# A MULTILEVEL INVESTIGATION OF THE RELATIONSHIPS BETWEEN PERSONALITY AND TEAM ROLE ADOPTION

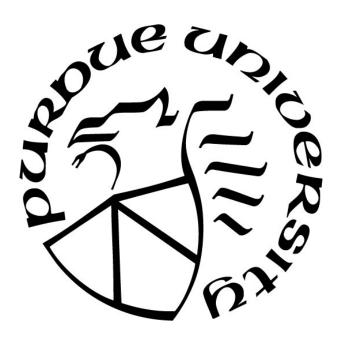by

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*To my husband, David, your unwavering love, support, and encouragement inspired me to complete this research. And, to my parents, everything I am is because of you.*

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# ABSTRACT

There is a plethora of team composition and personality research, but limited research incorporating the influences of team context or teammate behaviors for a multilevel examination. Using secondary data from a pre-existing study consisting of 86 teams and 430 total participants, we investigated the multilevel relationships of personality and team role adoption. We predicted hypotheses at three levels. At the individual-level, we predicted personality traits would predict role adoption. At the team-level, we predicted team personality composition (measured as mean) would predict role composition (measured as density). We also predicted cross-level interactions, such that team personality composition would moderate relationships between individual personality and role adoption. We utilized Density scores to calculate team role composition, which captures mean ties per group member where a tie is being perceived as adopting a leadership role. At the individual-level, we found support that extraversion levels predicted adoption of all roles. At the team-level, mean conscientiousness predicted density of all team roles. We found no support for any cross-level moderations that team personality composition influenced individual-level personality to role predictions.

# INTRODUCTION

The utilization of work teams has become prevalent in organizations (Devine et al., 1999). Teams provide numerous benefits including increased productivity and heightened innovation. Although teams have been shown to induce positive effects in some instances, they have also created losses and inefficiency in other scenarios (Steiner, 1972; Stewart, Fulmer, & Barrick, 2005). These conflicting results indicate a lack of knowledge about what characteristics influence team processes or functioning.

The Input-Process-Output model has been heavily utilized in team research (Barrick et al., 1998; Gladstein, 1984; Guzzo & Shea, 1992; Hackman, 1987; McGrath, 1984). This posits that inputs affect team processes, which in turn affect team outputs. Inputs can refer to individual-level (e.g., team-member characteristics), group-level (e.g., team structure or size), or environmental-level factors (e.g., task characteristics). Processes refer to the interactions that take place among members (e.g., communication, conflict, leadership, etc.). And finally, outputs refer to the team's outcomes such as productivity.

Most team research has investigated only one particular level of inputs at a time (e.g., the relationship between individual-level characteristics and team outcomes; Blumberg, 2001; Mathieu et al., 2015). However, team processes are innately multilevel and affected by many different levels simultaneously. Little empirical research has examined both individual and team-level characteristics, leaving a gaping hole in team research. More insight is needed into these multilevel processes to better understand team functioning. To fill this void, the current study investigated both individual and team-level characteristics. The main purpose of this study was to examine how individual and team-level Inputs (e.g., personality) influence Intragroup Processes (e.g., leadership role adoption and leadership role density). Additionally, we investigated the possible cross-level effects of team personality on the effects of individual personality on role adoption.

**Literature Review**

*Team Leadership Roles*

      As defined by Mathieu and colleagues (2015), a *role* is a "cluster of related and goal-directed behaviors taken on by a person within a group or team" (p. 7). According to Stewart, Fulmer, and Barrick (2005) team roles represent patterns of individual behaviors resulting from interactions with other team members. Additionally, Goffman (1959) noted that roles are fluid or dynamic and can be taken on or off with relative ease. Therefore, roles represent the behaviors (or processes) being performed within the group, and individual characteristics (or team characteristics) are the inputs influencing roles to be taken on (adopted) or not. These roles are fluid thus team members may adopt or drop roles over time in order to drive the team towards its goal(s).  Some roles that team members may adopt involve enacting leadership responsibilities or actions. These roles are referred to as Team Leadership Roles.

      *Team leadership roles* describe the "interactions and behaviors enacted by team members to lead the team by sharing leadership responsibilities" (Hiller, Day, and Vance 2006, p. 388). In other words, multiple individuals may act as leaders to the group versus one appointed leader. This process of shared (or collective) leadership has been linked with higher team functioning (Neubert, 1999; Pearce & Sims, 2002). A recent meta-analysis (Wang, Waldman, & Zhang, 2014) demonstrated a positive relationship between shared leadership and team effectiveness, especially when tasks were more complex, and Mumford (2011) posed that collective leadership is successful because when leadership is shared (versus centralized), individuals with relevant expertise can step into an appropriate leadership role and solve the given problem. Thus, teams can rely on the appropriate person equipped to handle different scenarios as opposed to relying on a single person to have all the answers all the time. Marrone, Tesluk, and Carson (2007) described four distinct team leadership roles that team members may adopt to promote team success: Navigator, Engineer, Social Integrator, and Liaison.

      The Navigator role is the direction setter for the team. Navigators initiate and communicate clear plans for the team and problem solve along the way. The Engineer role organizes the team and acts as an operational coordinator. Engineers are the director of activity and keep the group structured. The Social Integrator is the adjudicator or harmonizer for the team. Social Integrators effectively coach and assist with processes to keep social harmony

within the group. Lastly, the Liaison is an advocate for the team and spans outside the group for support. Liaisons may utilize external networks to obtain materials or resources for the group's success. In addition to performing different activities, these roles can also be categorized based on their main focus of team activities.

These roles perform either task-focused, socio-emotional focused, or boundary-spanning behaviors (Mumford et al., 2006). Thus, these roles are dubbed task, social-emotional, or boundary-spanning roles. Task roles represent behaviors primarily concerned with work completion and problem-solving (Mathieu et al., 2015; Stewart, Fulmer, & Barrick, 2005). Team members who perform task roles work diligently to accomplish the team's goals. Socio-emotional roles enact behaviors of cooperation and group cohesion (Forsyth, 1990; Stewart et al., 2005). Team members performing social roles encourage others and resolve conflict. Boundary-spanning roles represent behaviors that connect the group with environments outside the team (Aldrich & Herker, 1977). Team members performing boundary-spanning roles often interact with outsiders to procure resources for the team (Mumford et al., 2008).

In the current study, the Navigator and Engineer roles are task-focused, but in different ways. The Navigator role focuses on structuring the team and providing direction. The Engineer role completes tasks and gets the necessary work done. Socio-emotional roles often manage the interpersonal processes of team members and socially integrate opposing views or complex expertise. Social Integrator is a socio-emotional role in the current study. Social integrators focus on maintaining harmony within the group. Boundary-spanning roles focus on behaviors that connect the team with resources outside of their group. The Liaison is a boundary-spanning role focusing on connecting the group with outside people, resources, or stakeholders.

Research has shown a positive relationship between leadership behaviors exhibited by team members and team performance (Carson et al., 2007). In other words, teams perform better when multiple leadership roles are enacted within the group. These findings contribute to the latter half (Process → Output portion) of the Input-Process-Output model. However, this provides little to no insight into what Inputs relate to the Processes. As mentioned above, individuals may step into leadership roles based on predispositions. The question becomes, what characteristics influence the roles team members to adopt? More research is needed to help determine what characteristics influence the adoption, or enactment, of Team Leadership Roles.

*Personality*

Theoretically, personality should represent a critical influence on role adoption. *Personality* refers to "an individual's characteristic patterns of thought, emotions, and behavior" (Funder, 2001, p. 2; Stewart et al., 2005, pp. 344-345). In other words, an individual's personality captures how they act, feel, or think across a variety of situations. Therefore, personality should also direct how individuals behave within a team and which role they enact. Previous research supports this idea at the individual-level.

The Five-Factor Model of Personality emerged in the 1980s. Utilizing factor analysis, five personality dimensions were identified and deemed the Five-Factor Model (FFM), also known as the "Big Five" (Costa & McCrae, 1992). These dimensions include (1) Extraversion, (2) Conscientiousness, (3) Emotional Stability (sometimes referred to as Neuroticism), (4) Agreeableness, and (5) Openness to New Experiences.

Extraversion is defined as the degree of sociability, warmth, gregariousness, and positivity (Costa & McCrae, 1992). Highly extraverted people are often talkative, expressive, active, and show initiative. Extraverted individuals enjoy being with people or at social gatherings.

