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Personality and Process: The Role of Dyadic Homophily

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Personality and Process: The Role of Dyadic Homophily

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
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Dedication

This thesis is dedicated to my parents, Sheri and Scott, who have supported me through my entire scholastic journey. I appreciate the love and support you both have provided. Thank you for believing in me and providing encouragement.

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Abstract

This paper focuses on understanding the development of quality of intra-team processes. Utilizing semester-long project teams, social networks were used to measure the information sharing and coordination between all pairs of members within the teams. Dyadic-level homophily on the personality traits of agreeableness, extraversion, and openness to experience were used to predict the quality of these dyadic processes. Additionally, data from 11 weeks were used to examine whether the personality-process relationships change during the life cycle of the team.

Chapter One: Introduction

In the modern workforce, organizations are increasingly reliant on teams as the central unit of work (Kozlowski & Ilgen, 2006). Teams are critical to organizational success because when they are able to work well together, teams can respond to the complex, dynamic nature of the modern workforce (Kozlowski & Ilgen, 2006). Due to the cruciality of teams in organizations, the antecedents of good team outcomes are commonly studied in the literature. From this research, processes have been identified as critical antecedents for team outcomes (e.g., Ilgen et al., 2005; Kozlowski & Bell, 2003; Kozlowski & Ilgen, 2006, LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). Processes are the interdependent actions of team members, such as coordinating behaviors or talking with other members that change inputs to outputs (Marks, Mathieu, & Zaccaro, 2001). Processes are commonly studied through the input – process – output model (IPO; Hackman, 1987; McGrath, 1984) or more recently, the input – mediator – output – input (IMOI; Ilgen, Hollenbeck, Johnson, & Jundt, 2005) model of teamwork. These models can be used to understand which inputs can foster good processes which can then lead to good team outcomes. Given that inputs are the proximal predictors of processes (i.e., mediators), it is important to understand what inputs can help lead teams to engage in more processes, the critical mechanism for transforming inputs into good team outcomes.

Team processes are the dynamic interactions among team members that allow relationships to develop and change over time within the team (Kozlowski & Klein, 2000; Morgeson & Hoffman, 1999). Given the definition that process occurs through cognitive, verbal,

and behavioral activities directed towards team tasks (Marks et al., 2001), it is imperative to understand the role of inputs such as personality which lead to these critical processes within newly formed teams. Therefore, considering the individual differences of the team members that produce the individual-level affect, behavior, and cognitions, as well as the intra-team interactions among them, is important for understanding and predicting how process develops within teams (Asendorf & Wilpers, 1998).

There are several gaps in the literature that this paper will address. While research on team composition has continually provided understanding into the types of individual differences that relate to positive team outcomes (e.g., Barrick, Stewart, Neubert, & Mount, 1998; Barry & Stewart, 1997; Stewart, 2003; Bell, 2007), very little research examines these relationships at the dyadic level. These relationships are also rarely studied over time (Kozlowski, Chao, Grand, Braun, & Kuljanin, 2013). Because of the dearth of research about these relationships over time, it is not possible to fully understand the developmental trajectories for processes in teams (Epstein, 1999). And finally, many team constructs are frequently studied through the aggregation of individual responses from team members (Bliese, 2000; Kozlowski et al., 2013). This leaves little research examining the intra-team processes and differential relationships among each pair of dyads within a team. When these gaps are combined, they leave holes in our understanding of how processes develop and change over time among team members based on personality, making it impossible to make robust recommendations for how to best compose teams.

The purpose of the current study is to explore the effects of dyadic level personality predicting processes over time within teams. More specifically, how dyadic level similarity on the traits of agreeableness, extraversion, and openness to experience, predict communication and

coordination within teams. Personality has continuously been found to impact team outcomes (e.g., Bell, 2007), while communication and coordination are critical for team functioning (e.g., Mesmer-Magnus & DeChurch, 2009; Brannick, Roach, & Salas, 1993). To understand these relationships, archival data was used. The data are longitudinal and were collected weekly from project teams, and were used to analyze the development and changes in communication and coordination throughout the life of each team. To capture the relational data in this study, each team member rated every other team member on all process related variables. These data provide insight into how personality similarity among dyads affect the amount of process within the team. In addition to testing a basic set of a priori hypotheses, an additional research question regarding how the proposed relationships change throughout the duration of the team's lifespan is posed.

