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TEAMWORK KNOWLEDGE, SKILLS, AND ABILITIES, PREFERENCE FOR
TEAMWORK, AND THE INTERACTION OF TASK INTERDEPENDENCE
AS PREDICTORS OF TEAM PERFORMANCE

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Psychology:
Industrial/Organizational

by
Rhiannon Jane Kirchner

June 2013

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ABSTRACT

Research shows that about half of U.S. organizations utilize teams. Because of this use of teamwork, a significant amount of research in the field of industrial and organizational psychology has focused on uncovering those variables that best predict team performance. Although much about team success has been revealed, two variables that have been relatively under researched to date as predictors of performance are (1) teamwork knowledge, skills, and abilities (KSAs) and (2) preference for teamwork. Additionally, no previous studies have directly addressed how task interdependence might impact these relationships. This study examined these variables and found that teamwork KSAs are minimally predictive of performance in high task interdependence settings and negatively related to performance in low task interdependence settings. Preference for teamwork was positively related to performance in low task interdependence settings, but negatively related to performance in high task interdependence settings. Based on these results, it appears that teamwork KSAs should continue to be researched as a valid predictor of performance and

organizations should approach selecting team members based on preference for teamwork with caution.

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CHAPTER ONE

INTRODUCTION

Due to the significant proportion (about 50 percent) of United States' organizations who utilize teams (Devine, Clayton, Philips, Dunford, & Melner, 1999), much of the current research in the field of industrial-organizational psychology has focused on team performance within organizations. In particular, researchers have sought to define the specific factors (e.g., team member personality, team structure, and team member preference for team work) that best predict successful team performance to equip organizations with the best information to make informed selection decisions (see Stevens & Campion, 1999; Bell, 2007; Jung & Sosik, 1999 for examples).

While research on these factors has yielded significant results (more to be described in subsequent sections), there is still much to be uncovered. Specifically, the variables teamwork knowledge, skills, and abilities (KSAs) and preference for teamwork as they relate to team performance remain not fully understood as predictors of team performance (Stevens & Campion, 1999;

Miller 2001; Shaw, Duffy, & Stark, 2000; Wageman, 1995). Furthermore, task interdependence remains an understudied variable as a team task structure factor that may moderate the relationship between other variables and team performance (Miller, 2001; Shaw et al., 2000). Therefore, it is the focus of the current study to (1) explore further the variables of teamwork KSAs and individual preference for teamwork as predictors of team performance and (2) uncover any interaction effects that may exist between both teamwork KSAs and preference for teamwork and task interdependence on team performance.

The current study, then, will contribute to the existing body of related research by further developing any relationship that might exist between the variables of focus (teamwork KSAs and preference for teamwork) and team performance, as well as provide data on the interaction of a team structure variable (task interdependence) on the relationship between the two primary variables explored in the study. This information is useful not only to researchers but also for organizations concerned with team selection instruments as they relate to subsequent team performance. For example, results of this study could provide information

to organizations regarding whether they need to screen applicants on their teamwork KSAs, or if this screening is only necessary in certain team settings (e.g., when task interdependence is low or high).

Teamwork Knowledge, Skills, and Abilities

Traditional research related to employee performance at the individual level has revealed that one of the strongest predictors of future performance was an individual's KSAs (Hunter & Hunter, 1984; Reilly & Chao, 1982). Therefore, as discussed in Kottke and Kimura (2009), although personality measures had received a great deal of attention for their predictability and lack of adverse impact, consistent results demonstrating the significantly higher predictability levels achieved from cognitive ability measures—such as those which measured an individual's KSAs—could not be disregarded in industrial-organizational psychology research. Based on this line of research, Stevens and Campion (1994) hypothesized that similar results would likely be found at a team level: an individual's KSAs related to working effectively in a team should predict team performance. The usefulness of defining and researching the KSAs of

team performance, the authors stressed, was that the research would reveal a predictor of team performance that could be manipulated or developed by organizations. This suggestion was beneficial because considering only fixed variables, such as personality, as predictors of team performance could not be manipulated or easily developed. Furthermore, based on past research at the individual level, Stevens and Campion (1994) argued that focusing on teamwork KSAs rather than personality characteristics could possibly predict performance more accurately, at least when compared to personality measures alone.

In an effort to demonstrate the utility of KSAs, Stevens and Campion (1994) developed 14 KSAs they felt individuals should possess to work effectively in a team. Within the 14 KSAs, there were five subcategories, which were (1) conflict resolution, (2) collaborative problem solving, (3) communication, (4) goal setting and performance management, and (5) planning and task coordination. Stevens and Campion (1994) classified subcategories one through three as "Interpersonal KSAs" and subcategories four and five as "Self-Management KSAs." An example of an interpersonal KSA within the

subcategory of collaborative problem solving is: "The KSA to identify situations requiring participative group problem solving and to utilize the proper degree and type of participation" (Stevens & Campion, 1994, p. 505). In contrast, an example of a self-management KSA, within the subcategory of goal setting and performance management KSAs is: "The KSA to help establish specific, challenging, and accepted team goals" (Stevens & Campion, 1994, p. 505). For a full listing of the 14 KSAs defined by Stevens and Campion, see Appendix A.

Validation Studies on a Teamwork Knowledge Skills and Abilities Selection Instrument

After developing the 14 KSAs, Stevens and Campion (1994) created a selection instrument (hereafter referred to as the "Teamwork Test") and conducted a validation study to test how well the defined teamwork KSAs predicted team performance (Stevens and Campion, 1999). The Teamwork Test contained 35 items written at an eighth-grade reading level. Each item was a multiple-choice question in which test-takers responded to a proposed situation by selecting one of four multiple-choice options.

The instrument's original validation study was conducted in two parts, first in an organization with newly formed teams, and then in an organization with well established teams (Stevens & Campion, 1999). In each of the validation studies, individuals completed the Teamwork Test and other selection measures of general mental ability, then supervisors rated each individual's task performance and his or her team's performance. Results of the two-part validation study revealed that the Teamwork Test correlated with supervisor ratings of both task performance (the individual level evaluation; $r = .40$) and team performance ($r = .32$); although the hopes were that the instrument would correlate more highly with team performance, results did not support this conclusion. Results also indicated that the Teamwork Test was highly correlated with other selection instruments that measured general mental ability ($r = .74$; correlation calculated by first creating z-scores for nine different aptitude tests, averaging the scores to create one "employment aptitude battery" score, and then correlating the composite score with Teamwork Test scores). Therefore, the original validation study on the Teamwork Tests provided only limited support for use

of the instrument, although criterion-related validity was demonstrated in that test scores were shown to correlate with task and team performance and the authors argued that the instrument would likely result in high face validity among applicants.

Since the original validation of the Teamwork Test, few studies have been published that examined the criterion related validity of the instrument as it relates to measures of team performance. Because the initial study provided relatively little support for the Teamwork Test beyond that of general mental ability as a predictor of team performance, these other studies are important to evaluate the value of the Teamwork Test. Some of these research findings are discussed below.

McClough and Rogelberg (2003) utilized a sample of undergraduate students who were participating in a group task to assess how well student's scores on the Teamwork Test predicted team member behavior (e.g., a student's participation level in the group and his or her interpersonal skills while working with other team members). Results of the study indicated that Teamwork Tests scores did, in fact, correlate with subsequent performance. Specifically, the correlation of Teamwork

Test scores with (1) external raters' ratings of an individual's performance was .31 and (2) fellow team member ratings of an individual's performance was .34. Based on the study's findings, the authors concluded that the Teamwork Test was predictive of individual performance and potentially a useful tool for human resource managers to utilize in their selection programs (McClough & Rogelberg, 2003). Similarly, a study conducted in the United Kingdom at a manufacturing organization by Leach, Wall, Rogelberg, and Jackson (2005) examined the relationship between Teamwork Test scores and team performance as reported by managers and found strong support for the relationship ($r = .51$).

Another relatively recent study also found support to indicate that the Teamwork Test was an effective instrument for predicting performance (Morgeson et al., 2005). This study differentiated between task and contextual performance—defining task performance as job related behaviors directly related to reaching a performance goal and contextual performance as activities related to supporting the work environment. The authors proposed that the nature of work done in teams would require a higher level of contextual performance compared

to task performance. Thus, Morgeson et al. (2005) hypothesized that Teamwork Test scores would be highly correlated with and predictive of contextual performance. The data supported this hypothesis, indicating that the Teamwork Test was a valid predictor of contextual performance ($r = .33$)—which is required in team settings (Morgeson et al., 2005).

A similar study re-evaluating the validity of the Teamwork Test conducted by Miller (2001), however, did not support the findings of these studies previously discussed. In her study, the author hypothesized that a positive relationship would exist between a team's average Teamwork Test score and team performance. The hypothesis was not supported. Thus, based on this study's results, the Teamwork Test was not a valid predictor of team performance. Miller (2001), however, proposed in her discussion that a more significant relationship between Teamwork Test scores and team performance might be evident in settings where teams are not evaluated individually—as was the case in her study—but on a team level. This insight was suggested because although the selection instrument is meant to predict team performance, data from supervisors regarding team

performance may actually be capturing individual rather than team performance based on how supervisors traditionally evaluate teams (on an individual rather than team level). Therefore, Miller suggested that a more accurate criterion measurement might be achieved in settings where the teams are measured on a team rather than individual level, and that perhaps this more accurate measurement of team success would find greater support for the use of the Teamwork Test.

The Development of Teamwork Knowledge, Skills, and Abilities

One study, instead of examining the relationship between the Teamwork Test and team performance, chose to test if teamwork KSAs could actually be developed (Chen, Donahue, & Klimoski, 2004). In this study, undergraduates participated in a course that was meant to increase their teamwork KSAs. To measure any increases, the Teamwork Test was administered to the class at the start of the course and at the end. The instrument was also administered in the same fashion to students in a similar course that was not designed to increase student's teamwork KSAs to provide control group data. Results at the end of the course demonstrated that both

teamwork-related knowledge and teamwork-related skills were significantly increased in the experimental group. When the student data were compared to normative data collected by Stevens and Campion (1999), students in the teamwork KSA training course, on average, increased their teamwork knowledge and skills 20 percentile points within the working population (Chen et al., 2004).

Similar results supporting the trainability of teamwork skills were also found in another study that examined generic teamwork skills training (Ellis, Bell, Ployhart, Hollenbeck, & Ilgen, 2005). In this study, an experimental student group received training in generic teamwork skills, and a control group did not. After training, the experimental group participants were given the Teamwork Test and their scores were compared to the control group, who completed the Teamwork Test without any training prior to being given the test. Results indicated that those who received the training exhibited greater teamwork competency declarative knowledge and higher levels of planning and task coordination, collaborative problem solving, and communication skills (Ellis et al., 2005). The results of these two studies

support Stevens and Campion's (1994) original expectation that teamwork KSAs can be manipulated and developed.