Conscientiousness refers to the degree of self-discipline, achievement striving, and competency (McCrae & Costa, 1992). Conscientiousness is an indicator of the extent to which a person is careful or diligent. Individuals high on conscientiousness tend to be organized, task-focused, and take obligations seriously.

Emotional Stability is defined as the extent to remain calm and even-tempered. Otherwise the opposite of being anxious, depressed, irritable, moody, angry, sad, embarrassed, emotional, worried, or insecure (Mathieu et al., 2015; Schultz & Schultz, 2012). Those high on emotional stability are likely calm and refrain from making impulsive decisions.

Agreeableness refers to being courteous, flexible, trusting, good-natured, cooperative, soft-hearted, forgiving, and tolerant (McCrae & Costa, 1992). Those high on agreeableness are often compliant, modest, considerate, and sympathetic. Agreeable individuals will likely aim to please others and "go with the flow."

Lastly, Openness (or Openness to Experience) is defined as preferring fantasy, aesthetics, and new opportunities (McCrae & Costa, 1992). It refers to being imaginative, cultures, curious,

original, broad-minded, intelligent, and artistically sensitive. Those high on openness may be more imaginative or willing to try new ideas.

Previous research has linked these personality characteristics with team roles. In particular, Blumberg (2001) found that task roles held a positive relationship with conscientiousness ($r = .41$) and agreeableness ($r = .23$), and social roles were positively related with agreeableness ($r = .45$), conscientiousness ($r = .24$), emotional stability ($r = .42$), and extraversion ($r = .26$). Results from Stewart, Fulmer, and Barrick (2005) showed that 9% of the variance in social roles and 12% of the variance in task roles is accounted for by personality. Higher levels of agreeableness were related to social roles ($r = .25$). Conscientiousness levels were positively related to the task roles ($r = .25$), as well as emotional stability ($r = .15$). To our knowledge, there are no known studies that investigated the relationship between personality and boundary-spanning roles. This is possibly due to the difficulty of implementing a boundary-spanning team task within an investigative setting.

In sum, task roles have been related to conscientiousness, agreeableness, and emotional stability, whereas social roles have been related with agreeableness, conscientiousness, emotional stability, and extraversion. These results indicate that personality characteristics indeed related to the adoption of roles. However, the studies above did not include the additional context of the team or other team members in their investigations. Team context is important to incorporate because the relationships and interactions between team members directly influence how others behave or what team roles will be adopted.

Teams are inherently multilevel as they amalgamate individual contributions and influence collective outcomes (Kozlowski & Klein, 2000; Stewart et al., 2005). Thus, team members do not exist within a vacuum. Team performance is a complex function of the varying behaviors of lower-level characteristics (Kozlowski & Klein, 2000). Therefore, a complete picture of how personality influences the roles members take on in teams needs to also consider the influence of the other team members and their personalities.

The current study aims to accomplish this by exploring a multilevel model of personality and roles. Specifically, this study investigates the individual and team-level relationships between personality and team roles as well as investigating a cross-level interaction between the individuals' and team's personality on role adoption.

*Methods of Operationalization*

There are several ways to operationalize team composition variables. In particular, some of the most common methods of operationalization are calculating mean scores, the variability of scores, minimum/maximum of scores, or density (Barrick & Stewart, 1998). All of these methods come with both advantages and disadvantages in team research. Utilizing mean scores "assumes that the amount of a characteristic possessed by each member increases the collective pool of said characteristic" (Barrick & Stewart, 1998). In other words, more of the characteristics is always better (or worse) regardless of the distribution amongst the team. This assumption is problematic as it can potentially hide valuable information.

On the other hand, utilizing variability of a characteristic to operationalize team composition captures differences amongst the group members that may be masked by the mean. In this case, variability would measure the variance of a characteristic within the team. This can provide insight into the similarities of team members. Low variability would represent those team members all have similar levels of a characteristic. For example, if members of a team are all highly conscientious, there would be low variability of conscientiousness. Additionally, it can represent the different levels of inputs expected to be brought by each member. For example, if a team has varying levels of conscientiousness, then you would expect some team members to provide more conscientious ideas or points where others would not.

There may be some teams where low varying characteristics are beneficial. Similar teams may have less conflict or struggle between members since they may act or think in similar manners. However, teams with more variation may have members providing differing perspectives, ideas, thoughts that could help them team perceive future obstacles or brainstorm more creative thoughts. According to Barrick and Stewart (1998), utilizing variability is most appropriate when research seeks to understand the relationship between homogeneity and team processes or outcomes. Thus, there are scenarios in which homogeneity in teams is beneficial and scenarios in which it is not. Team composition research needs to measure variability and test when it is more (or less) beneficial for a team member to differ.

The third method operationalizes variables into the minimum or maximum scores (i.e., the highest or lowest). This is based on the concept that scores of one individual can significantly affect a group (Barrick & Stewart, 1998; Kenrick & Funder, 1988). For example, a team member with a very low cognitive ability score may significantly decrease the quality of work (Steiner,

1972). Utilizing maximum or minimum scores is most appropriate in situations where one person may overwhelmingly affect the team's performance as a whole.

In recent years, studies have utilized the social network approach to team composition research and operationalized as density. *Density* refers to the proportion of total possible relationships (actual ties over potential ties) that exist in a network (Carson et al., 2007; Wasserman & Faust, 1994). Higher density indicates that there are more relationships, whereas lower density indicates fewer relationships. For example, if 20 people are participating in a group, one person could potentially have 19 connections. If said person had 19 connections, the density would be exactly 1.0. This particular example is at the individual-level, but could also be applied to the team-level. Team density would be calculated by summing all of the actual relationships between all 20 members and dividing that summation by the total number of potential relationships.

In the current study, the team composition of leadership roles will be measured via density. High density in this scenario would indicate that more of the team members are reporting a leadership role is being performed. On the contrary, low density would indicate that fewer members are performing said leadership role. In particular, a perfect team Navigator density score of 1.0 would indicate that all five team members rated each other as strongly performing the Navigator role (e.g., a 5 rating on the Likert scale). On the contrary, the lowest team Navigator density score would indicate that no member is performing the Navigator role (e.g., a 1 rating on the Likert scale). The latter scenario would be bad if at least one team member needed to perform as a Navigator for positive team functioning. Utilizing density to operationalize team role composition provides benefits such as incorporating all team members' scores (versus just one). Additionally, it provides information similar to mean and variability, but more holistically. In the current study, measures will be operationalized as density, mean, and minimums for reasons explained later on.

# CURRENT STUDY AND HYPOTHESES

The purpose of the current study is to expand upon previous empirical findings. In particular, we hope to gain insights into the relationship of personality and team leadership roles in a team context as opposed to previous individual-level studies. More specifically, we look at role density, which refers to the proportion of actual relationships versus total possible relationships (Carson et al., 2007; Wasserman & Faust, 1994). By doing this, we hope to learn how team characteristics may influence individual-level relationships. Thus, our study incorporates a multilevel perspective by linking both individual-level and team-level qualities (see Figure 1) to answer three research questions. First, do Level 1 individual personality characteristics predict the individual team roles we adopt? Second, does Level 2 team personality composition predict the density of team roles? And last, does Level 2 team personality composition influence (moderate) the Level 1 relationships between personality and role adoption?



Figure 1: Multilevel Model of Predictions

To test these three research questions, we utilized data collected in a pre-existing study that had not been analyzed for these research questions. The original study employed a modified version of the Distributed Dynamic Decision-making (DDD) computer simulation task. This dynamic simulation was developed for the U.S. Department of Defense. Teams of five members with little to no previous experience collaboratively monitor a simulated geographical grid. This grid is partitioned into four equal quadrants. Each member is assigned one of the quadrants (except for one member who can see all four quadrants). During the task, teammates are to track, detect, and destroy enemy targets without accidentally destroying friendly targets. To perform effectively, team members must rely on each other to track targets outside of their visible quadrant. As the nature of this task requires collaboration, communication, direction, strategy, social harmony, and task completion, the DDD task is appropriate for the team roles we are interested in (i.e., Navigator, Social Integrator, Engineer).

|                     | Navigator | Engineer | Social Integrator | Liaison |
|---------------------|:---------:|:--------:|:-----------------:|:-------:|
| Extraversion        | +         |          | +                 |         |
| Conscientiousness   | +         | +        |                   |         |
| Emotional Stability | +         |          | +                 |         |
| Openness            |           |          |                   |         |
| Agreeableness       |           |          | +                 |         |

Figure 2: Depiction of the Individual-Level Hypotheses

**Individual-Level Hypotheses**

Aiming to replicate findings from previous research, we expect that personality characteristics of the Five-Factor Model (Extraversion, Conscientiousness, Emotional Stability, Openness, and Agreeableness) will be related to the adoption of team leadership roles (Navigator, Social Integrator, Engineer). Role adoption refers to the voluntary enactment of

behaviors described by a particular role. (See Figure 2 for a depiction of the following individual-level hypotheses or Table 1 for a depiction of all hypotheses.)