The Importance of Process

The notion that inputs and processes are important for team outcomes have commonly been studied through the input-process-outcome and the input-mediator-output-input models of teamwork (IPO; IMOI; Hackman, 1987; McGrath, 1984; Ilgen et al., 2005). These models suggest that inputs such as personality composition within a team can lead to processes like communication and coordination and that these processes ultimately lead to important outputs including team performance, satisfaction, and viability. Marks and colleagues, (2001) define team process as “members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing task work to achieve collective goals” (p. 357). This definition along with the IPO and IMOI models emphasize the vital importance of team processes for influencing team outcomes. Not surprisingly, a plethora of empirical evidence supports the critical role of process for improving the outcomes of teams (e.g., Ilgen et al., 2005; Kozlowski & Bell, 2003; Kozlowski & Ilgen, 2006, LePine et al., 2008).

The Importance of Personality Composition in Teams

Team composition is defined as the configuration of member attributes in a team (Levine & Moreland, 1990) and plays an influential role as an input for team outcomes (Kozlowski & Bell, 2003). The relationship between team composition and performance is thought to exist because individuals must engage in processes such as communication and coordination to have successful performance. Based on the IPO and IMOI frameworks, we know that team member characteristics are critical predictors of team process (Hackman, 1987; McGrath, 1984; Ilgen, et al., 2005). In particular, team personality has been consistently found to be an important predictor of team functioning (Bell, 2007). Therefore, different team compositions, particularly personality compositions, influence how teams engage in process and consequently how the team performs (Bell, 2007).

Three personality compositions appear particularly important for team processes and outcomes: agreeableness, extraversion, and openness to experience. These traits were chosen because they have been continuously linked to positive relationships based on similarity (Youyou, 2017; Nelson, Thorne, & Shapiro, 2011; Selfhout et. al, 2010; Yoon & Bono, 2016). This is likely due to the prosocial and recognizable nature of agreeableness and extraversion helping to encourage pleasant social interaction. Research has demonstrated that both extraversion and agreeableness are salient characteristics which can be reliably judged in relatively short amount of time (Carney, Colvin, & Hall, 2007; Gifford, 1991). Likewise, similarity on openness to experience helps foster similar liking for hobbies and activities (Selfhout et. al, 2010) which would facilitate social engagement with similar people. Personality compositions of agreeableness, extraversion, and openness to experience, therefore, should foster higher quality relationships on certain processes because of higher levels of positive affectivity

regarding their relationship and be better able to anticipate the likes and actions of one another improving team outcomes.

For example, agreeableness has been continually empirically linked to higher team performance (Barrick et al., 1998; Graziano, Hair, & Finch, 1997; Neuman, Wagner, & Christiansen, 1999; Neuman & Wright, 1999; Van Vianen & De Dreu, 2001). Individuals who are high in agreeableness tend to be generous, kind, and sympathetic (Costa & McCrae, 1992), and these characteristics are expected to facilitate process in teams (Barrick et. al, 1998), therefore, leading to more positive team outcomes. Individuals who are high in extraversion are talkative and outgoing (Costa & McCrae, 1992). Researchers therefore expect these characteristics to result in a positive attitude towards teamwork (Barrick et al., 1998; Barry & Stewart, 1997) and therefore higher performance (Barry & Stewart, 1997). And finally, openness to experience has also been linked to higher overall team performance (Neuman et al., 1999). Individuals who are high on openness to experience are thought to be curious, imaginative, and insightful (Costa & McCrae, 1992) which can be important for problem solving on team tasks. Given the input to output link, it is likely that process is facilitating these relationships, therefore it is important to better understand and evaluate the input to process link. However, with few exceptions (Barry & Stewart, 1997), a majority of the research regarding team personality and outcomes have been conducted using cross-sectional data and with some form of aggregation to determine group composition (Barrick et al., 1997; Neuman et al., 1999; Graziano et al., 1997, etc.)