To summarize, it appears that the Teamwork Test may have potential for predicting team performance, based on the sparse research on the instrument as well as some of the promising results that have been uncovered (the instrument's demonstrated criterion-related validity as well as the finding that teamwork KSAs can be developed; Stevens & Campion, 1999; Morgeson, et al., 2005; McClough & Rogelberg, 2003; Chen et al., 2004). Furthermore, because of the possibility that the test's performance criterion may not be being captured properly (as raised in Miller, 2001), further research is necessary. Based on the above research findings, the following hypotheses are proposed:

H1A: A significant and positive relationship between an individual's teamwork KSAs (as measured by the Teamwork Test) and an individual's performance in a team setting (as measured by a self evaluation measure) will exist.

H1B: A significant and positive relationship between an individual's teamwork KSAs (as measured by the Teamwork Test) and an individual's

performance in a team setting (as measured by a peer evaluation measure) will exist.

H1C: A significant and positive relationship between a team's overall teamwork KSAs (as measured by the Teamwork Test) and team performance (as measured by an instructor team evaluation measure) will exist in teams that are evaluated at a team level.

Preference for Teamwork

Preference for teamwork has been classified in the literature as a sub-dimension of individualism/collectivism, and is defined as an individual's preference to work in teams rather than perform tasks in an autonomous setting (Wagner, 1995; Wagner & Moch, 1986). Although understudied, the variable has frequently been shown to be a significant variable to consider when examining team member characteristics and team performance (French & Kottke, in press). For example, in the review of the variable provided by French and Kottke (in press), the authors explain that preference for teamwork has been correlated with emotional intelligence, personality characteristics

(e.g., agreeableness and extroversion) and team performance (details of this study are discussed more in-depth below).

Campion, Medsker, and Higgs (1993) published one of the first studies which examined the relationship between an employee's preference for teamwork and performance outcomes, proposing that individuals who prefer to work in teams were likely to be more effective and more satisfied working in the team compared to those who reported a low preference for working in teams. Campion et al. (1993) found support for the notion that preference for teamwork was correlated with employee satisfaction ($r = .18$); however, there was no significant relationship between preference for teamwork and productivity or the manager's judgment of how effective the team was. Since Campion et al.'s (1993) study, though, further research has indicated that preference for teamwork might, in fact, be related to team performance. Some of these research findings are discussed below.

Jung and Sosik (1999) conducted a study to see (1) if preference for teamwork was positively related to group performance and (2) if preference for teamwork

would be impacted by past performance in a group setting. Results of their study indicated that preference for teamwork was related to group performance ($\beta = .22$ at time one, $\beta = .28$ at time two). However, contrary to what the authors predicted, results indicated that preference for teamwork was relatively stable over time and not influenced by previous performance in a group setting.

Related to these findings, Erez and Somech (1996) conducted a study to see if individuals who were more interdependent (those who preferred to work in group settings) performed more successfully in team settings compared to individuals who were more independent (those who preferred not to work in group settings). In their study, Erez and Somech (1996) had groups with members from a collectivistic culture (those who were believed to be interdependent) complete a group task and compared their mean performance (at both the group and individual level) to groups with members from an individualistic culture (those who were believed to be independent). Results indicated that 1) those from the collectivistic culture were significantly more interdependent than those from the individualistic culture, who were significantly more independent and 2) that the groups from the

interdependent group performed more successfully at both the group and individual level. These results, thus, support the notion that an individual's preference for teamwork does have an impact on performance (Erez, Somech, 1996).

O'Neill and Kline (2008) examined the relationship between an individual's predisposition to be a team player and task performance while working in a group setting. In the study, the Team Player Inventory (Kline, 1999) was used to measure individual's predisposition to be a team player, which is meant to assess "an individual's predisposition and appreciation for working in a team setting" (O'Neill & Kline, 2008, p. 70). Results of the study supported the authors' hypothesis that an individuals' team player inventory score was significantly and positively related to task performance ($r = .24$; O'Neill & Kline, 2008).

Finally, in a meta-analysis of 490 studies that assessed predictors of team performance, an examination of ten studies revealed that preference for teamwork was positively related to team performance (Bell, 2007). Individuals who reported a high preference for teamwork performed better than individuals who had a low

preference for teamwork (corrected population correlation = .22; Bell, 2007).

Based on the previously discussed research, the following hypotheses are proposed:

H2A: A significant and positive relationship between an individual's preference to work in a team (as measured by the Team Player Inventory) and an individual's performance in a team setting (as measured by a self evaluation measure) will exist.

H2B: A significant and positive relationship between an individual's preference to work in a team (as measured by the Team Player Inventory) and an individual's performance in a team setting (as measured by a peer evaluation measure) will exist.

H2C: A significant and positive relationship between a team's overall preference to work in a team (as measured by the Team Player Inventory) and team performance (as measured by an instructor team evaluation measure) will exist in teams that are evaluated at a team level.

Task Interdependence

Task interdependence is a dimension of task structure that refers to the extent to which members within a team depend and rely on one another to complete a team task and/or reach a goal (Campion, Medsker, & Higgs, 1993). The importance of this variable in relation to team performance has commonly been accepted in the field of group research in industrial/organizational psychology and was highlighted in McGrath's (1991) time, interaction, and performance (TIP) theory of groups. According to McGrath's (1991) TIP theory, a holistic understanding of the group process and group performance includes an understanding of the ways in which teams interact. Specifically, McGrath (1991) noted that teams engage in various "modes" that impact team performance, including determining the goals of the team, decisions around what team members will do, and how the team will perform the various tasks required to meet the goal. Consequently, McGrath's (1991) TIP theory (among other things) supported the notion that task interdependence could have a significant impact on a team's performance.

Thompson (1967) described task interdependence as a typology in which a task could be completed in three

different ways, representing varying levels of task interdependence. First, teams could complete a task by using a *pooled* workflow approach. Within this category, team members would work separately from each other and interact very minimally with the other team members (representing a low level of task interdependence). Second, a task could be completed using a *sequential* workflow approach, meaning that each team member would rely on another team member to complete a portion of a task before (or after) he or she could complete his or her own portion. Finally, a team could utilize a *reciprocal* workflow approach to complete a task, in which the output of one team member acts as the input for another team member and vice versa (representing a high level of task interdependence). Recent research on task interdependence has recognized Thompson's typology as useful for descriptive purposes, but researchers have typically measured the construct as a continuous variable rather than a typology to capture the varying degrees of interdependence that may exist within each category (Campion et al. 1993, for example). This same approach to task interdependence as a continuous variable will be utilized in the current study.

Several studies have demonstrated that task interdependence can positively influence team performance when it is matched with another dimension of interdependence: outcome interdependence (Allen, Sargent, & Bradley, 2003; Van der Vegt, Emans, Van de Vliert, 2001). When the level of task interdependence (high or low) required to complete a task within a team is matched by the type of outcome the group is working towards (individual based or group based), teams are more likely to perform successfully compared to teams in which the two types of interdependence are in conflict (Allen, Sargent, & Bradley, 2003; Van der Vegt, Emans, Van de Vliert, 2001). For example, a team with a high level of task interdependence will perform better when working towards a group reward or goal rather than an individual reward or goal.

Studies related to task interdependence have supported the proposition that the construct is an important factor affecting how successful teams are in performing a given task. The construct has been related to motivation, in that when a high level of task interdependence exists, individuals are more motivated to complete a given task. This increase in motivation, in

turn, increases the likelihood that the work completed will be of high quality (Campion et al., 1993; Wong & Campion, 1991; Campion, Papper, & Medsker, 1996). Within the team literature, task interdependence has also been demonstrated consistently to be a moderator of the relationship between various constructs and team performance. Specifically, the impact task interdependence has on the relationships between team cohesion and team member helping behaviors with team performance have been researched; some of the studies in this area are discussed below.

In one meta-analysis, the relationship between team cohesion and team performance was shown to be moderated by task interdependence: the relationship was strongest for those teams with a high level of task interdependence (Gully, Devine, & Whitney, 1995). Furthermore, task interdependence has also been demonstrated as a moderator between the relationship between helping behaviors in a team and team performance. Results have indicated that helping behavior has a strong impact on team performance, especially in situations with a high level of task interdependence (Bachrach, Powell, Collins, & Richey, 2006; Allen, Sargent, & Bradley, 2003).

In reference to the two constructs of interest in the current study—teamwork KSAs and preference for teamwork—and team performance, a very limited amount of research exists regarding how task interdependence might moderate these relationships.

The author is aware of no studies that have directly examined task interdependence as a moderator of the relationship between preference for teamwork and team performance. However, one study previously discussed that examined teamwork KSAs (Miller, 2001) uncovered that task interdependence was related to team performance. Those team members who were highly dependent on each other within the team were most successful. Based on these results, the author suggested task interdependence should be further researched to see if the construct had any effect on the relationship between Teamwork Test scores and team performance because the nature of the data collected in the study did not allow for such an analysis. In this study, I will collect these types of data to permit such an analysis.

Regarding preference for teamwork, Shaw et al. (2000) indicated that an interaction existed between preference for teamwork and performance: when individuals

with a low preference for teamwork were in "low task interdependence" group settings, they performed just as well as individuals who preferred teamwork and were in "high task interdependence" group settings. Furthermore, individuals who reported the lowest preference for teamwork were also the individuals with the highest ability (indicated by GPA). To summarize, the overall results of Shaw's study indicated that individuals with the highest ability reported the lowest preference for teamwork and that these individuals performed best in situations in which there was a low level of task interdependence (Shaw et al., 2000).

Based on the above research findings, it is evident that task interdependence is an important factor to consider as a moderator when researching the factors that best predict team performance. The following six research questions (no directionality is predicted, thus research questions, not hypotheses) are proposed:

RQ1A: Is the relationship between a team's teamwork KSAs (as measured by the mean of the team's Teamwork Test scores) and a team's performance (as measured by the mean of the team's self evaluation measure scores) moderated by the

level of task interdependence that exists within a team?

RQ1B: Is the relationship between a team's teamwork KSAs (as measured by the mean of the team's Teamwork Test scores) and a team's performance (as measured by the mean of the team's peer evaluation measure scores) moderated by the level of task interdependence that exists within a team?