Extraversion can be defined as the degree of sociability, warmth, gregariousness, and positivity (McCrae & Costa, 1992). Simply put, extraversion is an indicator of how outgoing or social a person is. Those high on extraversion will likely speak up within the group and give direction. Similarly, the Navigator role sets a clear direction for the team while Social Integrators induce positive social atmospheres. Thus, we predict that Extraversion will be positively related to the Navigator role (Hypothesis 1a) and the Social Integrator role (Hypothesis 1b).

Conscientiousness can be defined as self-discipline, achievement striving, and competency (McCrae & Costa, 1992). It is an indicator of the extent to which a person is careful or diligent. Those high on conscientiousness will likely be organized, do tasks well, and take obligations seriously. Navigator and Engineer roles demonstrate very similar behaviors. Navigators provide direction for the team to achieve success while Engineers organize the team and ensure tasks are completed. We predict that conscientiousness will be positively related to the Navigator role (Hypothesis 2a) and the Engineer role (Hypothesis 2b).

Emotional Stability can be defined as the ability to remain calm and even-tempered (McCrae & Costa, 1992). It refers to a person's ability to remain stable, non-anxious, and balanced. Those high on emotional stability are likely calm and refrain from making impulsive decisions. Similarly, Navigators aid in problem-solving and must remain calm to do so. Social Integrators act as adjudicators of conflict and must have emotional stability to do so. Thus, we predict that emotional stability will be positively related to the Navigator role (Hypothesis 3a) and the Social Integrator role (Hypothesis 3b).

Agreeableness can be defined as being compliant, modest, and tender-minded. It indicates being cooperative, sympathetic, altruistic, and considerate (McCrae & Costa, 1992). Those high on agreeableness will likely aim to please and "go with the flow." Social Integrators induce social harmony within the group; therefore, must be altruistic and cooperative to some extent. Therefore, we predict that agreeableness will be positively related to the Social Integrator role (Hypothesis 4).

Openness (or Openness to Experience) can be defined as preferring fantasy, aesthetics, and new opportunities (McCrae & Costa, 1992). It indicates curiosity, creativity, variety of experience, etc. Those high on openness may be more imaginative or willing to try new ideas.

We make no hypotheses about openness because we think there will be no relationship with the particular roles used in the current study. We also make no hypotheses about the Liaison role, due to the task; there are little to no opportunities for a boundary-spanning role to emerge given the participants mainly interact with their team members versus additional outside stakeholders.

**Team-Level Hypotheses**

At the team-level, we aim to better understand the relationships between team personality and role composition. Investigating with team context is important because team members influence each other's behaviors and role adoption. Individuals may be motivated or prohibited from taking on team roles by other members. This team context matters, and we aim to capture that factor in the current study.

We execute this by aggregating individual team member personality and role scores. In particular, we calculate mean team scores for personality characteristics, because the nature of the task is collective (Barrick & Stewart, 1998). However, we utilize density scores to reflect the team-level aggregates of role scores. Density represents the pattern of relationships between teams and operationally is the proportion of total possible relationships (actual ties over potential ties) that exist in a network (Carson et al., 2007; Wasserman & Faust, 1994). In this case, ties between team members (also referred to as relationships) exist when one member perceives another as adopting a role. Thus, the role density increases when more team members are perceived as enacting a role. For example, high Navigator density scores would indicate that more members of that team are acting as Navigators (possibly all). Whereas lower scores would indicate that fewer members are acting as Navigators (potentially only one). Per Contractor and colleagues (2012), density is the most appropriate way to represent team leadership roles utilized in the current study.

Our team-level hypotheses are essentially the same as our individual-level hypotheses because these constructs are functionally parallel or homologous (Chen, Bliese, & Mathieu, 2005; Chen et al., 2009). In other words, because the team-level constructs are aggregates of the individual constructs, we can expect the results to be similar at both levels. We predict that when teams have higher mean levels of personality characteristics (Extraversion, Conscientiousness, Emotional Stability, or Agreeableness), more team members will take on roles within the group.

Therefore, we predict that mean levels of extraversion will be positively related to the Navigator density scores (Hypothesis 5a) and Social Integrator density (Hypothesis 5b). Additionally, we predict that mean levels of conscientiousness will be positively related to Navigator density (Hypothesis 6a) and Engineer density (Hypothesis 6b). We also expect that mean levels of emotional stability will be positively related to Navigator density (Hypothesis 7a) and Social Integrator density (Hypothesis 7b). Lastly, we predict that mean levels of agreeableness will be positively related to Social Integrator density (Hypothesis 8).

**Cross-Level Hypotheses**

To better understand team functioning on a holistic level, we are interested to investigate cross-level interactions. In particular, the current research examines how team-level personality composition can moderate individual-level relationships between personality and role adoption. The following hypotheses describe our predictions for the anticipated cross-level effects.

As described above, highly extraverted individuals are social and outgoing. Therefore, we predicted that individuals high on extraversion will be more likely to adopt the Social Integrator role that instills social cohesiveness within the group. However, prior research at the team-level has shown that when extraverted individuals are gathered together, there is already cohesiveness because of their similar, social behaviors (Muchinsky & Monahan, 1987). Additionally, Mumford and colleagues (2012) indicated that shifting of leadership responsibilities is often due to the skills necessary to overcome the problem. Thus, when there are several extraverted team members, they may think and behave similarly with more harmony. There may be fewer social problems and less of a need for leadership to fix said problems (i.e., no need for the Social Integrator role to emerge). Following this reasoning, we predict that mean levels of extraversion will moderate the relationship between individual extraversion and Social Integrator role adoption such that the relationship will be strongest when mean extraversion is low (Hypothesis 9).

The Navigator role instills focus and direction for the team. Navigators are task-oriented and ensure the job gets done. We predicted that individuals high on conscientiousness will be more likely to adopt the Navigator role. However, if all team members are conscientious and focused on completing the task, then there may be no need for leadership to direct focus to task completion (i.e., the Navigator role is not needed). Thus, we predict that mean levels of

consciousness will moderate the relationship between individual conscientiousness levels and the Navigator role (Hypothesis 10a) such that the relationship will be strongest when the mean levels of conscientiousness are low.

Similarly, the Engineer role is also task-focused, like the Navigator. We again anticipate that more conscientious team members will decrease the need for the Engineer role to emerge. Therefore, we predict that mean levels of conscientiousness will moderate the relationship between individual conscientiousness levels and the Engineer role (Hypothesis 10b) such that the relationship will be strongest when mean levels of conscientiousness are low.

Emotional Stability describes remaining calm and stable under pressure. If team members are not emotionally stable, they may get stressed and be unable to effectively perform. As stated by Barry and Stewart (1997), it only takes one unstable person to cause a problem within the group. Therefore, for the remaining hypotheses, we operationalize team personality as minimums instead of means, because minimum levels better reflect the low, potentially problem solving, personality levels.

If there is low emotional stability manifested within the group, individual(s) may become overwhelmed, anxious, and unable to remain focused on the task at hand. Additionally, emotionally unstable behaviors may distract other team members from being able to adequately perform. In this scenario, the presence of a task-focused Navigator role would be helpful to herd the group back on track. In this problematic scenario, a unique leadership skill set would be required to get the team back on course. Conscientious individuals are task-focused people good at identifying the team's objectives and the best course of action to achieve those goals (Stewart et al., 2005). Additionally, highly conscientious team members can identify what resources are available or needed within the team and secure those resources when needed (Porter et al., 2003). At the individual-level, we predicted that conscientiousness would be positively related to the Navigator role. Expanding on this, we deduce that conscientious individuals will be able to identify there is a problem within the group and step into a leadership role to overcome the problem. Thus, we predict that minimum emotional stability levels will moderate the relationship between conscientiousness and the Navigator role (Hypothesis 11a) such that the relationship will be strongest when minimum levels of emotional stability are low.