Personality to Coordination and Communication

As previously stated, process is an important mediating mechanism between inputs and outputs in teams. Process necessitates that members must work interdependently with each other along with their environment to complete tasks. Two key processes that foster better team

performance are communication and coordination. The process of communication occurs when individuals in a team are sharing and exchanging information. Communication is particularly important in teams when members need to work interdependently to coordinate their actions as well as monitor both their progress as a team and the environment (Marks et al., 2001). The dissemination of information allows team members to work more effectively because they are more aware of their tasks and current environment relative to their goal. Coordination is also a critical component in team performance as it is the process by which the team organizes the order and the timing of interdependent actions (Brannick et al., 1993; Fleishman & Zaccaro, 1992; Zalesny, Salas, & Prince, 1995). Coordination is important for team performance because teams who become out of sync on interdependent tasks will likely not be as efficient and therefore underperform (Steiner, 1972). Both communication and coordination are critical processes that help cultivate better team performance (Fiore, Salas, & Cannon-Bowers, 2001; Kozlowski & Bell, 2003). It is therefore important to understand the inputs that lead to these critical team processes.

One example of a personality team composition that is related to both communication and coordination processes in teams is agreeableness. Barrick and colleagues (1998) found that as teams become more agreeable, conflict tends to diminish. This is because highly agreeable individuals seek to maintain social harmony and reduce within-group competition (Graziano, et al., 1997), therefore dissipating conflict. Because individuals who are high in agreeableness tend to be more considerate, trusting, and friendly, Bell (2007) suggests agreeableness is related to the degree to which team members engage in positive interpersonal processes such as communication and coordination.

In another example of personality process, extraversion should foster both communication and coordination. Individuals who are more talkative and outgoing should be more comfortable working in group settings due to their social nature, more likely to engage in critical team processes like communication, and experience more optimism about their team. Through more frequent and positive interactions, teams engage in better process and consequently performance. By definition, extraversion as a trait includes people who are social, affiliation seekers, and assertive (Costa & McCrae, 1992). Therefore, it would be expected that extraversion should be beneficial for jobs or situations that require interpersonal interactions, such as teams (Barrick & Mount, 1991; Organ & Ryan, 1995). If team members are high in extraversion, therefore tending to be more talkative and likely to seek affiliation, it is reasonable to expect that this team would have higher communication and coordination, particularly because communication is frequently looked as a support behavior for establishing coordination (Kozlowski & Ilgen, 2006).

And finally, openness to experience should be related to both communication and coordination. As Lepine discussed (2003), openness to experience is related to team performance because team members that are high on this trait are more adaptable and make the changes required to respond to the dynamic team environment. More open individuals should also have the flexibility to respond to conflict (Marks, et al., 2001). Having a team that is adaptable and responsive requires both communication and coordination from members on the team to readjust their current team functions to the new adapted approach. Because individuals who are open are more willing to be collaborative and compromise (Moberg, 2001), this would entail both talking, listening, and sharing information with the individuals in their team, thus higher communication and coordination.

Coordination and Communication to Team Performance

To complete the IPO framework, it is also important to consider the final relationship in the model – process to outcomes. Both communication and coordination are critical mediating mechanism for producing good team outcomes; Kozlowski and Bell (2003) identified communication and coordination as two of the three key team behavioral processes for teams. Communication is frequently thought of as the process that proceeds the processes of coordination and cooperation (Kozlowski & Bell, 2003; Kozlowski & Ilgen, 2006), therefore making it a critical first step for good team functioning. Communication is critical for team performance because it involves both task-work (exchanging task-related information and developing team solutions to problems) and teamwork (establishing the patterns and quality of interactions), both of which should foster better overall performance (Morgan, Salas, & Glickman, 1993). Coordination is also thought to be particularly critical for team effectiveness in situations where all group members must contribute to see successful team outcomes (Kozlowski & Bell, 2003). Coordination allows for team members to successfully work together through effectively managing their interdependent actions, developing better performance.