RQ1C: Is the relationship between a team's teamwork KSAs (as measured by the mean of the team's Teamwork Test scores) and a team's performance (as measured by an instructor team evaluation measure) moderated by the level of task interdependence that exists within a team?

RQ2A: Is the relationship between a team's preference to work in a team (as measured by the mean of the team's Team Player Inventory mean scores) and a team's performance (as measured by the mean of the team's self evaluation measure scores) moderated by the level of task interdependence that exists within a team?

RQ2B: Is the relationship between a team's preference to work in a team (as measured by the mean of the team's Team Player Inventory mean scores) and a team's performance (as measured by the mean of the team's peer evaluation measure scores) moderated by the level of task interdependence that exists within a team?

RQ2C: Is the relationship between a team's preference to work in a team (as measured by the mean of the team's Team Player Inventory mean scores) and a team's performance (as measured by an instructor team evaluation measure) moderated by the level of task interdependence that exists within a team?

CHAPTER TWO

METHOD

Sample

Study participants were 436 students from a large state university in southern California from eight different sections in four different upper division courses in either the business management department or psychology department at the university. All study participants received course extra credit for their participation in the study. The initial sample size was 436, however, 59 participants were removed from the study for the following reasons: 25 individuals completed only survey one of the study, 12 participants completed only survey two of the study, one individual was deleted from the analysis because no other group members completed the surveys required to participate, and 21 surveys from one course were dropped from any analyses due to administrative issues in the collection of the second survey. Therefore, the final sample size was 377 consisting of participants from seven different sections in four different upper division courses. The data

consisted of a total of 78 groups ranging in size from two to eleven members.

The final sample consisted of 246 females and 129 males. Although the gender breakdown was disproportionate, this breakdown was an accurate reflection of the populations within the two departments surveyed in the present study. The mean age within the sample was 23.83 (SD = 6.06). The ethnicity breakdown for the sample was as follows: 45.1% Hispanic, 29.7% white, 8.2% African-American, 4.2% Asian-American, and 11.9% reporting "other" as their ethnicity. Three participants (.08%) did not report their ethnicity. Fifteen participants (4%) were sophomores, 192 (50.9%) were juniors, 163 (43.2%) were seniors, and one participant (.03%) was a graduate student at the university (six participants [1.6%] did not indicate their class level) with a mean grade point average (GPA) of 3.07 (SD = .43). Twenty-eight participants (7.4%) were international students at the university. Of the 377 participants, 332 (88.1%) reported having work experience, while 38 (10.1%) reported having no work experience (missing data for this question = 1.9%). For those who did have work experience, the mean work experience was 6.05 years (SD = 5.75).

Procedure

As mentioned above, the data were collected from seven different sections of four different courses within the department of management and the department of psychology at the university. Data were collected from four different professors teaching the various course sections. Though data were collected from various courses and sections of the same course, all participants were required to complete a team based assignment that required participants to work over the course of a 10-week quarter to complete either a team paper, team presentation, or a combination of both. Therefore, it was believed that the data from the various courses could be analyzed together since the participants in the various course sections were completing similar project types within teams. The length of the team project was not of significant concern because research suggests that teams go through two distinct phases in completing projects, regardless of the amount of time they are given to complete a task (Gersick, 1988). In one qualitative study, Gersick (1988) reported that teams ranging in a life span from 11 days to six months all approached their tasks in a distinctive way; however, all teams also

reached a distinctive mid point marked by great change halfway through the time provided to complete their tasks. Therefore, it was expected that the timeframe given for teams to complete their assignment in the study would not have a significant impact on team performance, as research supports that teams go through relatively similar phases according to the timeframe given to complete the task (Gersick, 1988). As a result, the primary concern of the author was to seek data from courses that required some form of a long-term team assignment that would require participants to work with their teammates outside of class to complete. Most participants in the current study completed a team assignment that spanned the entire quarter; however, some teams did complete their team projects over the span of several weeks during the quarter.

All data were collected using the same process. First, participants completed the first survey, which consisted of the Teamwork Test (Stevens & Campion, 1999), Team Player Inventory (Kline, 1999) and several demographic questions. The survey was completed during the first few meetings of each of the class sections, and surveys were completed prior to the participants

beginning to work on the course's team project. Then, once the team project had been completed, participants completed the second portion of the study, which consisted of a survey in which they were asked to rate: (1) the level of task interdependence that existed within their team for the project, (2) the performance of their teammates while working on the team project, and (3) their own performances while working on the team project. Additionally, students were asked questions regarding their familiarity working in teams, their previous experiences working with their team members and a couple additional demographic items. At the time the team projects were turned in, the four professors were asked to complete a team evaluation that assessed the overall performance of each of the teams contained in their courses and asked whether or not they were aware of any team conflicts that existed within the teams.

Measures

Teamwork Knowledge, Skills, and Abilities

The Teamwork Test (Stevens & Campion, 1999) was utilized to measure an individual's teamwork KSAs. As previously discussed, the instrument is a 35-item

situational judgment test that measures five dimensions of teamwork KSAs (conflict resolution, collaborative problem solving, communication, goal setting and performance management, and planning and task coordination) and is dichotomously scored. Study participants completed the Teamwork Test measure as part of survey one. In the current study, the internal reliability of this measure was .66. Sample items from the Teamwork Test can be found in Appendix B.

Preference for Teamwork

Kline's (1999) Team Player Inventory was used to measure an individual's preference for teamwork. The inventory consists of 10 items used to measure an individual's predisposition to work within a team. Participants responded to each item by indicating the degree to which they agreed with the various statements presented on a five point Likert-type scale ranging from "disagree completely" to "agree completely." An example item from the Team Player Inventory is: "Working in a group gets me to think more creatively." Study participants completed the Team Player Inventory measure as part of survey one. The coefficient alpha of the Team Player Inventory was .85 in the current study. The full

listing of the items included on the measure can be found in Appendix C.

Task Interdependence

To measure task interdependence, a five-item measure based on a measure developed by Pearce and Gregersen (1991) that evaluates reciprocal task interdependence was used. Respondents were asked to rate their level of agreement to items such as "the team assignment required me to work closely with others in doing my work" and "the team assignment created an environment in which the way I performed my workload had a significant impact on others" on a seven-point Likert-type scale ranging from "disagree completely" to "agree completely." In the current study, a high score on this measure will indicate a high level of task interdependence, while a low score on this measure will represent a low level of task interdependence. The alpha coefficient for this measure in the present study was .82. The full listing of the items included on the measure can be found in Appendix D.

Team Performance (Peer Evaluation)

Study participants completed a peer evaluation for each member of his or her team at the completion of the team assignment as part of survey two. The peer

evaluation was a ten-item measure created by the author to assess how well each individual felt his or her teammates performed within the team by rating each member's performance on a scale of one to seven for each item. Each item on the peer evaluation addressed a different aspect of performance such as an individual's participation and quality of work within the team and asked participants to rate the degree to which each teammate was either the "top performer" or "worst performer" ranging on a scale from one to seven compared to everyone else in the team regarding that aspect of performance. The coefficient alpha for this measure was .98 for the current study. The full listing of the items included on the measure can be found in Appendix E.

Team Performance (Self Evaluation)

Study participants completed a self evaluation of their performances within the team at the completion of the team assignment as part of survey two. The self evaluation was identical to the peer evaluation, but framed so that individuals assessed their own performances within the team rather than their peers. The measure was a ten-item measure and was created by the author to assess how well the individual participants

perceived their contributions to the success of the team project; they rated their performances on a scale from one to seven measuring the degree to which they believed they were either the "top performer" or "worst performer" regarding various aspects of team performance. As with the peer evaluation, each item on the self evaluation addressed a different aspect of performance such as an individual's participation and quality of work within the team. The coefficient alpha for the team performance self-evaluation within the study was .98. The full listing of the items included on the measure can be found in Appendix E.

Team Performance (Professor Evaluation)

To measure each team's level of performance on the team assignment, professors were asked to complete a team evaluation measure for each team after evaluating each of the team's projects. The team evaluation was tailored to the type of assignment the teams were required to complete (i.e., a presentation, a paper, or both a presentation and paper); therefore, the number and types of items on the measure varied depending on the team assignment for that course. In four of the seven courses that were surveyed, the assignment required that the

teams complete only a presentation, while two of the courses required that the teams complete both a presentation and a paper to fulfill the assignment requirements and one class required that each team complete only a paper. As a result, for the courses in which teams had to complete only a presentation, the professors completed a four-item team evaluation, and for the courses in which teams had to complete only a paper, the professors completed a different four-item team evaluation, while for the courses in which the teams were required to complete both a presentation and a paper, the professors completed a five-item team evaluation. The coefficient alphas for the four-item presentation only team evaluation and the five-item presentation and paper team evaluation were computed separately, but were shown to be identical. The coefficient alpha for these two measures in this study was .78. The coefficient alpha for the four-item, paper only, team evaluation was .72 in the current study. The full listing of the items included on the professor performance evaluation can be found in Appendix F.

Data Analysis Strategy

Hypotheses 1A, 1B, 2A, and 2B were all tested at the individual level by computing bivariate correlation coefficients. Due to the group level nature of the professor team evaluation measure, hypotheses 1C, and 2C were examined at the group level. To do this, participants' Teamwork Test scores and Team Player Inventory scores were aggregated within their teams. Justification of aggregation was not sought prior to aggregating these variables because it was believed that within-group agreement for these variables was not necessary since each individual "brought to his or her team" a pre-existing level of teamwork KSAs and preference to work in a team setting that was completely independent of his or her membership to the team; therefore, inter-rater agreement for these variables was not examined prior to aggregation. Additionally, the author believed that aggregating this data using a team-level mean value was appropriate (rather than examining the amount of dispersion or complementarily within each team regarding these measures), as the value represented each team's overall level of teamwork KSA

aptitude, resulting in a meaningful and interpretable group-level measure.

For each of the research questions, the task interdependence variable was also aggregated, and because the variable was intended to measure a variable that was unique to membership within the team, a justification for the aggregation of this variable was sought by examining the agreement within the team of each team member's assessment of the level of task interdependence while completing the team project. To do this, within-group rater agreement for the task interdependence variable was examined for each team by using a type of intraclass correlation coefficient: ICC(2) values. Once the values were obtained, the values were evaluated to see if there was agreement within teams regarding the level of task interdependence.