Similarly, low emotional stability may also induce argumentative conversations or fighting behaviors within the group. In this scenario, it would be beneficial for a Social

Integrator to emerge and instill social harmony. We anticipate again that conscientious individuals are the most likely to realize this void and fill it. Thus, we predict that minimum levels of emotional stability will moderate the relationship between individuals' conscientiousness levels and the Social Integrator role (Hypothesis 11b) such that the relationship will be strongest when minimum levels of emotional stability are low.

Like the Navigator role, Engineers are also task-focused and concentrate on getting the job done. If low levels of Emotionally Stability begin to wreak havoc on the group's functioning, Engineers could emerge to help this scenario. Again, we believe conscientious individuals are more likely to be aware of this need. Thus, we predict that minimum levels of emotional stability will moderate the relationship between individual conscientiousness levels and the Engineer role (Hypothesis 11c) such that the relationship will be strongest when the minimum levels of emotional stability are low.

Agreeableness indicates being cooperative and considerate. Low levels of agreeableness would indicate non-cooperation, possibly argumentative behaviors or disagreement within the group. In this scenario, the Social Integrator role would ideally emerge and step in to rectify the conflict. As prior research has indicated, conscientious individuals are more likely to recognize this need and fill the void. Thus, we predict that minimum levels of agreeableness will moderate the relationship between individual conscientiousness levels and the Social Integrator role (Hypothesis H12) such that the relationship will be strongest when the minimum levels of agreeableness are low. A full list of all hypotheses can be found in Table 1 below.

Table 1: All Hypotheses

| **Individual-Level Hypotheses (Level 1)** | |
|---|---|
| 1a | Extraversion will be positively related to the Navigator role. |
| 1b | Extraversion will be positively related to the Social Integrator role. |
| 2a | Conscientiousness will be positively related to the Navigator role. |
| 2b | Conscientiousness will be positively related to the Engineer role. |
| 3a | Emotional Stability will be positively related to the Navigator role. |
| 3b | Emotional Stability will be positively related to the Social Integrator role. |
| 4 | Agreeableness will be positively related to the Social Integrator role. |
| **Team-Level Hypotheses (Level 2)** | |
| 5a | Mean levels of extraversion will be positively related to Navigator density scores. |
| 5b | Mean levels of extraversion will be positively related to Social Integrator density scores. |
| 6a | Mean levels of conscientiousness will be positively related to Navigator density scores. |
| 6b | Mean levels of conscientiousness will be positively related to Engineer density scores. |
| 7a | Mean levels of emotional stability will be positively related to Navigator density scores. |
| 7b | Mean levels of emotional stability will be positively related to Social Integrator density scores. |
| 8 | Mean levels of agreeableness will be positively related to Social Integrator density scores. |
| **Cross-Level Hypotheses** | |
| 9 | Mean levels of extraversion will moderate the relationship between individual extraversion and the Social Integrator role. |
| 10a | Mean levels of conscientiousness will moderate the relationship between individual conscientiousness and the Navigator role. |
| 10b | Mean levels of conscientiousness will moderate the relationship between individual conscientiousness and the Engineer role. |
| 11a | Minimum emotional stability levels will moderate the relationship between individual conscientiousness and the Navigator role. |
| 11b | Minimum levels of emotional stability will moderate the relationship between individual conscientiousness and the Social Integrator role. |
| 11c | Minimum levels of emotional stability will moderate the relationship between individual conscientiousness and the Engineer role. |
| 12 | Minimum levels of agreeableness will moderate the relationship between individual conscientiousness and the Social Integrator role. |

# METHOD

It should be noted that the data utilized in this study was previously collected during a pre-existing study. The data had not been previously used to test this study's hypotheses or research questions.

## Participants

The study sample included 86 teams comprised of undergraduate students (N = 430) from a large southwestern university. Participants were randomly assigned to teams of five people. Fifty-three percent of the sample participants were female, and ages ranged from 18 to 26 (mean = 20.38). Eighty-four percent were white/Caucasian, and sixty-three percent reported holding a junior-level class standing. The study lasted a total of three hours.

## Team Task

Participants performed a computer-based Distributed Dynamic Decision-Making (DDD) simulation task developed for the Department of Defense (see Hollenbeck, et al., 2002 or Miller et al., 1998 for a complete description). DDD is a computer simulation of a military control center in which team members worked interdependently to protect an air space. Teams must monitor, identify, and disable enemy intrusions of the air space while identifying and protecting friendly vehicles. Teammates needed to work together to radar contacts, make decisions, and coordinate their actions to prevent intrusions into their radar perimeter.

This specific DDD task used was designed to be played by 2-5 team members together with little or no military experience. Each participant worked at their networked PC workstation and used a computer mouse to control simulated military assets (e.g., tanks, helicopters, jets, AWACS renaissance planes). The team worked together in the same room so that they could easily speak and communicate with one another, but participants could not see their team members' computer screens. Each team received an identical team task including 100 separate tracks (i.e., enemy or potentially enemy vehicles) to identify, which lasted approximately 30 minutes.

**Procedures**

Before completing the task, all members completed a self-reported personality measure and then voluntarily agreed to participate in the study. Next, each participant was randomly assigned to a five-person team underwent thorough 90-minute training and practice for the simulation task. The first 30 minutes were devoted to explaining the rules and details of the DDD game. The next 30 minutes were devoted to hands-on training to learn the movements and the clicks on the PC. The last 30 minutes were devoted to practice and allowed the trainer to answer any participant questions. During this last 30-minute segment, teammates were also able to practice working together and get acclimated with one another. After the 90-minute training session, participants were allowed a 10-15-minute break. Following the break period, teams immediately began performing the DDD task described above. After the DDD game conclusion, participants completed a questionnaire, including team role responses, and then were thanked and debriefed on the study.

**Measures**

*Individual Personality*

Participants' extraversion, conscientiousness, emotional stability, and agreeableness were assessed via self-report to the NEO Five-Factor Personality Scale (Costa & McCrae, 1992). This measure consists of 240 items which assess extraversion, openness, and emotional stability with 48 items each. Participants responded on a 5-point Likert scale based on how much they agreed with each of the items (1 = Strongly disagree, 5 = Strongly agree). Sample items for each construct ae as follows: extraversion – "I feel comfortable around people," conscientiousness – "I am always prepared," emotional stability – "I have frequent mood swings," agreeableness – "I have a good word for everyone," and openness – "I have a vivid imagination." The coefficient alpha estimates of reliability for extraversion, conscientiousness, emotional stability, agreeableness, and openness were .90, .89, .90, .87, and .88 respectively.

*Team Personality*

The team personality construct was created by aggregating individual member personality scores for each team. We created both team mean scores as well as team minimum

scores for all five personality constructs. Utilizing mean and minimum scores were important based on the context of our task and study design (Barrick et al., 1998; Steiner, 1972). A taxonomy developed by Steiner (1972) outlines that operationalizing measures with the mean may be most appropriate for additive tasks in which the contribution of each member adds to a collective pool. The nature of this study's task does require inputs from all team members to be successful thus utilizing the mean is an appropriate operationalization. Additionally, Steiner's taxonomy outlines that utilizing the minimum would be most appropriate when the task is conjunctive meaning that one defective member could lead to bad performance. Following these guidelines, we created both mean scores and minimum scores for personality.

Team mean scores were group-level constructs created by calculating the mean personality scores for each of the five personality factors. Team minimum scores were calculated by taking the lowest individual member's score on each of the five personality factors. This is based on the concept that scores of one individual can significantly affect a group (Barrick & Stewart, 1998; Kenrick & Funder, 1988).

### Team Roles

To capture levels of team leadership roles, we utilized a measure pioneered by Jay Carson (2006). This measure utilizes a response matrix to capture ratings from all team members on each of the leadership roles. Therefore, team roles were assessed via self and peer-report (i.e., team members rated themselves and each other). For each role, a concise definition and brief behavior samples are provided. The four roles were listed on the left-hand side and each team member was listed as a column. All team members rated each other on the extent to which they fulfilled the four leadership roles. The prompt read "To what extent do you perceive each team member (including yourself) to be providing the following type of influence to your team?" Participants responded on a 5-point Likert scale (1=Not at all, 5 = To a very great extent). An individual's role score was calculated by averaging the ratings on each role.

### Team Role Density

The team role density variable is a group-level construct determined by aggregating the individual team role scores to the team-level. Density can also be thought of as the mean number of ties per team member (Carson et al., 2007; Sparrowe et al., 2001; Wasserman & Faust, 1994).