Gaps in the Existing Literature

The relationship between team personality and team performance is well studied, and even the relationship between team personality and process is well understood. However, what is less understood is the role of dyadic level personality on team processes such as communication and coordination *over time*. These relationships are frequently studied cross-sectionally, but the relationships between predictors and criteria can change over time (e.g., Ackerman, 1989; Murphy, 1989) Research has also demonstrated that depending on the team's current stage of development the processes that teams engage in differ (e.g., Dierdorff, Bell, & Belohalav, 2011; Kozlowski, Gully, Nason, & Smith, 1999; McGrath, 1991). Therefore, we expect to see

differences in homophily predicting both communication and coordination in teams throughout their life cycle.

Team outcomes have commonly been studied through the input-process-outcome and the input-mediator-output-input models of teamwork (IPO; IMOI; Hackman, 1987; McGrath, 1984; Ilgen et al., 2005). However, these models are generally used to study teams using team-level aggregates for inputs, processes, and outcomes forming a gap in understanding of how within-team personality can influence interactions and processes *between* team members. When observing a team level composition the most common way to analyze the data is by calculating a mean score (Heslin, 1964; Williams & Sternberg, 1988; Barrick et al., 1998). Using a mean score represents a team as a singular entity. It is important to consider though, that teams are comprised of many relationships and those relationships likely have meaningful differences between them which can be studied at the dyadic level. Relationships within the team at the dyadic level are likely not interchangeable but unique and should be measured as such (Bliese, 2000). Therefore, it is important to study how dyadic personality can foster communication and coordination at the within-team level. A dyadic within-team approach that occurs longitudinally is able to better capture of how communication and coordination occurs between pairs of team members.

Homophily in Relationships

Homophily, which Lazarsfeld and Merton first defined (1954), is the tendency for individuals to form relationships disproportionately with others who are like themselves. What is important to note about homophily is that the relationship is related to the *level of similarity* on a personality trait, not *how high* an individual or a pair is on a personality trait. These findings would suggest that two individuals who are similarly closed off to experiences are more likely to be in a relationships than form a relationship with an individual who is mildly open to

experiences and another who is highly open to experiences. It is also likely that the individuals who find themselves in a social relationship are more likely to engage in processes such as communication and coordination than individuals who are not in a social relationship. As such, homophily could be a reason for many of the currently accepted relationships between team personality and team processes and outcomes.

Homophily predicting communication and coordination in dyadic-level relationships in teams may be explained through the uncertainty reduction theory. Berger and Calabrese posed the uncertainty reduction theory which suggests that interpersonal relationships develop as participants reduce uncertainty about each other (Berger 1979; Berger & Calabrese, 1975). At its core, uncertainty reduction theory argues that dyadic relationships develop when individuals are able to reduce uncertainty about each other. One way that individuals in teams may reduce uncertainty about the other members in their team is by looking for similarities, or homophily, between themselves and their teammates. If an individual is more similar, the other member of the dyad is better able to anticipate the individual's actions thus reducing the uncertainty regarding the individual –fostering more liking within the dyad. Then, once a team member decides that they like the other member of their dyad, a relationship will likely continue to foster through processes like communication and coordination.

Another reason homophily should predict better levels of process among dyads in teams is through the reinforcement-affect model. When engaging in dyadic interactions, interpersonal attraction between individuals is based on reciprocal rewards that occur (Byrne, 1961). An example of a reciprocally rewarding stimuli when engaging in dyadic interaction may be a similar attitude shared within the dyad. Using the reinforcement-affect explanation, individuals who have high similarity on personality traits such as agreeableness, extraversion, and openness

to experience would use this similarity information provided by their dyadic partner to reinforce their own opinions, views, and feelings about the team thereby triggering an implicit affective response that increases attraction (Clore & Byrne, 1974). Having a team member that shares the same fundamental traits that illicit a positive affective response should increase processes such as communication and coordination, because team members should be more likely to work with someone that they like and view as similar to themselves.