Little guidance is provided in the literature as to what ICC(2) value should be utilized as the appropriate level of agreement when justifying aggregation of data, although LeBreton and Senter (2008) suggest "moderate" agreement within a group is not achieved until ICC(2) values are .51 or above. However, the author believed that an ICC(2) threshold value that high would have been

inappropriate to apply to the task interdependence variable in the current study. This was believed to be the case because task interdependence, while a group level variable, was collected based on each team members *perception* of the level of task interdependence that existed within each team. Furthermore, the level of task interdependence was not controlled for by any of the professors included in the current study (e.g., each team could make the task as interdependent [or not] as it wanted), further supporting the idea that it is possible, if not likely, that individuals would develop their own perceptions of task interdependence that might not have been in high agreement with their teammates. Therefore, instead of using a strict cut point, the author utilized a natural cut point in the data set to differentiate between those teams who appeared to share some level of agreement regarding the level of task interdependence that existed within the team and those who did not. As a result, .27 appeared to be a natural cut point, as the next level ICC(2) value for any team below .27 was .17. Using .27 as the cut point, 42 of the 78 teams appeared to agree on the level of task interdependence that existed within the team. As a result, the six research

questions that involved the task interdependence variable were analyzed with only those teams who seemed to have agreement regarding the level of task interdependence, as the aggregation of the task interdependence variable for these teams was deemed appropriate.

Due to the group-level nature of the task interdependence variable, to address research questions 1A, 1B, 2A, and 2B, aggregated Teamwork Test total scores and Team Player Inventory mean scores were utilized. Additionally, both the peer and self performance evaluation scores were aggregated to create a mean self and peer performance score for each team. Using aggregated scores for each team rather than each individual's scores was necessary to appropriately address the questions using only one level of analysis, as a multilevel approach with an individual level predictor and a group level outcome was not fitting given the theoretical meaning behind the use of multilevel modeling (i.e., an individual level measure is not an appropriate predictor of a group-level outcome). For research questions 1C and 2C, group level analyses were also performed using the aggregated Teamwork Test total scores and Team Player Inventory mean scores as well as

the professor team evaluation scores (which, as previously mentioned, was designed to be group level), resulting in a full group level design. All six research questions were analyzed using hierarchical linear regression analyses to test for an interaction effect due to task interdependence.

Data Screening

Prior to performing any data analyses, the data were analyzed for missing data, normality, and outliers.

Missing Data

A missing values analysis was performed for each of the six variables of interest in the current study. Results of a missing values analysis revealed that less than five percent of the data were missing for the survey items measuring the (1) Teamwork Test, (2) Team Player Inventory, (3) task interdependence, (4) team performance self evaluation, and (5) team performance professor evaluation variables. However, more than five percent of the data were missing for one of the ten items included on the team performance peer evaluation variable. For item eight on the peer evaluation measure, 18.3% of the data were missing. For all other items on the team

performance peer evaluation measure less than five percent of the data were missing.

The author believes that such a large amount of data were missing for this item because the surveys were distributed in hard copy format and the space provided to respond to this item was blocked in many of the surveys by the placement of the staple. As a result, study participants likely skipped over this item because it was less obvious that a response was needed due to the blocked response space. To control for this large amount of missing data, participants' average ratings for the teammate he or she was rating was substituted for the missing item. The author believed that this substitution was an appropriate resolution because the missing data appeared to be a result of a clerical error (the placement of the staple) that likely had nothing to do with the content of the item. Furthermore, the author believed the average rating was likely a fair estimate of the rating that the study participant would have provided had he or she responded to the item (since all 10 items included on the team performance peer evaluation were relatively similar to one another). (It should be noted that missing values analyses were conducted both before

and after replacing the missing values with mean values and showed that the results of the study hypotheses were not significantly different.)

Normality and Outliers

Each of the variables included in the current study's hypotheses and research questions was examined for normality and outliers. To test for outliers, each variable was transformed to a z-score and any case that had a z-score greater than 3.29 and was discontinuous from the distribution of scores was to be deemed an outlier. An assessment of the z-scores for each of the variables revealed that there were two cases that had a z-score greater than 3.29. One outlier was present in the team evaluation peer performance measure ($z = 3.89$) and one outlier was present in the task interdependence measure ($z = -3.49$). Consequently, these cases were left out of any analyses that included these measures.

Normality of the variables was examined using histogram graphs and skewness and kurtosis values for each of the six variables. The histograms for the Teamwork Test total scores and Team Player Inventory mean scores were relatively normal and deemed to be appropriate for subsequent analyses. The distribution of

task interdependence scores had a slight negative skew (skewness = -1.03) and was somewhat leptokurtic (kurtosis = 1.05); however, the distribution was deemed to be appropriate for subsequent analyses because the skew was not severe and signaled that many participants found the team project they completed to be relatively interdependent. For the team performance self evaluation total score variable, the histogram was leptokurtic (kurtosis = 1.77) and positively skewed (skewness = 1.43), signaling that many of the participants rated their performance relatively highly). Additionally, 25 of the 377 cases were discontinuous from the rest of the distribution. Again, though, the variable was deemed to be appropriate for further analyses because it was expected that most individuals would see themselves in a rather favorable light (thus, resulting in very positive self performance scores), while a few students would be relatively honest that they did not perform better than the rest of their teammates (resulting in some discontinuous scores on the low performance end of the distribution). For the team evaluation peer performance measure, the distribution of scores was slightly platykurtic (kurtosis = -.24) and

positively skewed (skewness = .37); however, because the kurtosis and skewness values were relatively small, the variable was deemed to be appropriate for subsequent analyses as it reflected true differences in respondents' performances as reported by their teammates. Finally, for the team performance professor evaluation measure, the distribution was platykurtic (kurtosis = -.94) and contained some discontinuous scores at the lower end of the performance scale. The author believed this distribution reflected that many of the professors evaluated the teams in an "all or nothing" sense (i.e., most of the teams received similar ratings across all of the items on the measure), and that the professors believed most of the teams performed an average or above average level of performance. As a result, the variable was deemed to be appropriate for further analyses.

In addition to the screening for univariate outliers, the data that were deemed to be appropriate to include in the research question analyses (i.e., ICC[2] values greater than or equal to .27) were also screened for multivariate outliers prior to performing the six hierarchical linear regression analyses. The data were assessed for multivariate outliers in each of the

analyses by computing Mahalanobis' distance values for the two pairs of predictor variables explored in the analyses. Mahalanobis' distance values greater than 13.82 would have indicated a multivariate outlier; however, no cases in the data set had an absolute value equal to or above this value and as a result, it was concluded that no multivariate outliers in relation to the six research questions were present in the data set.

CHAPTER THREE

RESULTS

Means, standard deviations, and correlations for the each of the variables explored in the current study are shown in Table 1 under Appendix G.

Hypothesis Testing

It should be noted that for the hypotheses concerned with the team performance peer evaluation and self evaluation variables, a negative correlation would indicate support of the hypotheses due to the meaning of the scale used for these measures (i.e., a low score indicated a high level of performance while a high score indicated a low level of performance). Therefore, for hypotheses 1A, 2A, 1B, and 2B, a negative correlation would indicate support for each of these hypotheses. However, for hypotheses 1C and 2C, which were concerned with the team performance professor evaluation variable, a positive correlation would indicate support for the hypotheses, as a high score on this variable indicated a high level of performance. Therefore, for these two hypotheses a positive correlation was predicted.

Hypothesis 1A predicted that a significant and positive relationship between an individual's teamwork KSAs (as measured by the Teamwork Test) and an individual's performance in a team (as measured by a self evaluation measure) would exist. A calculation of the bivariate correlation between these two variables revealed that the two variables were not significantly correlated ($r = .08$, $p > .05$; small effect size). Thus, hypothesis 1A was not supported.

Hypothesis 2A predicted that a significant and positive relationship between an individual's preference to work in a team (as measured by the Team Player Inventory) and an individual's performance in a team (as measured by self evaluation measure) would exist. Hypothesis 2A was not supported; the bivariate correlation between these two variables was $r = .12$ ($p < .05$; small effect size). This correlation indicated that those individuals with a high preference to work in a team were more likely to give themselves a high self performance evaluation score (which indicated a lower level of performance). Therefore, the data provided evidence of a small effect size in the opposite direction of the proposed hypothesis

Turning to the team performance peer evaluation variable, hypothesis 1B predicted that a significant and positive relationship between individual teamwork KSAs (as measured by the Teamwork Test) and an individual's performance in a team (as measured by a peer evaluation measure) would exist. The bivariate correlation between these two variables was $-.12$ ($p < .05$), providing evidence of a small effect size in support of this hypothesis.

Similarly, hypothesis 2B predicted that a significant and positive relationship between an individual's preference to work in a team (as measured by the Team Player Inventory) and an individual's performance in a team (as measured by a peer evaluation measure) would exist. This hypothesis was not supported ($r = .11$, $p < .05$; small effect size). Similar to hypothesis 2A, the data provided evidence of a small effect size in the opposite direction of the proposed hypothesis: individuals who preferred to work in a team were more likely to receive lower performance scores from their teammates.

Finally, hypotheses 1C and 2C predicted that a significant and positive relationship between a team's

(1) teamwork KSAs (as measured by the Teamwork Test) and (2) overall preference to work in a team (as measured by the Team Player Inventory) and team performance (as measured by a peer evaluation measure) would exist. As mentioned above, these two hypotheses were treated as group-level hypotheses since each group received an overall team evaluation score from its professor. Therefore, bivariate correlations between each team's (1) average Teamwork Test score totals and (2) average Team Player Inventory average scores and the professor's team evaluation score were calculated. Results of these analyses did not support either of the hypotheses: The bivariate correlation between a team's mean teamwork KSAs and team performance was $r = .09, p > .05$ (small effect size). The bivariate correlation between a team's mean preference to work in a team and team performance was $r = .10, p > .05$ (small effect size). Therefore, Hypotheses 1C and 2C were not supported.

Exploration of Research Questions

In addition to the six proposed hypotheses, the author was also interested in whether task interdependence moderated any of the relationships

proposed in the hypotheses. To explore this question, hierarchical linear regression analyses were performed to see if a moderation effect existed for the variable of task interdependence.

As a reminder, due to the nature of the data, all analyses were performed at the group level by aggregating any variables that were not already group level since task interdependence was believed to be a group level variable and multi-level analyses were not appropriate for the research design. Additionally, because task interdependence was considered a group variable in which team members should agree, only those teams with an ICC(2) value greater than .20 were included in these analyses (N = 193 participants, 42 teams).¹ Prior to performing the analyses, each variable was centered.