In the current study, ties between team members exist when a member is perceived as enacting a role. Team roles were assessed via self and peer-report (i.e., team members rated themselves and each other). Each participant was provided the definition and sample behaviors of the four-team roles. Then, they were asked, "To what extent do you perceive each team member (including yourself) to be providing the following type of influence to your team." Participants responded on a 5-point Likert scale (1=Not at all, 5 = To a very great extent).

Because the current study data were measured on a scale from 1 to 5, we followed the method set forth by Sparrowe and colleagues (2001). We computed density as the sum of the actual responses divided by the total possible sum of responses for each team. Since the teams consisted of 5 members, the denominator, or the total possible sum of responses, was 25 (5 members by 5-point Likert). The numerator, or the actual number of responses, was the sum of each members' rating on the Likert scale. This quotient produces a proportion ranging from 0 to 1, with a score of 1 indicating all five team members were performing a particular team role to the highest rating. Team density scores were calculated in this manner for all four team roles (Carson et al., 2007). Aggregation of individual role adoption scores was justified after determining adequate inter-rater agreement for all roles (ICC = .71 - .85; $r_{wg}$ = .64 - .88).

# RESULTS

## Individual-Level Analyses

The individual-level hypotheses predicted relationships between specific personality dimensions from the Big Five and shared leadership team roles. Table 2 shows the means, standard deviations, and zero-order correlations for the individual personality predictors and individual roles. Table 3 shows the results of regression analyses testing Hypotheses 1 through 4 predicting role adoption based on individual personality characteristics. According to the regression models, personality accounted for only 3% of the variance in the Navigator role, 5% of the Social Integrator role, 3% of the Engineer role, and 0.5 % of the Liaison role. This is a very small amount of variance accounted for by personality predictors.

Table 2: Means, Standard Deviations, and Zero-Order Correlations Among Individual-Level Variables

| Variable | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Navigator | 2.95 | .70 | - | | | | | | | |
| 2. Social Integrator | 2.95 | .65 | .47** | - | | | | | | |
| 3. Engineer | 2.90 | .64 | .44** | .51** | - | | | | | |
| 4. Liaison | 2.90 | .64 | .43** | .53** | .74** | - | | | | |
| 5. Extraversion | 3.46 | .73 | .15** | .18** | .13** | -.01 | - | | | |
| 6. Conscientiousness | 3.68 | .62 | .02 | .04 | .07 | .01 | .03 | - | | |
| 7. Emotional Stability | 2.71 | .69 | -.07 | -.09 | -.05 | .05 | -.12* | .06 | - | |
| 8. Agreeableness | 3.93 | .54 | .01 | .01 | .07 | -.06 | .28** | .12* | -.13** | - |
| 9. Openness | 3.49 | .54 | .05 | .11* | .01 | -.02 | .30** | -.05 | -.15** | .18** |

\* $p < .05$

\*\* $p < .01$

Linear regression analyses indicated that Hypotheses 1a and 1b were supported as Extraversion was positively, significantly predicted the Navigator role, $b = .15$, $t(422) = 3.195$, $p = .002$, and the Social Integrator role, $b = .18$, $t(422) = 3.816$, $p < .001$. Further, when

Extraversion was entered into a multiple regression model with other personality dimensions, these predictions remained significant. This indicates that extraverted team members were more likely to be Navigators and Social Integrators in their teams, even after accounting for other personality factors.

The remaining individual-level hypotheses (2 – 4) were not supported. Conscientiousness was essentially unrelated to the Navigator ($b = .02$, $p = .64$) and Engineer roles ($b = .07$, $p = .15$). Similarly, emotional stability was unrelated with the Navigator (Hypothesis $b = .07$, $p = .14$) and Social Integrator ($b = -.09$, $p = .07$) roles. Agreeableness was unrelated to the Social Integrator role ($b = .01$, $p = .90$).

Table 3: Linear regression modeling tests of individual-level outcomes

|  | Dependent Variables: | | | |
|---|---|---|---|---|
|  | Navigator | Social Integrator | Engineer | Liaison |
| *Individual-level predictors* | Est.(SE) | Est.(SE) | Est.(SE) | Est.(SE) |
| Extraversion | .15(.69)** | .18(.64)** | .13(.63)** | .15(.69)** |
| Conscientiousness | .02(.70) | .11(.65) | .07(.64) | .02(.70) |
| Emotional Stability | .07(.70) | .09(.65) | .05(.64) | .07(.70) |
| Agreeableness | .01(.70) | .01(.65) | .07(.64) | .01(.70) |
| Openness | .05(.70) | .11(.65)* | .01(.64) | .05(.70) |

\* $p < .05$

\** $p < .01$

Two unanticipated relationships were found in the data. Extraversion significantly predicted the Engineer role, $b = .13$, $p = .007$. Additionally, extraversion significantly predicted the Liaison role, $b = .15$, $p = .006$. These relationships suggest that extraverted individuals are more likely to adopt team leadership roles in general.

**Team-Level Analyses**

The team-level hypotheses predicted relationships between team average personality characteristics and team role density. Table 4 shows the means, standard deviations, and zero-order correlations for the team personality predictors and roles. Table 5 shows the results of

regression analyses testing Hypotheses 5 through 9 predicting team role density based on team personality characteristics (average levels). According to the regression models, team personality accounts for 4% of the variance in Navigator density, 2% of the Social Integrator density, 6% of the Engineer density, and 6% of the Liaison density.

Table 4: Means, Standard Deviations, and Zero-Order Correlations Among Team-Level Variables

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Navigator Density | .59 | .08 | - | | | | | | | |
| 2. Social Integrator Density | .59 | .09 | .82** | - | | | | | | |
| 3. Engineer Density | .58 | .08 | .76** | .79** | - | | | | | |
| 4. Liaison Density | .58 | .10 | .75** | .82** | .77** | - | | | | |
| 5. Mean Extraversion | 3.46 | .33 | -.03 | .06 | .01 | .02 | - | | | |
| 6. Mean Conscientiousness | 3.68 | .27 | .15** | .12* | .19** | .18** | .12* | - | | |
| 7. Mean Emotional Stability | 2.71 | .28 | .05 | .02 | .06 | .13* | -.01 | -.01 | - | |
| 8. Mean Agreeableness | 3.93 | .23 | .05 | .06 | .03 | .07 | .18** | .07 | -.15** | - |
| 9. Mean Openness | 3.49 | .24 | -.08 | -.05 | -.14** | -.08 | .16** | -.08 | -.10* | .27** |

\* $p < .05$

\*\* $p < .01$

Hypothesis 6a and 6b were supported as team average conscientiousness levels significantly predicted Navigator density, $b = .11$, $t(422) = 3.11$, $p = .02$ and Engineer density, $b = .19$, $t(422) = 3.88$, $p < .001$. Further, when accounting for other team personality characteristics, these relationships remained significant ($p < .05$). Thus, teams with higher levels of conscientiousness also had more Navigators and Engineers within the team. These results support Hypotheses 6a and 6b.

The remaining team-level hypotheses were not supported. Average levels of extraversion were not related to density of Navigators ($b = .06$, $p = .22$) or Social Integrators ($b = .06$, $p = .22$). Similarly, Hypotheses 7a and 7b failed to reach significant levels. Average levels of emotional stability were unrelated with the density of Navigator ($b = .02$, $p = .71$) or Social

Integrators ($b = .02$, $p = .71$). Lastly, Hypothesis 8 was failed to be supported. Average levels of agreeableness were unrelated to the density of Social Integrators ($b = .06$, $p = .20$).

Table 5: Linear regression modeling tests of team-level outcomes

| | Dependent Variables: | | | |
| | Navigator Density | Social Integrator Density | Engineer Density | Liaison Density |
| --- | --- | --- | --- | --- |
| *Team-level predictors* | Est.(SE) | Est.(SE) | Est.(SE) | Est.(SE) |
| Mean Extraversion | .06(.33) | .06(.09) | .01(.08) | .02(.09) |
| Mean Conscientiousness | .11(.27)* | .11(.09)* | .19(.08)** | .18(.09)** |
| Mean Emotional Stability | .02(.28) | .02(.09) | .06(.08) | .02(.09) |
| Mean Agreeableness | .14(.28)** | .06(.09) | .03(.08) | .07(.09) |
| Mean Openness | .27(.23) | .04(.09) | .14(.08)** | .08(.09) |

\* p < .05

\*\* p < .01

Several unanticipated relationships were found in the team-level data. Average conscientiousness levels significantly predicted the density of Social Integrator, $b = .11$, $p < .02$ and Liaison roles, $b = .18$, $p < .001$. Average levels of agreeableness were significantly related with density of the Navigator role, $b = .14$, $p = .002$. Finally, average levels of openness were significantly related with the density of Engineer roles, $b = .14$, $p = .004$.