The notion of homophily could appear counterintuitive to the general notion that higher on a given trait is better. However, the finding that teams with higher levels of certain personality traits perform better could actually be an artifact of homophily. The mean and variance of a given trait within the team are inherently related (i.e. as the mean increases toward its ceiling, the variance is inherently decreased; Bell, 2007). This would suggest that as the mean personality of a team reaches the scale ceiling/floor, the variance is inherently restricted because everyone must be more similar. Homophily has also consistently been supported across a wide breadth of social relationships. Homophily predicts friendship with many different variables including surface variables (or easily observed variables) such as age, ethnicity, class, but also deep level (or characteristic such as personality, beliefs, or abilities) such as education and interests (Marsden, 1988; McPherson, Smith-Lovin, & Cook, 2001; Shrum, Cheek, & MacD, 1988). In dyadic pairs, personality similarity has also been related to relationships.

For example, individuals similar on agreeableness would likely form social relationships based on homophily. Agreeableness is a variable that is highly salient and reliably judged in a short amount of time (Carney et al., 2007; Gifford, 1991). The relationship between homophily and agreeableness has been established in other social relationships outside of the team context as well. Homophily in agreeableness has been linked to positive outcomes in both leader-

member-exchange relationships and friendships in adolescents and young adults (Burgess, Sanderson & Umaña-Aponte, 2011; Yoon & Bono, 2016; Nelson et al., 2011; Selfhout et al., 2010). Due to the recognizable nature of agreeableness and that both the uncertainty reduction theory and the affect-reinforcement explanation are both concepts that would occur at the inception and early stages of a relationship, agreeableness is a personality variable that will foster homophily-based relationships. Then applying the idea that uncertainty reduction theory should initiate social relationships and that affect-reinforcement should continue to foster positive social interactions, I would expect higher engagement in processes because of higher levels of positive affectivity regarding the homophily-based relationship. If individuals like and feel comfortable with specific members of their team based on similarity they will engage in communication and coordination. Hunter and Cushenberry's (2014) research demonstrates that individuals low in agreeableness are more likely to share their ideas, particularly in harsh group settings with negative feedback, than their highly agreeable counterparts. This will likely lead to a cluster of individuals low on agreeableness sharing their ideas and a group of individuals higher on agreeableness avoiding those lower on the trait, creating clusters. Individuals who are high in agreeableness will be uncomfortable engaging with team members who are more pessimistic regarding the team and others' ideas. Therefore, they will engage with other agreeable individuals who can help bolster their more optimistic view of the team.

H1: Individuals will report engaging in higher (a) communication and (b) coordination with others more similar to themselves on agreeableness.

In past research, homophily in extraversion between dyads has been linked to positive outcomes in both friendships and leader-member exchange (Burgess et al., 2011; Yoon & Bono, 2016). Similar to agreeableness, extraversion is highly salient and reliably judged in a short

amount of time (Carney et al., 2007; Gifford, 1991) making it important for the formation of social relationships in teams. The highly recognizable nature of extraversion will create relationships in teams based on similarity. This will then naturally lead into similar individuals who have formed positive social relationships engaging in communication and coordination within the context of team settings. When team discussions occur, individuals high in extraversion are likely to dominate the conversations through their need for engaging with others while fostering more communication and coordination with others like themselves. Their equal enthusiasm about team tasks should encourage process among similar others. Individuals low in extraversion will likely not be rousing team discussions and be uncomfortable with the high level of energy and excitement of an extraverted individual, thus choosing to engage with other low in extraversion individuals. Dominance as a facet of extraversion may be important as well, where individuals who are both high in extraversion will not dominate one another in a conversation, but an individual who is low in extraversion may not have any control over the conversation. Individuals low in extraversion will be more comfortable engaging in communication and coordination with others who match their less assertive nature because they will have more time to share their thoughts and opinions about the team without having the conversation controlled by an extroverted individual.

H2: Individuals will report engaging in higher (a) communication and (b) coordination with others more similar to themselves on extraversion.