Research question 1A asked whether the relationship between a team's teamwork KSAs (as measured by the mean of the team's Teamwork Test scores) and a team's performance (as measured by the mean of the team's self

¹ Each research question was also examined by including the entire sample and by including only those teams with low ICC values (i.e., $ICC < .27$). Results of these analyses are located in Appendix L.

evaluation measure scores) was moderated by the level of task interdependence that the team reported while completing the team assignment. Results of this analysis revealed that the addition of the interaction term for the two predictor variables was significant ($\Delta R^2 = .06$, $F[1, 193] = 13.26$, $p < .001$; small to medium effect size). Therefore, task interdependence appeared to be a significant moderator of the relationship between a team's average Teamwork Test scores and average self performance scores. The final multiple regression model produced the following results: $R^2 = .12$, $F(1, 193) = 8.71$, $p < .001$ (medium effect size). The data were graphed using ModGraph² to understand the nature and direction of the interaction effect and revealed that as a team's average teamwork KSAs increased, team performance actually decreased in low task interdependence settings. Furthermore, as a team's

² It should be noted that since the moderator variable (task interdependence) was a continuous variable, the moderation effect was graphed using the z-score values for this variable, with "medium" serving as the mean ($z = 0$), "low" representing the mean minus one standard deviation, and "high" representing the mean plus one standard deviation. This approach was utilized for each graph of the significant moderation effects found in exploring the research questions.

average teamwork KSAs increased in high task interdependence settings, the impact on the team's performance was only slightly more positive. The graph of this interaction effect is located in Appendix H.

Similarly, research question 2A asked whether the relationship between a team's preference to work in a team (as measured by the mean of the team's Team Player Inventory mean scores) and a team's performance (as measured by the mean of the team's self evaluation measure scores) was moderated by the level of task interdependence that the team reported while completing the team assignment. Results of this analysis revealed that the addition of the interaction term for the two predictor variables was not significant ($\Delta R^2 = .006$, $F[1, 193] = 1.13$, $p > .05$). Therefore, task interdependence did not appear to moderate the relationship between a team's average Team Player Inventory scores and average self performance scores.

Research question 1B examined peer performance and asked whether the relationship between a team's teamwork KSAs (as measured by the mean of the team's Teamwork Test scores) and a team's performance (as measured by the mean of the team's peer evaluation measure scores) was

moderated by the level of task interdependence that the team reported while completing the team assignment. Results of this analysis revealed that the addition of the interaction term for the two predictor variables was significant ($\Delta R^2 = .03$, $F[1, 193] = 6.44$, $p < .05$; small effect size). As a result, it was determined that task interdependence was a significant moderator of the relationship between a team's average Teamwork Test scores and average peer performance scores. The final multiple regression model produced the following results: $R^2 = .08$, $F(1, 193) = 5.64$, $p < .05$ (small to medium effect size). The data were graphed using ModGraph to understand the nature and direction of the interaction effect and revealed that, similarly to those results found in research question 1A, an increase in a team's teamwork KSAs had only a marginal positive impact on team performance in high task interdependence settings. Additionally, the higher a team's teamwork KSAs were in low task interdependence settings, the lower the team's performance was. This graph can be located in Appendix I.

Relatedly, research question 2B asked whether the relationship between a team's preference to work in a team (as measured by the mean of the team's Team Player

Inventory mean scores) and a team's performance (as measured by the mean of the team's peer evaluation measure scores) was moderated by the level of task interdependence that the team reported while completing the team assignment. Results of this analysis revealed that the addition of the interaction term for the two predictor variables was significant, indicating the presence of a moderation effect ($\Delta R^2 = .04$, $F[1, 193] = 8.03$, $p < .01$; small effect size). The final multiple regression model produced the following results: $R^2 = .10$, $F(1, 193) = 7.07$, $p < .001$ (medium effect size). To see more specifically how task interdependence moderated this relationship, ModGraph was used to plot the data. An analysis of this graph revealed that as a team's average preference to work in a team increased the impact on team performance was positive when task interdependence was low. However, as a team's preference to work in a team increased in high task interdependence settings, performance was negatively impacted. The graph for this interaction effect is located in appendix J.

Turning to the final two research questions, research question 1C examined whether the relationship between a team's teamwork KSAs (as measured by the mean

of the team's Teamwork Test scores) and a team's performance (as measured by a professor team evaluation measure) was moderated by the level of task interdependence that the team reported while completing the team assignment. Results of this analysis revealed that the addition of the interaction term for the two predictor variables was not significant ($\Delta R^2 = .001$, $F[1, 193] = .208$, $p > .05$). As a result, it appeared that task interdependence did not moderate the relationship between a team's average Teamwork Test scores and professor team performance scores.

Last, research question 2C examined whether the relationship between a team's preference to work in a team (as measured by the mean of the team's Team Player Inventory mean scores) and a team's performance (as measured by a professor team evaluation measure) was moderated by the level of task interdependence that the team reported while completing the team assignment. Results of this analysis revealed that the addition of the interaction term for the two predictor variables was significant, indicating the presence of a moderation effect ($\Delta R^2 = .03$, $F[1, 193] = 7.18$, $p < .01$; small effect size). The final multiple regression model produced the

following results: $R^2 = .25$, $F(1, 193) = 21.37$, $p < .001$ (large effect size). As was the case previously, ModGraph was utilized to understand more completely the nature and direction of the interaction effect. A review of this graph revealed that the interaction effect was similar to that found in the results for research question 2B: as a team's preference to work in a team increased, performance increased in low task interdependence settings, but decreased in high task interdependence settings. The graph of this interaction effect is located in Appendix K.

CHAPTER FOUR

DISCUSSION

As previously discussed in the introduction, the purpose of this study was to (1) explore further the variables of teamwork KSAs and individual preference for teamwork as predictors of team performance and (2) uncover any interaction effects that may exist between both teamwork KSAs and preference for teamwork and task interdependence on team performance. Research in this area is valuable because it will not only help guide future research in the area, but also for organizations seeking to predict team performance through the use of team selection instruments. Below, a discussion of the results found in the current study as they relate to the goals of the research is provided.

Teamwork Knowledge, Skill, and Ability

Hypotheses 1A, 1B, 1C, and research questions 1A, 1B, and 1C were all concerned with the relationship between teamwork KSAs and team performance (at both the individual and group level). Results of the three hypotheses revealed only one statistically significant relationship between the two variables, which was the

relationship between an individual's teamwork test scores and peer performance scores. However, the correlation found between these two variables was relatively small ($r = -.12, p < .05$). Therefore, based on the results of the current study, overall, an individual's teamwork KSAs appear to be minimally predictive of performance, a finding that appears to be counter to much of the past research on teamwork KSAs.

These results could have occurred for a few different reasons. For example, one possible reason no support was found could be due to the fact that student teams were utilized. It is possible that many of the study participants participated in the study with the primary motivation of receiving extra credit, and the participants did not take the surveys very seriously, resulting in null results. This is especially plausible because (1) the surveys were relatively long and participants might have wanted to finish the surveys as quickly as possible and (2) many of the second surveys were completed once participants finished their course finals at the end of the quarter and participants were likely anxious to exit the classroom after completing a test.

Another possible reason for the lack of support for these hypotheses, though, could be that there truly is a relatively small and/or non-significant relationship between teamwork KSAs and team performance. It is possible that few studies have been published that examine this relationship because it is uncommon to find a significant correlation between the two variables. One recent article (O'Neil, Goffin, & Gellatly, 2012) has pointed out that the Teamwork Test might not actually be an accurate measure in predicting team performance. Therefore, it is possible that the results of the current study provide support for the arguments presented by O'Neill et al. (2012): the Teamwork Test might not be a sufficient measure of teamwork aptitude.

One final reason, though, that these results could have turned out this way relates to the results found in examining the three research questions related to this variable. The results of these analyses showed that the level of task interdependence that is present within a team has an impact on the relationship between a team's average teamwork test scores and a team's average (1) self performance ratings and (2) peer performance ratings. Therefore, it is likely that a lack of support

for the hypotheses was found because an interaction effect was present.

Based on the results of these two research questions, it appears that the level of task interdependence that exists within a team impacts the relationship between teamwork KSAs and performance. First, it appears that teamwork KSAs do not positively impact team performance when task interdependence is low. In fact, the results of this study demonstrated just the opposite: high levels of teamwork KSAs had a negative impact on team performance when task interdependence was low. Second, when task interdependence was high, it appeared that teamwork KSAs only had a minimal positive impact on team performance. This finding seems counter intuitive to what one would expect, and supports the notion that teamwork KSAs might not be that important in relation to team performance.

Since this was the first study to the author's knowledge that has examined this moderation effect, it would be ideal for future research to continue collecting data related to this research question to see if the results are replicated. Not only could this research advance this area of study, the findings could also be

valuable from a practical standpoint because they would provide information to organizations regarding which team situations screening for teamwork KSAs might be most valuable. For example, if future research supports that teamwork KSAs do not significantly improve team performance (and even harm it when task interdependence is low), organizations could take from this that considering an individual's teamwork KSAs might not be a valuable consideration, providing little utility to the organization.

Preference for Teamwork

Hypotheses 2A, 2B, 2C, and research questions 2A, 2B, and 2C were all concerned with the relationship between preference for teamwork and team performance (at both the individual and group level). Results for each of these hypotheses provided no support for any of the three proposed hypotheses. Instead, significant results in the opposite direction of hypotheses 2A and 2B were found, demonstrating that a small relationship between and individual's preference to work in a team and lower performance scores existed ($r = .12$ for self-reported

performance and $r = .11$ for peer-reported performance, $p < .05$).

These results could have been found in the current study for reasons similar to those provided above related to the hypotheses concerned with teamwork KSAs. For example, the results could have been a consequence of using student participants who did not take the content of the surveys as seriously as was intended, resulting in substantial error variance or 'noise' in the results. Another plausible explanation, though, is that there is truly no significant and positive relationship between an individual's preference to work in a team and his or her subsequent performance. As was stated earlier, few studies exist that have explored this relationship and found similar support. In fact, based on the results of the current study, it appears that just the opposite might be true: those individuals who prefer to work in teams do not perform highly as a team member.

This explanation was further supported based on the results of research questions 2B and 2C. Both of these research question analyses provided evidence that as a team's preference to work in a team increased, their performance decreased when task interdependence was high.