**Cross-Level Analyses**

The analyses to assess the cross-level interactions were conducted by running seven mixed-model linear regression models using the linear mixed model procedure in SPSS. All models utilized a variance components covariance structure and restricted maximum likelihood estimation (Heck et al., 2014). Following the multilevel modeling procedure as demonstrated by Heck et al. (2014), we created these models in a series of four steps. First, we entered only the intercept into the model. Second, we added level 1 predictors into the model. Third, we added level 2 predictors into the model. Fourth and finally, we created and entered a cross-level interaction term into the model.

It should be noted that all level 1 predictors were group-mean centered (i.e., the group's mean was subtracted from each individual's score). All level 2 predictors were grand-mean centered (i.e., the population's mean was subtracted from each group's scorer). This was done to give the value of zero meaning in our analyses (i.e., ratings were originally captured on a 1 to 5 Likert scale with no zero point). In general, centering makes our values more interpretable because the expected "value of Y when x is zero represents the expected value of Y when X is at its mean" (Bauer & Curran, 2005, p. 376). Group-mean centering level 1 predictors is essential. Since our Likert scale did not include zero, group-mean centering now provides an interpretation for the value of zero. When we include level 2 predictors into the analysis, this reintroduces the mean we just subtracted. For cross-level interactions (i.e., this investigation), Bauer and Curran (2005) recommend group-mean centering level 1 predictors and grand-mean centering level 2 predictors. Thus, we follow this approach to account for reintroducing the mean at level 2 and provide meaning to our zero value.

The results from our cross-level analyses can be found in Tables 6 through 12. Table 6 demonstrates the results testing Hypothesis 9. This predicted that team mean extraversion levels would moderate the relationship between individual extraversion and adopting the Social Integrator role. To create this multilevel model, in Step 1 we only entered the intercept, Step 2 we entered the individual-level predictor, extraversion (level 1). In Step 3, we entered the team-level mean extraversion variable. Lastly, in Step 4, we entered the cross-level interaction term created by multiplying individual extraversion and mean extraversion together. Data within Table 6 indicates that our hypothesis was not supported. Although our intercept and individual extraversion levels were significant ($\gamma = .19$, $p < .01$); the team and cross-level interaction terms were not significantly predictive of adopting the Social Integrator role ($\gamma = .00$, $p = .73$). Thus, a group's extraversion composition does not significantly influence the predictive relationship between an individual's extraversion levels and adoption of the Social Integrator role. In other words, an individual may adopt the Social Integrator role regardless of the other team member's extraversion.

Table 6: Multilevel Model Testing Hypothesis 9 - Predicting Social Integrator role adoption

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | Estimate ($\gamma$) | SE | Estimate ($\gamma$) | SE |
| Intercept | 2.95** | .05 | 2.95** | .05 |
| Extraversion | .18** | .04 | .19** | .04 |
| Mean Extraversion | .10 | .14 | .10 | .14 |
| Extraversion x Mean Extraversion | | | .00 | .16 |

\*   $p < .05$

\*\* $p < .01$

Tables 7 and 8 depict the test results of Hypotheses 10a and 10b. These hypotheses predicted that team mean conscientiousness would moderate the relationship between individual conscientiousness and adopting the Navigator role (H10a) or the Engineer role (H10b). Steps in creating this multilevel model were conducted the same except conscientiousness was used in place of extraversion. Our interaction term was not significant ($\gamma = -.17, p = .48$) for Hypothesis 10a, indicating the team mean conscientiousness does not moderate the relationship between individual conscientiousness and adopting the Navigator role. Additionally, our interaction was not significant for Hypothesis 10b ($\gamma = -.17, p = .43$) indicating that team mean conscientiousness does not moderate the relationship between conscientiousness and adopting the Engineer role. Team conscientiousness levels do not significantly impact the individual, predictive relationships between conscientiousness and the Navigator or Engineer roles. In sum, neither Hypothesis 10a nor 10b were supported.

Tables 9 through 11 depict the test results from Hypotheses 11a, 11b, and 11c. These hypotheses predicted that team minimum emotional stability would moderate the relationships between individual conscientiousness and adopting the Navigator role (11a), Social Integrator role (11b), and the Engineer role (11c). Again, the steps to create the multilevel model were the same, except we entered minimum emotional stability for the team-level variable. None of the cross-level interaction terms were significant for Hypothesis 11a ($\gamma = .18, p = .21$), Hypothesis 11b ($\gamma = .20, p = .12$), or Hypothesis 11c ($\gamma = -.05, p = .64$). (Results visible in Tables 9, 10, or

11). These results indicate that minimum emotional stability did not moderate any of the relationships between individual conscientiousness and roles, failing to support our hypotheses.

Table 12 depicts the results testing Hypothesis 12. This hypothesis predicted that team minimum agreeableness levels would moderate the relationship between individual conscientiousness levels and adopting Social Integrator roles. Results in Table 8 demonstrate that neither the individual, team, nor interaction variables are significant ($\gamma = .09$, $p = .41$). This indicates that team minimum agreeableness levels do not moderate the relationship between individual conscientiousness and adopting the Social Integrator roles. These results fail to support Hypothesis 12. In sum, none of our cross-level hypotheses were supported. We found no support that the level 1 relationships between personality and roles were moderated by team-level personality. These results indicate that an individual team member's likelihood to adopt a role (predicted by individual personality levels) will not be significantly influenced by the team's composition of personality. A visual depiction of all of our hypotheses and whether they were supported, or not, can be found in Table 13.

Table 7: Multilevel Model Testing Hypothesis 10a - Predicting Navigator role adoption

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | **Estimate ($\gamma$)** | **SE** | **Estimate ($\gamma$)** | **SE** |
| Intercept | 2.95** | .04 | 2.95** | .04 |
| Conscientiousness | -.03 | .06 | -.04 | .06 |
| Mean Conscientiousness | .24 | .17 | .25 | .17 |
| Conscientiousness x Mean Conscientiousness | | | -.17 | .21 |

\* p < .05

\*\* p < .01

Table 8: Multilevel Model Testing Hypothesis 10b: Predicting Engineer role adoption

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | Estimate (γ) | SE | Estimate (γ) | SE |
| Intercept | 2.90** | .05 | 2.90** | .05 |
| Conscientiousness | .00 | .04 | -.01 | .04 |
| Mean Conscientiousness | .36 | .19 | .36 | .19 |
| Conscientiousness x Mean Conscientiousness | | | -.17 | .16 |

\* p < .05

\*\* p < .01

Table 9: Multilevel Model Testing Hypothesis 11a - Predicting Navigator role adoption

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | Estimate (γ) | SE | Estimate (γ) | SE |
| Intercept | 2.95** | .04 | 2.95** | .04 |
| Conscientiousness | -.03 | .06 | -.03 | .06 |
| Min Emotional Stability | .15 | .12 | .15 | .12 |
| Conscientiousness x Min Emotional Stability | | | .18 | .15 |

\* p < .05

\*\* p < .01

Table 10: Multilevel Model Testing Hypothesis 11b - Predicting Social Integrator role adoption

|  | Model 1 | | Model 2 | |
|---|---|---|---|---|
|  | Estimate (γ) | SE | Estimate (γ) | SE |
| Intercept | 2.95** | .05 | 2.95** | .05 |
| Conscientiousness | .01 | .05 | .01 | .05 |
| Min Emotional Stability | .11 | .13 | .11 | .13 |
| Conscientiousness x Min Emotional Stability |  |  | .20 | .13 |

\* p < .05

\*\* p < .01

Table 11: Multilevel Model Testing Hypothesis 11c - Predicting Engineer role adoption

|  | Model 1 | | Model 2 | |
|---|---|---|---|---|
|  | Estimate (γ) | SE | Estimate (γ) | SE |
| Intercept | 2.90** | .05 | 2.90** | .03 |
| Conscientiousness | .00 | .04 | .00 | .06 |
| Min Emotional Stability | .17 | .14 | .17 | .17 |
| Conscientiousness x Min Emotional Stability |  |  | -.05 | .11 |

\* p < .05

\*\* p < .01

Table 12: Multilevel Model Testing Hypothesis 12 - Predicting Social Integrator role adoption

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | **Estimate (γ)** | **SE** | **Estimate (γ)** | **SE** |
| Intercept | 2.95** | .05 | 2.95** | .03 |
| Conscientiousness | .01 | .05 | .01 | .06 |
| Min Agreeableness | .06 | .11 | .06 | .07 |
| Conscientiousness x Min Agreeableness | | | .09 | .12 |

\* p < .05

\*\* p < .01

# DISCUSSION

The primary goals of this study were to (1) investigate the level 1 relationships between individual personality characteristics and adoption of team roles, (2) investigate the team-level relationships between average personality and role density, and (3) investigate how team-levels of personality could moderate the level 1 relationship. We found that some of our level 1 hypotheses were supported and that some of our team-level hypotheses were supported, but none of our cross-level hypotheses were supported. In the following sections, we explain why we believe these results occurred.