Finally, homophily in openness to experience, should work like both agreeableness and extraversion by fostering positive social relationships among dyadic pairs and therefore promoting communication and coordination. Again, openness to experience has been linked to other social relationships; past research demonstrates that homophily in openness to experience

between dyads is related to the formation of friendships and romantic partners (Youyou, 2017; Burgess et al., 2011). While openness to experience should form relationships and foster process, how openness to experience would foster relationships in teams deviates slightly from agreeableness and extraversion. Openness to experience is not as salient as the other two traits, however similarity on openness to experience helps foster similar liking for hobbies and activities (Selfhout et. al, 2010) which would facilitate social engagement with similar people. In teams, individuals who are open to the same activities and have hobbies in common are more likely to want to engage with one another fostering process with the other member of the similar dyad. When engaging in team activities like decision making, individuals low in openness to experience should be less likely to deviate from established preset plans and tasks than a high openness individual who is more adaptive to change. Individuals low on openness will be uncomfortable going along with the highly open individual, and therefore engage with other low openness individuals. Conversely, high openness individuals will be bolstered and engage with other individuals who are more adaptable to plans and tasks in the team setting.

H3: Individuals will report engaging in higher (a) communication and (b) coordination with others more similar to themselves on openness to experience.

Changing Relationships over Time

The processes that teams engage in can differ depending on the team's current stage of development (e.g., Dierdorff et al., 2011; Kozlowski et al., 1999; McGrath, 1991) and relationships between predictors and criteria can change over time (e.g., Ackerman, 1989; Murphy, 1989). Therefore, the relationships between personality homophily and team processes may change through a team's life cycle, in which personality traits that may not be as salient at the inception of a team may be more important later on (Harrison, Price, Gavin, & Florey, 2002).

Conversely, the three personality variables were chosen because of their available and distinguishable nature, which may make them more identifiable traits and therefore their importance may diminish over time (Harrison et al., 2002). However, most research on processes in teams has used data from a single time point and very few longitudinal studies capture the entire life cycle of a team including the inception. Limited theory exists to predict the magnitude or directionality of the change in relationships and as such, I propose the following research question.

Research Question: How does the relationship between personality homophily and team process change over time?

Chapter Two: Method

Sample

Because the focal level of analysis in this study is the dyad, the ideal data to answer these aforementioned questions are large teams. This is because in teams, the number of dyads within a team growth exponentially with each added members, allowing for there to be more dyadic level connections within each team. Therefore, to better understand how personality affects within-team dynamics, the archival data set being used followed 46 individuals that were randomly assigned to 6 newly formed student teams (average team size= 7.7) who worked on a 12 week semester-long project to analyze the role of personality homophily on the engagement of communication and coordination. Participants recruited for this study were undergraduate students enrolled in an upper-level psychology course at a large mid-eastern university. Of these participants, the average age was 20.9; 72% were female, 28% were male, and 83% of participants were Caucasian. Since this study examines within-team personality and processes, all analyses were conducted at the dyadic level. As such, each team yielded a sample size of $n*(n-1)$ where n is the number of individuals per team. There were a total of 320 dyads across 11 time points collected for a total sample size of 3,520. This data is currently under review in another manuscript – only one variable is repeated (communication). However, in this paper communication is used as a dependent variable and in the manuscript under review it is used as an independent variable. See Appendix A for all variables collected in the dataset, and which are used in each paper.

Procedure

During week one of the study, participants completed informed consent and the semester-long teams were formed. No meaningful interactions took place between members during this first week, therefore no data were collected for week 1 with exception of the personality measure. Over the next 11 weeks, teams worked together to complete a highly interdependent project. Communication and coordination were assessed each of the 11 weeks to allow for observable changes over time. At the end of the project, participants completed a self-performance measure, were debriefed, and received research credit for their participation.

Measures

Personality. Personality was assessed using the 50-item International Personality Item Pool (IPIP), where each of the Big-5 personalities are measured with 10 items each (Goldberg, et al., 2006). The items are on a 5 point Likert scale ranging from very inaccurate (1) to very accurate (5). A sample item for extraversion was “(I) Don't mind being the center of attention” (see Appendix B for full scale). This measure was collected during the first week of the study. The overall scale was found to be reliable ($\alpha = .85$). The agreeableness, extraversion, and openness to experience subscales consisted of 10 items each and their reliabilities were as follows: ($\alpha = .87$; $\alpha = .91$; $\alpha = .78$).