Conversely, both research questions also demonstrated that increases in a team's preference to work in a team had a positive impact on performance when task interdependence was low. Based on these findings, it appears that individuals who prefer to work in a team struggle to do so successfully and that this is especially true when task interdependence within a team is high. One interesting finding, though, was that when teams with a high preference to work in a team were in low task interdependence settings, those teams performed successfully. One potential explanation for this could be that those individuals in low task interdependence teams were more able to build positive relationships with their teammates, resulting in a more positive perception in the eyes of their peers and likely a more favorable perception of their own performances due to a satisfaction with the relationships they were able to build. This is more likely to occur in low task interdependence settings because it is likely that in high task interdependence settings, teammates are more task-oriented and less focused on building relationships. Future studies should seek to understand this interaction

effect further, as previous published research regarding this relationship is very sparse.

Future Research

Overall, the results of the current study demonstrate that there is much to still be uncovered concerning the variables of focus in the current study. For example, future research related to teamwork KSAs should be concerned with the accuracy of the Teamwork Test. As reported by O'Neil et al. (2012), Ramsay Corporation distributes the Teamwork Test as a team selection instrument to "dozens of organizations across several industries" (p. 37). However, as O'Neil et al. (2012) propose, there might be reason to be concerned with organizations using the Teamwork Test to make hiring decisions, as research hasn't exhaustively researched the relationship between teamwork KSAs and team performance. Therefore, future research providing information on the accuracy and predictability of the instrument could be very valuable to researchers as well as organizations, which have clearly demonstrated a demand for this type of selection instrument.

Further research related to an individual's preference to work in a team and team performance would also be advantageous. The results of the current study appear to be contradictory to the limited research available that have examined the relationship between an individual's preference to work in a team and team performance. Future research should examine this relationship to see if, in fact, those individuals who prefer to work in team settings perform less successfully than those who prefer not to work in team settings. If these results are replicated, it would be interesting to understand why this relationship exists. One potential avenue for future research concerned with this relationship would be to see if those individuals who do not prefer to work in a team trust their teammates less and, thus, work harder to ensure their team is successful. This approach is especially likely for student teams since each student is ultimately concerned with his or her individual course grade. The results of the research questions regarding preference for teamwork could serve as a starting point in understanding under what circumstances preference for teamwork might be valuable or harmful to a team.

Organizations could benefit greatly from this future research as well. As Bell (2007) pointed out, if preference for teamwork does have an impact on performance, organizations should allow employees to select-out of teamwork when possible. However, if the relationship found in the current study is replicated, providing this choice to employees could potentially harm a team's performance. Therefore, it appears that the relationship should be explored further before organizations can confidently make team composition choices based on an individual's preference to work in a team. Furthermore, organizations should approach utilizing preference for teamwork as a selection instrument with caution, as it is unclear whether selecting individuals for teams based on he or she's preference to work in a team is beneficial or harmful to a team's performance.

Conclusion

The ultimate goal of this study was to provide both researchers and organizations with relevant information to further define predictors of team performance and, ultimately, make more accurate hiring decisions regarding

the selection of positions that require teamwork. While many of the proposed relationships and research questions resulted in null results, it is believed that the results of the current study were still valuable in furthering an area of research that, to date, appears to be relatively underdeveloped. It is the hope of the author that future studies could build upon the results found in the current study to clarify the relationships of focus explored in this study.

APPENDIX A
KNOWLEDGE, SKILL, AND ABILITY (KSA)
REQUIREMENTS FOR TEAMWORK

Knowledge, Skill, and Ability (KSA) Requirements for Teamwork

- I. **INTERPERSONAL KSAs**
 - A. **Conflict Resolution KSAs**
 - 1. The KSA to recognize and encourage desirable, but discourage undesirable, team conflict.
 - 2. The KSA to recognize the type and source of conflict confronting the team and to implement an appropriate conflict resolution strategy.
 - 3. The KSA to employ an integrative (win-win) negotiation strategy rather than the traditional distributive (win-lose) strategy.
 - B. **Collaborative Problem Solving KSAs**
 - 4. The KSA to identify situations requiring participative group problem solving and to utilize the proper degree and type of participation.
 - 5. The KSA to recognize the obstacles to collaborative group problem solving and implement appropriate corrective actions.
 - C. **Communication KSAs**
 - 6. The KSA to understand communication networks, and to utilize decentralized networks to enhance communication where possible
 - 7. The KSA to communicate openly and supportively, that is, to send messages which are: (1) behavior- or event-oriented; (2) congruent; (3) validating; (4) conjunctive; and (5) owned.
 - 8. The KSA to listen nonevaluatively and to appropriately use active listening techniques.
 - 9. The KSA to maximize consonance between nonverbal and verbal messages, and to recognize and interpret the nonverbal messages of others.
 - 10. The KSA to engage in ritual greetings and small talk, and a recognition of their importance.
- II. **SELF-MANAGEMENT KSAs**
 - D. **Goal Setting and Performance Management KSAs**
 - 11. The KSA to help establish specific, challenging, and accepted team goals.
 - 12. The KSA to monitor, evaluate, and provide feedback on both overall team performance and individual team member performance.
 - E. **Planning and Task Coordination KSAs**
 - 13. The KSA to coordinate and synchronize activities, information, and task interdependencies between team members.
 - 14. The KSA to help establish task and role expectations of individual team members, and to ensure proper balancing of workload in the team.

Adapted from Stevens, M. J., & Campion, M. A. (1994). The knowledge, skill, and ability requirements for teamwork: Implications for human resource management. *Journal of Management*, 20(2), 503-530.

APPENDIX B
TEAMWORK TEST SAMPLE ITEMS

Teamwork Test Sample Items

Suppose that you find yourself in an argument with several co-workers about who should do a very disagreeable, but routine task. Which of the following would be the most effective way to resolve this situation?

- A. Have your supervisor decide, because this would avoid any personal bias.
- B. Arrange for a rotating schedule so everyone shares the chore.**
- C. Let the workers who show up earliest choose on a first-come, first-served basis.
- D. Randomly assign a person to do the task and don't change it.

Suppose you are presented with the following types of goals. You are asked to pick one for your team to work on. Which would you choose?

- A. An easy goal so the team will be assured of reaching it, thus creating a feeling of success.
- B. A goal of average difficulty so the team will be somewhat challenged, but successful without too much effort.
- C. A difficult and challenging goal that will stretch the team to perform at a very high level, but attainable so that effort will not be seen as futile.**
- D. A very difficult, or even impossible goal so that even if the team falls short, it will at least have a very high target to aim for.

Your team wants to improve the quality and flow of the conversations among its members. Your team should:

- A. set up a specific order for everyone to speak and then follow it.**
- B. use comments that build upon and connect to what others have already said.
- C. let team members with more to say determine the direction and topic of conversation.
- D. do all of the above.

Stevens, M. J., & Campion, M. A. (1994). The knowledge, skill, and ability requirements for teamwork: Implications for human resource management. *Journal of Management*, 20(2), 503-530.

APPENDIX C

TEAM PLAYER INVENTORY MEASURE

Team Player Inventory Measure

Instructions: Please read the following statements and indicate the degree to which you agree or disagree with each statement using the following number scale:

- 1 = Disagree completely
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Agree completely

- ___ I enjoy working on group projects.
- ___ Group project work easily allows others **NOT** to “pull their weight.”
- ___ Work that is done as a group is better than the work done individually.
- ___ I do my best work alone rather than in a group.
- ___ Group work is overrated in terms of the actual results produced.
- ___ Working in a group gets me to think more creatively.
- ___ Groups are used too often, when individual work would be more effective.
- ___ My own work is enhanced when I am in a group situation.
- ___ My experiences working in group situations have been primarily negative.
- ___ More solutions/ideas are generated when working in a group situation than when working alone.

Kline, T. J. (1999). The team player inventory: Reliability and validity of a measure of predisposition toward organizational team-working environments. *Journal for Specialists In Group Work*, 24(1), 102-112.

APPENDIX D
TASK INTERDEPENDENCE MEASURE

Task Interdependence Measure

Instructions: Please read the following statements and indicate the degree to which you agree or disagree with each statement using the following number scale:

- 1 = Disagree completely
- 2 = Disagree
- 3 = Somewhat disagree
- 4 = Neither agree nor disagree
- 5 = Somewhat agree
- 6 = Agree
- 7 = Agree completely

_____ The team assignment required me to work closely with others in doing my work.

_____ The team assignment required me to frequently coordinate my efforts with others.

_____ The team assignment created an environment in which my own performance was dependent on receiving accurate information from other members of my team.

_____ The team assignment created an environment in which the way I performed my workload had a significant impact on others.

_____ The work I did on the team assignment required me to consult with other members of my team fairly frequently.

APPENDIX E

PEER AND SELF PERFORMANCE EVALUATION MEASURE

Peer and Self Performance Evaluation Measure

Instructions: Please read the following statements and indicate the degree to which you agree or disagree with each statement regarding each of your teammates' (your) performance on the assignment using the following number scale:

- 1 = This individual (I) performed better in this area than any other team member, i.e., (I) was THE top performer in this area.
- 2 = This individual (I) performed significantly better in this area than most team members, but (I) was not THE top performer in this area.
- 3 = This individual (I) performed somewhat better in this area than most team members in this area.
- 4 = This individual (I) performed at the same level as the other members of the team in this area in this area.
- 5 = This individual (I) performed somewhat worse in this area than most team members in this area.
- 6 = This individual (I) performed significantly worse in this area than most team members, but was not THE poorest performer in this area.
- 7 = This individual (I) performed worse in this area than any other team member, i.e., was THE poorest performer in this area.

On a scale of 1 – 7, how well would you rate this individual's (your):

- _____ Communication skills with other team members? (i.e., did this team member communicate openly with other team members and NOT speak aggressively or rudely to teammates?)
- _____ Ability to keep the team on track with the assignment? (i.e., did this team member help in setting team goals or work to minimize distractions or side conversations in team meetings?)
- _____ Availability while working on the group assignment?
- _____ Willingness to listen to his or her teammates while working on the group assignment?
- _____ Ability to provide meaningful feedback to other teammates? (i.e., did this individual provide feedback to teammates that was effective and do so in a non-aggressive manner?)

- _____ Cooperation with the group members? (i.e., did this individual make an effort to get along with the other team members and NOT create conflict within the team?)
- _____ Dependability while working on the group assignment? (i.e., could this individual be counted on to complete work as agreed upon by the team?)
- _____ Participation while working on the group assignment? (i.e., did this individual provide input to the team regarding the team assignment during meetings and through communication with other team members?)
- _____ Quality of work on the group assignment?
- _____ Overall contribution to the group assignment?

APPENDIX F

PROFESSOR PERFORMANCE EVALUATION MEASURE

Professor Performance Evaluation Measure

Please rate how well the team performed for each dimension listed below on a scale of 1-9 based on the descriptions provided.

