L

Parameter Estimates and Standard Error for Figure 6 (Path Model)

Path Coefficients and Standard Error for Figures 6

Outcome variable	Regression or covariance	Estimate	Path coefficient	Standard error	Z-score	P-value
TC2	Regression	TC1	.59	.14	4.18	0
TC2	Regression	CP1	.27	.24	1.14	.26
CP2	Regression	TC2	.10	.12	.85	.40
CP2	Regression	CP1	.61	.19	3.15	0
CP2	Regression	Team Performance TP2	-.08	.03	3.89	0
TC3	Regression	TC2	.68	.18	.52	.61
TC3	Regression	CP2	.12	.24	-2.14	.03
TC3	Regression	Neuroticism	-.37	.17	1.35	.18
CP3	Regression	TC2	.15	.11	2.98	0
CP3	Regression	CP2	.44	.15	-3.11	0
CP3	Regression	Familiarity	-.10	.03	-2.19	.03
CP3	Regression	Team Performance TP2	-.07	.03	-2.16	.03
CP3	Regression	Neuroticism	-.22	.10	-2.45	.01
TC2	Covariance	CP2	.09	.02	3.86	0
TC3	Covariance	CP3	.04	.01	3.13	0

Note. TC= interpersonal cohesion; CP= contextual performance; TP=time point; SE= standard error