Communication. Communication was assessed using a single self-report item. The item was on a 5 point Likert scale ranging from never (1) to always (5). The communication item was “How frequently did you communicate with ___ while working on the project?”

Both communication and coordination questions were administered using single item measures. This was to help minimize survey fatigue given that these questions were sociometric in nature. Sociometric data necessitates that participants rate each of their other team members

on the variable, meaning that the participants in this study needed to rate roughly 7 other people per sociometric item (e.g., Mehra, Smith, Dixon, & Robertson, 2006; Wasserman & Faust, 1994).

Coordination. Coordination was assessed using a single self-report item. The item was on a 5 point Likert scale ranging from strongly disagree (1) to strongly agree (5) strongly agree. The coordination item was “__ and I worked together in a well-coordinated fashion.” Again, these measures were administered sociometrically.

Chapter Three: Analyses

To determine the impact of dyadic level homophily on team processes, Multiple Regression Quadratic Assignment Procedure (MR-QAP) was utilized (Krackhardt, 1987). MR-QAP is a non-parametric extension of the standard ordinary least squares (OLS) multiple regression model. MR-QAP uses a permutation procedure that accounts for non-independence (i.e. clustering) when calculating standard errors and determining statistical significance. MR-QAP is able to account for all dependencies lower than the team level using the permutation computation, and by accounting for these dependencies, MR-QAP is able to adjust for biases in the standard error that cause the inflation of type-1 errors to arise (Dekker, Krackhardt, & Snijders, 2007). Next, dummy variables representing team membership were used to control for team-level dependencies in the data. Using a dummy variable accounted for team assignment as a nominal variable in the regression equation, which demonstrates the impact of each team on outcome coefficients. Finally, a linear time variable was included to account for all systematic growth in communication and coordination.

Level of homophily between dyads was determined using polynomial regression, which has been frequently used as a way to represent congruence or similarity, which can then be used to predict an outcome (Edwards & Parry, 1993). Polynomial regression allows for testing the relationships represented by difference scores while avoiding the well-documented issues associated with difference scores such as issues with reliability and constrained regression weights (Edwards, 1991).

The models tested are as follows:

Hypothesis 1

$$Y = \beta_0 + \beta_1(\text{Agree1}) + \beta_2 (\text{Agree2}) + \beta_3 (\text{Agree1})^2 + \beta_4(\text{Agree1})(\text{Agree2}) + \beta_5 (\text{Agree2})^2 + \varepsilon$$

Hypothesis 2

$$Y = \beta_0 + \beta_1(\text{Extra1}) + \beta_2 (\text{Extra2}) + \beta_3 (\text{Extra1})^2 + \beta_4(\text{Extra1})(\text{Extra2}) + \beta_5 (\text{Extra2})^2 + \varepsilon$$

Hypothesis 3

$$Y = \beta_0 + \beta_1(\text{Open1}) + \beta_2 (\text{Open2}) + \beta_3 (\text{Open1})^2 + \beta_4(\text{Open1})(\text{Open2}) + \beta_5 (\text{Open2})^2 + \varepsilon$$

However, to address the research question which necessitates an interaction with time, MR-QAP regression using differences scores interacting with time was used.

Chapter Four: Results

The first three hypotheses evaluated whether individuals more similar on the traits of agreeableness, extraversion, and openness to experience reported higher levels of engaging in communication and coordination. To test this, polynomial regression was used and all variables were centered. When using polynomial regression to determine the importance of homophily, the result being evaluated are drawn from the curvature of the line of incongruence (Barranti, Carlson, & Cote, 2017). The curvature of the line of incongruence is calculated from the coefficients from the regression output (Table 1 and Table 2) and then plotted on a response surface area (Edwards, 2002). This value is represented as A4 in Table 3, and homophily predicting a higher criterion is characterized as a large negative value, as negative levels of incongruence suggest congruence (Barranti et al., 2017). To determine whether a relationship exists between similarity and process, the response surface areas for all relationships are graphed. In these graphs, a downward, concave surface demonstrates that the amount of communication or coordination is lower as individuals' levels on the personality traits diverge (Barranti et al., 2007). There is no simple and agreed upon method of determining statistical significance for the parameters associated with the line of incongruence. As such, a clear relationship between homophily and process had to be present in the response surface area.