## Individual-Level Discussion

At the individual-level, we predicted that a person's Big Five personality characteristics would be positively related to their adoption of team leadership roles. We found support for two of our hypotheses. In particular, extraversion was positively related to the adoption of Navigator (Hypothesis 1a) and Social Integrator roles (Hypothesis 1b). This indicates that extraverted people are more likely to be Navigators or Social Integrators. Additionally, we also found two unpredicted relationships. Extraversion was also positively related to the adoption of the Engineer and the Liaison role. Thus, extraverted individuals are more likely to take on all of the leadership roles within a team setting. Based on these findings, extraverts may be more likely to adopt leadership roles, regardless of function. Unfortunately, none of our other five individual-level hypotheses were supported.

One explanation for these effects could be the strength of extraversion in this particular study. Specifically, extraversion was significantly related to all four leadership roles - Navigator, Social Integrator, Engineer, and Liaison roles. Because extraversion was significantly related to all four, it may have prevented any relationships between other personality characteristics and team roles. To test this, we ran a series of linear regression models. In the first four models, we entered all five personality characteristics as predictors and either (1) Navigator, (2) Social Integrator, (3) Engineer, or (4) Liaison as the dependent variable. In the next four models, we entered only extraversion as a predictor variable and again (1) Navigator, (2) Social Integrator, (3) Engineer, or (4) Liaison as the dependent variable. These regression models indicated that

Big Five personality constructs predict approximately 3% of the Navigator role, 5% of the Social Integrator role, 3% of the Engineer role, and 7% of the Liaison role. However, extraversion alone predicted at least 66% of this variance (2.4% of Navigator, 3.3% of Social Integrator, 2% of Engineer, and 1.3% of Liaison). This indeed indicates that extraversion is accounting for a vast majority of the variance possibly predicted by personality constructs. This helps explain why none of our other individual-level hypotheses were supported.

Additionally, correlational analyses show that the four-team roles are highly correlated with one another (see Table 2, all relationships $r > .40$, $p < .01$). This indicates a high covariance between our team roles. Thus, our roles were not as distinct or distinguishable as we hoped. We expected that extraversion would be correlated with Navigator and Social Integrator roles, and we found support for these relationships. Since the Engineer and Liaison roles are also highly correlated with the Navigator and Social Integrator roles, it makes sense that extraversion also demonstrated a significant relationship. These high correlations help to explain why these unpredicted relationships between extraversion and the Engineer and Liaison roles emerged. In sum, the distinguishability of our roles via measurement could be improved for future research.

Although we did not anticipate extraversion would be predictive of all role adoption this study, it is sensible considering other leadership research. In particular, extraversion is the strongest predictor of both leader emergence and leader effectiveness (Judge et al., 2002). Leader emergence describes the degree an individual is viewed as a leader by others in the group. Leader effectiveness is the leader's performance influencing or guiding the activities of the team to achieve its goals. We did not differentiate in this study between leader emergence or effectiveness, but it makes sense that extraversion was related with all roles as it is the strongest predictor of both emergence and effectiveness.

**Team-Level Discussion**

At the team-level, we predicted that a team's mean levels of personality would be positively related to their density of team roles. Our team-level hypotheses were essentially the same as our individual-level hypotheses because these constructs are functionally parallel or homologous (Chen et al., 2009; Chen, Bliese, & Mathieu, 2005). In other words, the team-level constructs were aggregates of the individual constructs, we expected the results to be similar at both levels. We predicted that when teams have higher mean levels of personality characteristics

(extraversion, conscientiousness, emotional stability, or agreeableness), more team members would take on roles within the group.

We found support for two of our hypotheses. In particular, mean conscientiousness was positively related to the adoption of Navigator (Hypothesis 6a) and Engineer roles (Hypothesis 6b). This indicates that teams who are more conscientious will have more Navigators and Engineers within the team. We also found two unpredicted, significant relationships. Mean Conscientiousness was related to Social Integrator and Liaison density scores as well. This indicates that the conscientiousness of a team is extremely valuable for leadership role adoption within the team. If the desire is to have multiple leadership roles in a team, then it would be vastly important to ensure that the team is highly conscientious.

One possible explanation for mean conscientiousness predicting density of all roles is the sheer strength and importance of conscientiousness at the team-level. This finding is supported in other leadership research studies. In particular, conscientiousness is the second strongest predictor of leader emergence and effectiveness (Judge et al., 2002). Leader emergence describes the degree to which an individual is perceived as a leader by others. Leader effectiveness is the performance of the leader influencing or guiding the activities of the team to achieve its goals. We did not differentiate between leader emergence or effectiveness at the individual or team-levels in this study. Since conscientiousness is a strong predictor of leader emergence and effectiveness, validated by other studies, it aligns that conscientiousness is a predictor of team leader roles not specified to be measuring emergence or performance. This helps explain why conscientiousness was related with all role density scores in this study.

Unfortunately, we did not find support for the other five team-level hypotheses; however, we did find several unexpected relationships. Mean openness was positively related to the density of the Engineer role. And, team mean conscientiousness was positively related to the density of the Social Integrator and Liaison roles. These relationships indicate that open-minded teams had more Engineers and conscientious teams had more Social Integrators and Liaisons in their group. This was unexpected, as we did not predict that the Liaison role or openness to experience would produce any significant relationships.

Our lack of support for hypotheses could be explained in several ways. First, we believe that team conscientiousness was extremely important in this study predicting role density. Mean conscientiousness levels were predictive of every role's density, thus possibly preventing other

personality characteristics from demonstrating any effect. In particular, mean conscientiousness alone accounted for over 50% of the total variance explained by all personality characteristics combined. This indeed supports the argument that conscientiousness levels were overpowering other team-level personality constructs. Thus, helping to explain why our other five hypotheses were not supported.

Second, density scores for all team roles were highly correlated with one another. These correlation coefficients ranged from .75 to .82. This high covariance directs that our roles were not as differentiated and distinct as we hoped they would be. Thus, teams with more Navigators may have also had more Liaisons, Social Integrators, etc. Although this is an unfavorable happenstance, it helps to explain why mean conscientiousness levels related to so many roles and why the Liaison role emerged.

We aimed to further understand how the Liaison role emerged within this study. We refrained from predicting relationships with the Liaison based on the team's task. By definition, the Liaison is a boundary-spanning role. They make connections with outside stakeholders to retrieve the necessary resources for the group. In the study, teams worked interdependently. We believed that there was no need for boundary spanning or outside resources. Therefore, we did not expect the Liaison role to emerge. However, this study was conducted with student participants in a university setting. There were research assistants who assisted with the training of participants and provided instructions. Therefore, we believe that participants could have interpreted interacting with the research assistant(s) as Liaison-based behaviors. This is one possible explanation as to why the Liaison role emerged significantly. In sum, only two of our team-level hypotheses were supported. Although some unexpected relationships were uncovered in our data analysis.

Finally, it should also be addressed that we expected our individual-level hypotheses and team-level hypotheses to be functionally homologous. Meaning that we expected our findings at the individual-level to be consistent with team-level findings since variables were aggregated. This assumption was not upheld as extraversion predicted role adoption at Level 1 but not Level 2. And, conscientiousness predicted role density at Level 2 but not at Level 1. To help explain these differing results across, we again rely on findings from Judge and colleagues (2002). In particular, the current study found support that extraversion predicted adoption of team leadership roles at the individual-level. This indicates that more extraverted individuals were

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more likely to adopt any or all of the roles.  This corresponds with findings of Judge et al. (2002) that extraversion is the strongest predictor of leader emergence and effectiveness.  It could be that extraverted individuals are more gregarious and outgoing, thus perceived as leaders by the group members.