	1	2	3	4	5	6	7	8	9
Assignment Requirements	All of the requirements of the assignment were not met (e.g., a major component of the assignment [paper, presentation, etc] was missing and/or some of the required elements of the assignment were not completed [handouts, references page, etc]).								All of the requirements of the assignment were met (e.g., the major components [paper, presentation, etc] of the assignment were turned in on time and the assignment contained all of the required elements [handouts, references page, etc]).
Written Materials <i>(for assignments that require a paper/essay)</i>	The written materials completed by the team contained mostly irrelevant information, and/or contained several spelling and grammatical errors, and/or the sections in the written materials did not flow well together.								The written materials completed by the team contained relevant information, were free from spelling and grammatical errors and all sections in the written materials flowed well together.
Presentation Materials <i>(for assignments that require a presentation)</i>	The presentation materials utilized by the team contained mostly irrelevant information and/or were very unprofessional, too busy, and/or contained several spelling and/or grammatical errors.								The presentation materials utilized by the team contained relevant information and were professional, not too busy, and free from spelling and grammatical errors.
Presentation Team Member Involvement <i>(for assignments that require a presentation)</i>	All team members were not actively involved in the presentation (e.g., only some team members spoke and managed the presentation materials and/or kept time, or some members of the team were absent from the presentation).								All team members were actively involved in the presentation (e.g., all of the team members were present, some or all team members spoke, and some team members managed the presentation materials and/or kept time)

	1	2	3	4	5	6	7	8	9
Team Member Involvement	All team members did not appear to be a contributor to the final project output (e.g., it was evident that at least one group member did not do their fair share of the work in this project).								All team members appeared to be a contributor to the final project output (e.g., it was evident that all group members did do their fair share of the work in this project).

During the time period in which this team assignment was completed, were you contacted by any of the team members because of team conflict issues the team was experiencing?

- Yes
- No

If yes, what was the nature of the team conflict? (Check all that apply.)

- A team member was being argumentative with other team members.
- A team member was not participating in team meetings and/or ignoring team communications.
- A team member was refusing to complete their share of the assignment.
- A team member was not being included in the work being completed by other team members (e.g., a team member was being “kept out of the loop”).
- Other: _____

APPENDIX G

TABLE 1

Table 1

Variable means, standard deviations, and correlations

	M	SD	1	2	3	4	5	6	7	8	9	10
1. Teamwork Test	18.85	4.64										
2. Team Player Inventory	3.06	.68	-.07									
3. Performance (self)	23.83	14.35	.08	.12*								
4. Performance (peer)	28.45	10.49	-.12*	.11*	.11*							
5. Performance (professor)	7.37	1.06	.09	.10	.04	.007						
6. GPA	3.07	.43	.22**	-.20**	-.02	-.16**	.006					
7. Class level	3.40	.57	.16**	-.01	.05	-.03	.01	-.03				
8. Amount of work experience	1.10	.30	-.10	.007	.001	.05	.02	.04	-.13*			
9. Amount of team experience	3.54	1.40	.12*	.05	.05	.07	.03	.06	.04	-.06		
10. Familiarity with teammates	1.91	1.62	-.13*	.04	.04	.09	-.04	-.05	-.03	.04	.02	
11. Task interdependence	26.98	5.72	-.07	-.12*	-.12*	-.07	.18**	-.008	-.14**	.03	-.03	.07

Note. * Indicates statistical significance $p < .05$. ** Indicates statistical significance $p < .01$.