At the team-level, we found that mean conscientiousness predicted role densities. This indicates that teams with more conscientious members also had more presence of leadership roles within the group. These findings also correspond with findings from Judge et al. (2002) as conscientiousness was the second strongest predictor of leader emergence and effectiveness. Perhaps teams with more conscientious members were better able to distinguish and recognize roles being adopted in the group, including roles being performed by others that may be less boisterous. On the contrary, perhaps extraverted individuals were more talkative and perceived as leaders at the individual-level.

**Cross-Level Discussion**

Unfortunately, we found no support for any of our cross-level hypotheses. We did not find that team-level personality moderated individual-level relationships. This is surprising because we know that context and situation can influence an individual's behaviors and actions. However, our results indicate that a team's personality composition did not. In particular, we ran post-hoc analyses to investigate how much variance of Level 1 role adoption could even be accounted for by Level 1 or Level 2 personality. Statistics indicate that between 3-12% of role variance could be accounted for by personality at Level 1 or Level 2 (Navigator 8%, Social Integrator 8%, Engineer 12%, Liaison 3%). Of that possible variance, Level 1 personality accounted for a large portion of that (between 16% and 70% of each role's variance). In sum, a very limited amount of role variance was accounted for by personality at either level, and more of that can be attributed to Level 1 personality. This helps to explain why our cross-level interactions were not significant.

Table 13: All Hypotheses and Results

| Individual-Level Hypotheses (Level 1) | | Supported? |
|---|---|---|
| 1a | Extraversion will be positively related to the Navigator role. | Yes |
| 1b | Extraversion will be positively related to the Social Integrator role. | Yes |
| 2a | Conscientiousness will be positively related to the Navigator role. | No |
| 2b | Conscientiousness will be positively related to the Engineer role. | No |
| 3a | Emotional Stability will be positively related to the Navigator role. | No |
| 3b | Emotional Stability will be positively related to the Social Integrator role. | No |
| 4 | Agreeableness will be positively related to the Social Integrator role. | No |
| **Team-Level Hypotheses (Level 2)** | | |
| 5a | Mean levels of extraversion will be positively related to Navigator density scores. | No |
| 5b | Mean levels of extraversion will be positively related to Social Integrator density scores. | No |
| 6a | Mean levels of conscientiousness will be positively related to Navigator density scores. | Yes |
| 6b | Mean levels of conscientiousness will be positively related to Engineer density scores. | Yes |
| 7a | Mean levels of emotional stability will be positively related to Navigator density scores. | No |
| 7b | Mean levels of emotional stability will be positively related to Social Integrator density scores. | No |
| 8 | Mean levels of agreeableness will be positively related to Social Integrator density scores. | No |
| **Cross-Level Hypotheses** | | |
| 9 | Mean levels of extraversion will moderate the relationship between individual extraversion and the Social Integrator role. | No |
| 10a | Mean levels of conscientiousness will moderate the relationship between individual conscientiousness and the Navigator role. | No |
| 10b | Mean levels of conscientiousness will moderate the relationship between individual conscientiousness and the Engineer role. | No |
| 11a | Minimum emotional stability levels will moderate the relationship between individual conscientiousness and the Navigator role. | No |
| 11b | Minimum levels of emotional stability will moderate the relationship between individual conscientiousness and the Social Integrator role. | No |
| 11c | Minimum levels of emotional stability will moderate the relationship between individual conscientiousness and the Engineer role. | No |
| 12 | Minimum levels of agreeableness will moderate the relationship between individual conscientiousness and the Social Integrator role. | No |

Additionally, a possible explanation for null findings could be the way we measured team personality. In this study, we used mean and minimums, but there are other ways to measure and aggregate these measures. It may be possible to use density in future studies similar to how we captured roles at the team-level. Utilizing density, or a more advanced operationalization would capture a more holistic picture of the team dynamics. Mean and minimums do not always give a full depiction of the team's personality composition as a whole. As research questions and topics become more complex, the statistical methods we employ should advance in parallel.

Finally, results from the multilevel models indicate significant Estimates of Covariance Parameters at both the individual and team-level. These significant values specify that there are still other constructs that could account for more variance of our dependent variables. In other words, there are team aspects and individual aspects that would significantly predict team roles. Although we did not successfully include and measure these potential predictors in the current study, it is promising to know that there are future directions with this line of research.

**Limitations**

The current study aimed to examine relationships between personality and team roles through a multilevel approach. Although we found support for a few of our hypotheses, the majority of our predictions were not supported. Additionally, these significant relationships may not generalize across all team situations. In the current study, we utilized an interdependent task that required all team members to work together. However, according to McGrath (1984), there are several categories of tasks differing on behaviors and concepts. We did not investigate the possible effects of task type. Thus, we cannot assume that findings from our study would generalize across different tasks.

Further, we utilized a student sample in the current study. Undergraduate participants were recruited and randomly assigned to teams. We believe our training was thorough and participants were fully equipped to complete the task; however, participants were only in teams together for approximately three hours. These team members were essentially strangers. Our results may not fully reflect the relationships of team members who have worked with each other for years. Tenure of the team may affect these relationships. Future research should consider observing and capturing the team dynamics better and how that affects the team's outcomes.

Additionally, there may have been competition or conflict between team members to enact a particular role. Although theoretically more than one person can perform a role and one person can perform more than one role, there could be conflicts between two individuals attempting to perform the same role. For example, if two members were both trying to be the Navigator for the group and disagreeing on how to strategically drive the team forward, that conflict would potentially influence the overall team. Future research should consider measuring conflict or competition within team member roles.

In this study, we utilized a variable-centered approach and focused on the five broad factors of the McCrae and Costa's Five Factor Model (1992). There are also subfactors for each of these factors. For instance, friendliness, talkativeness, and assertiveness are subfactors of extraversion. We did not get so granular in this study to measure and predict based on all of the subfactors, but these relationships could perhaps be more predictive of a particular role being adopted. Future research could investigate these facets. Further, research could also look into the holistic personality profiles incorporating all factors at once as opposed to focusing on one factor at a time.

As we noted, we conceptualized team personality composition as either means or minimums, but there are also other ways to measure these constructs. Although means and minimums are a common way to methodize team-level data, these statistics still place a lot of emphasis on one individual. For example, one team member's high score can pull up the mean. Or, one member's low score can pull down the minimum. This choice in measurement could have influenced our results. Moving forward, introducing other measurement methods such as density to the personality variables could better disperse or balance the influence for each team member.

Another potential limitation was our conceptualization and operationalization of team leadership roles. The taxonomy used to capture team role adoption included four roles, but did not include a critical thinker or devil's advocate-type role. This role is important to push the team to consider all aspects of a situation including other explanations or solutions (Mathieu et al., 2015). The current study employed a very quick-moving task, so it is possible the challenger, critical thinker-type role may not have emerged in this study anyhow. There may not have been time between airspace intrusions to pause and think through potential options, solutions, and outcomes. However, it is still widely accepted in the field as an imperative role for holistic team

effectiveness. It is justifiable to say the current taxonomy used of leadership roles could be expanded to include this type of role.

Finally, it should be noted again that the data used in this study was previously collected for another study. We were fortunate to have access to this secondary data; however, utilizing this secondary data created limitations in our ability to probe into alternative explanations for our findings (or lack thereof). Additionally, it restricted us from being able to explore other potential predictors and outcomes within the study. Our investigations were limited by the factors, constructs, and information available in the given data.

**Future Directions**

The goal of this research was to identify how to create high-performing teams via personality and leadership roles. To our knowledge, this is the first study to investigate these constructs with a multilevel approach. Future research should continue to implement a multilevel lens to these investigations to better test the nomological network. Also, future studies could introduce additional moderators such as differing task types, team tenure, or conflict between members to investigate the boundary conditions of these relationships.

Moreover, as statistical programs and analyses continue to evolve, team research should evolve with it. Traditional conceptualizations using means, minimums, standard deviations, etc. may no longer be the best way to capture team-level constructs. With the advancement of the social network approach, we have more complex and accurate ways of capturing team composition information. Future studies could look into using other conceptualizations, such as density scores, for personality variables. Utilizing these methods could give more accurate interpretations of what is present within the entire team instead of emphasizing one individual.

**Conclusion**

The present study investigated the multilevel relationships between personality and team roles. Based on our hypothesized relationships, minimal support was found. At the individual-level, extraversion related to the adoption of leadership roles. At the team-level, mean conscientiousness related to the density of roles. We found no support for any cross-level

moderations. As this was the first multilevel investigation connecting personality to team roles, future research should continue to investigate these potential relationships.

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