APPENDIX H

FIGURE 1

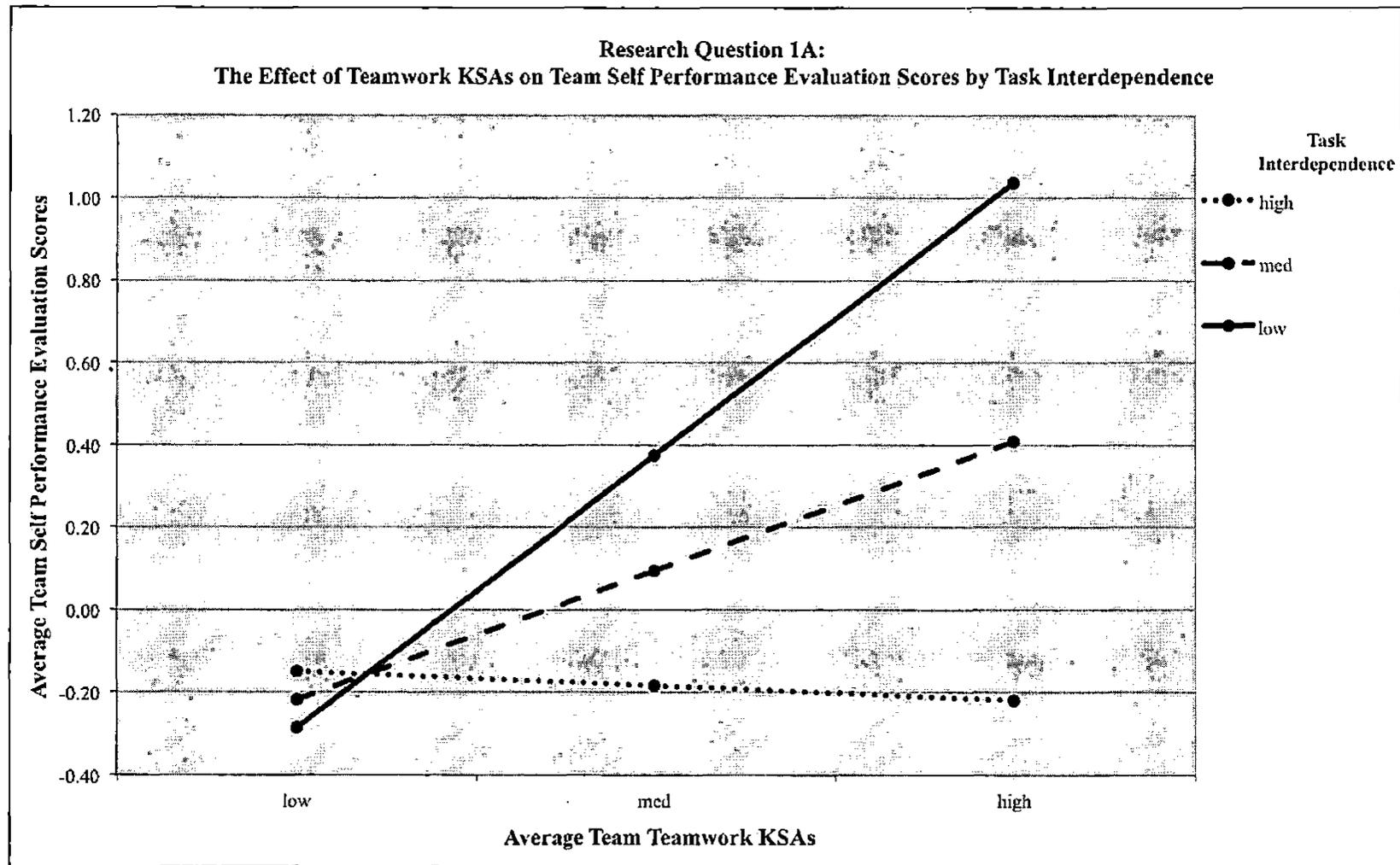


Figure 1

APPENDIX I

FIGURE 2

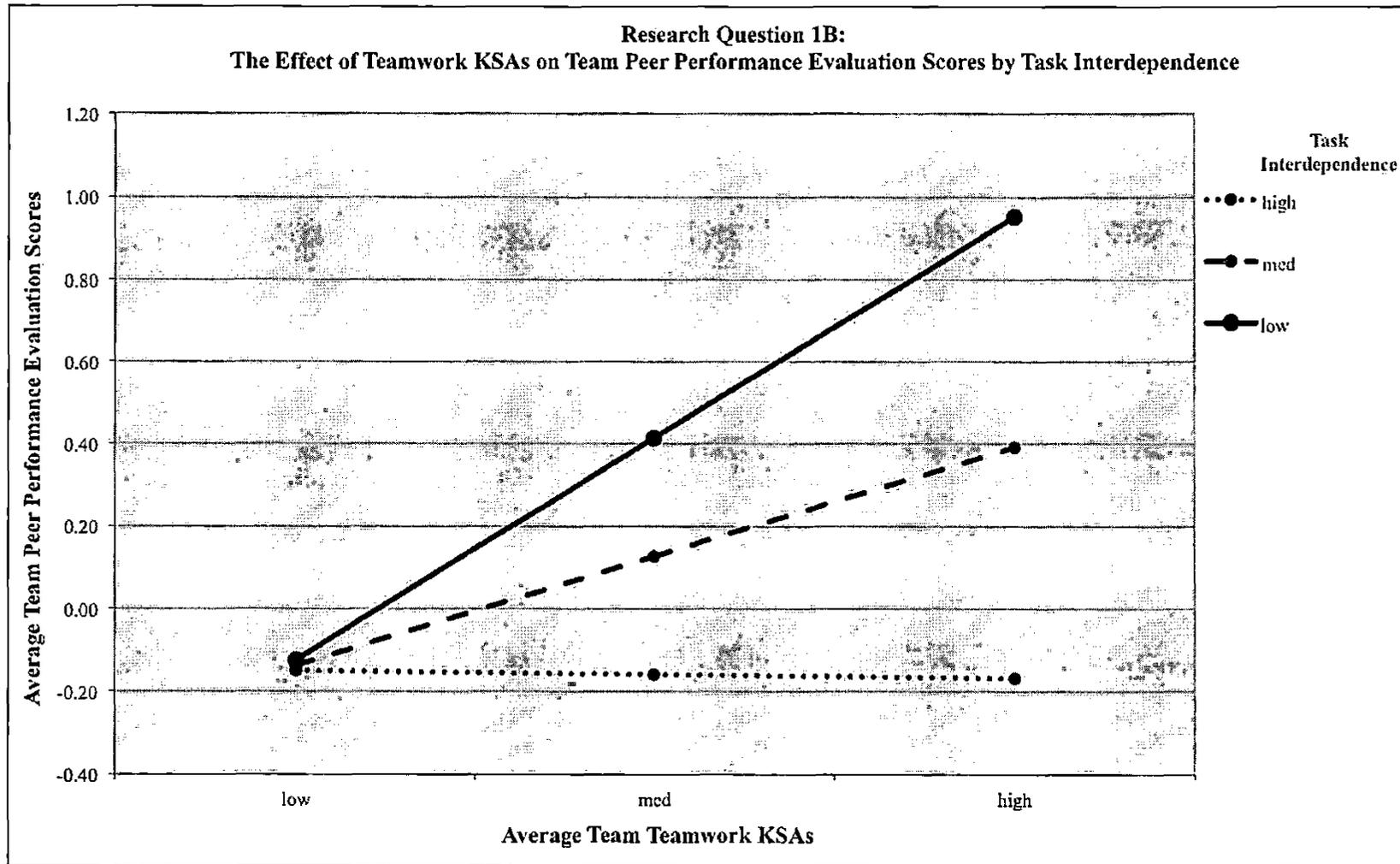


Figure 2

APPENDIX J

FIGURE 3

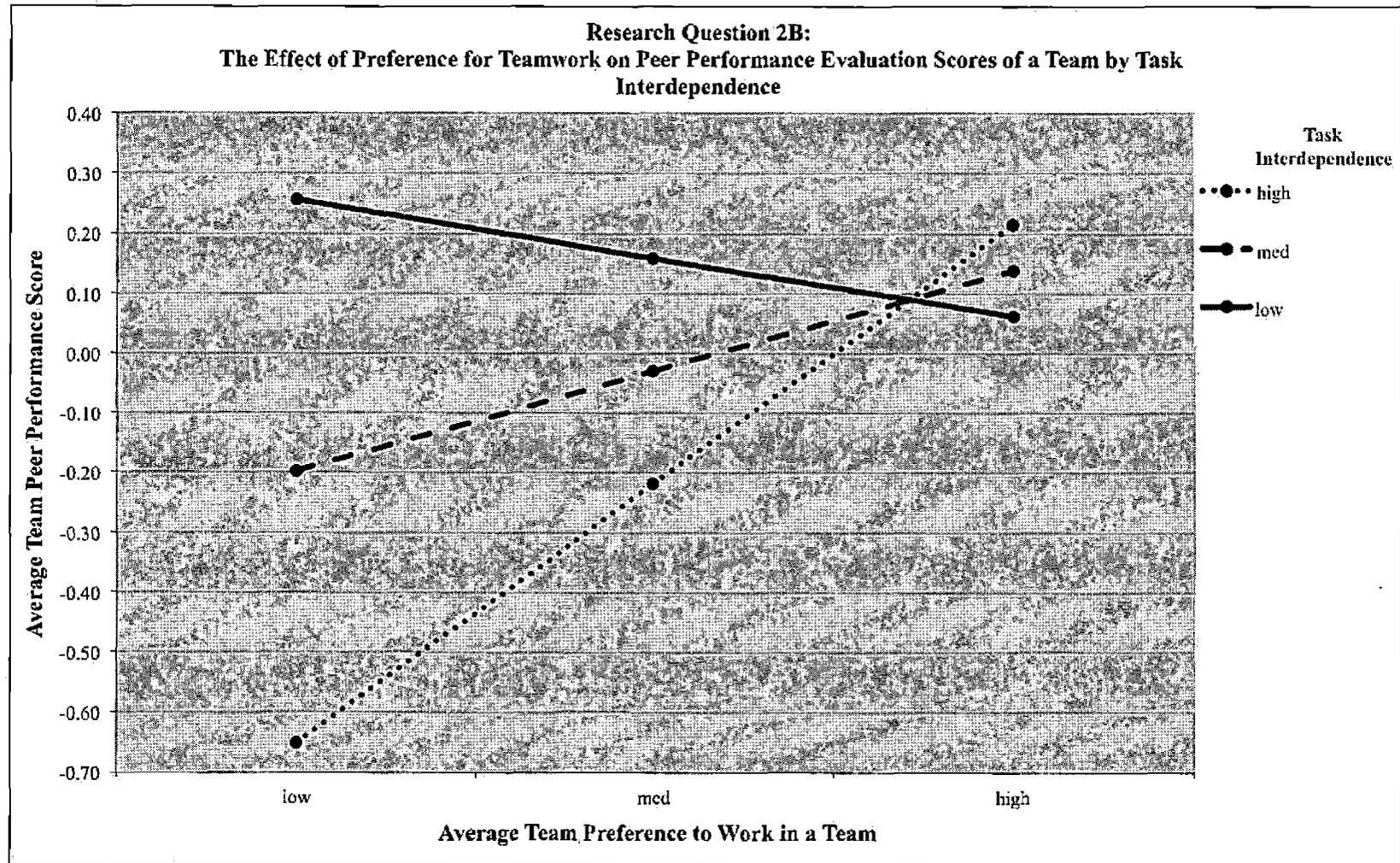


Figure 3

APPENDIX K

FIGURE 4

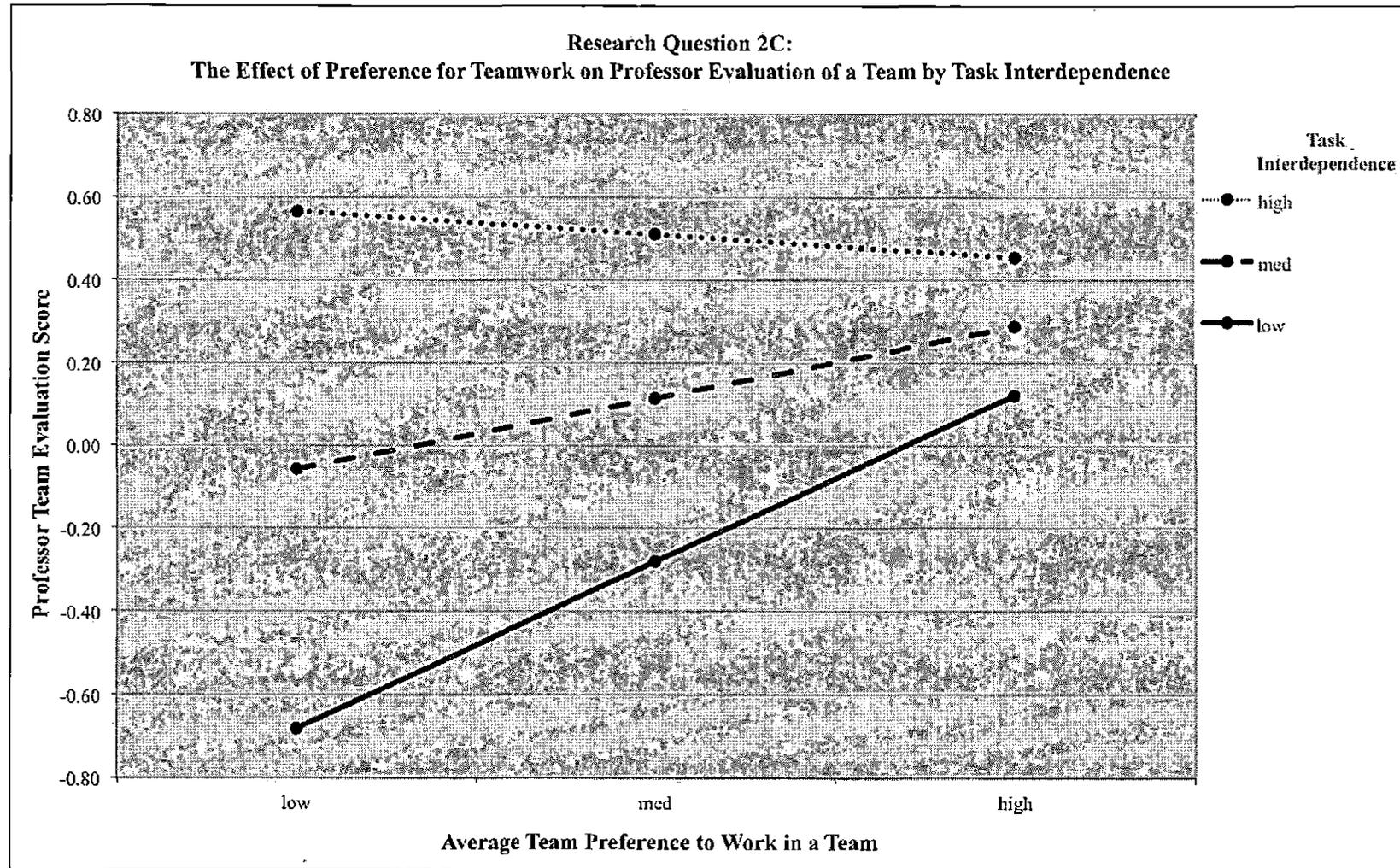


Figure 4

APPENDIX L

TABLE 2 AND 3

Table 2

Research question analyses results with all cases included

	ΔR^2	Evidence of interaction effect?	Final Model Results
RQ1A	.05, $F(1, 364) = 20.61, p < .001$	Yes	$R^2 = .09, F(1, 364) = 12.40, p < .001$
RQ2A	.005, $F(1, 367) = 1.90, p > .05$	No	
RQ1B	.01, $F(1, 363) = 5.43, p < .05$	Yes	$R^2 = .07, F(1, 363) = 8.88, p < .001$
RQ2B	.04, $F(1, 366) = 13.62, p < .001$	Yes	$R^2 = .06, F(1, 366) = 7.49, p < .001$
RQ1C	.01, $F(1, 364) = 3.93, p < .05$	Yes	$R^2 = .11, F(1, 364) = 14.04, p < .001$
RQ2C	.06, $F(1, 367) = 26.27, p < .001$	Yes	$R^2 = .16, F(1, 367) = 22.36, p < .001$

Note. Eight multivariate outliers were identified and removed from analyses for RQs 1A, 1B, and 1C. Six multivariate outliers were identified and removed from analyses for RQs 2A, 2B, and 2C.

Table 3

Research question analyses results with teams with ICC < .27 only

	ΔR^2	Evidence of interaction effect?	Final Model Results
RQ1A	.07, $F(1, 171) = 13.93, p < .001$	Yes	$R^2 = .13, F(1, 171) = 8.51, p < .001$
RQ2A	.005, $F(1, 174) = .004, p > .05$	No	
RQ1B	.01, $F(1, 170) = 2.06, p > .05$	No	
RQ2B	.02, $F(1, 173) = 3.40, p > .05$	No	
RQ1C	.000, $F(1, 171) = .04, p > .05$	No	
RQ2C	.06, $F(1, 174) = 10.32, p < .01$	Yes	$R^2 = .07, F(1, 174) = 4.11, p < .01$

Note. Eight multivariate outliers were identified and removed from analyses for RQs 1A, 1B, and 1C. Six multivariate outliers were identified and removed from analyses for RQs 2A, 2B, and 2C.

Bivariate correlation between team ICC value for task interdependence and team task interdependence = .09, $p > .05$

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