The first hypothesis predicted that dyads that are more similar on agreeableness will report higher a) communication and b) coordination. Similarity on agreeableness was not related to communication ($A4 = .15$) or coordination ($A4 = .09$), thus not supporting Hypothesis 1

(Figure 1). These results indicate that being more similar on agreeableness does not predict higher levels of communication or coordination, but are in fact in the opposite direction indicating *dissimilarity* on agreeableness predicts communication and coordination. The second hypothesis predicted that dyads that are more similar on extraversion will report higher a) communication and b) coordination. Similarity on extraversion was related to communication ($A4 = -.26$) and coordination ($A4 = -.06$), thus supporting Hypothesis 2 (Figure 2). This indicates that individuals more similar to one another on extraversion communicate and coordinate more frequently. Finally, the third hypothesis predicted that dyads that are more similar on openness to experience will report higher a) communication and b) coordination. As with Hypothesis 2, similarity on openness to experience was related to communication ($A4 = -.31$), however it is not related to coordination ($A4 = .32$), thus partially supporting Hypothesis 3 (Figure 3). These results indicates that individuals more similar to one another on openness communicate more frequently. The results from openness to experience also suggest that dyadic *differences* are related to coordination, contrary to the hypothesis. These results suggest homophily's importance in predicting communication and coordination, just in different directions than originally predicted. This can be seen where sometimes similarity matters more for predicting communication and coordination and sometimes differences matters more.

In addition to evaluating the three a priori hypotheses, I also tested to see whether the proposed relationships changed over time. To do so, personality difference scores between the individuals in each dyad were regressed, this was then interacted with time. Using this approach, first the main effects between difference scores and process for all relationships were tested (Table 4 and Table 5). Differences on both extraversion and openness to experience were related to communication respectively ($\beta=.07, p<.05$; $\beta=-.05, p<.05$), but not related to agreeableness.

Differences on extraversion were related to coordination ($\beta=.04$, $p<.05$), but neither agreeableness nor openness to experience. Continuing on to looking at the relationships over time, the relationship between homophily and process did not change over time for the relationship between the three personality variables and both communication and coordination (Table 4 and Table 5). This suggests that the relationship between homophily of agreeableness, extraversion, and openness to experience and communication and coordination remained stable over time.

Table 1. *Communication Polynomial*

	Communication			
	<u>Baseline</u>	<u>Agreeableness - Polynomial</u>	<u>Extraversion - Polynomial</u>	<u>Openness - Polynomial</u>
Intercept	-0.10(.04)*	-0.18(.04)**	-0.03(.05)	-0.59(.04)**
Team 1	-0.02(.05)	-0.01(.05)	-0.10(.05)	0.05(.06)
Team 2	-0.07(.05)	-0.03(.06)	-0.02(.06)	-0.09(.06)
Team 3	0.63(.05)**	0.61(.05)**	0.49(.05)**	0.6(.05)**
Team 4	0.53(.05)**	0.53(.06)**	0.55(.06)**	0.53(.05)**
Team 5	0.12(.05)*	0.08(.05)	0.07(.05)	0.13(.05)*
Time	0.09(.00)**	0.09(.00)**	0.09(.00)**	0.09(.00)**
Personality 1		0.03(.03)	0.18(.02)**	0.06(.03)*
Personality 2		0.13(.03)**	0.03(.02)	-0.02(.03)
Personality 1 Squared		-0.05(.02)*	-0.20(.02)**	-0.18(.04)**
Personality 1*Personality 2		-0.06(.04)	0.06(.03)*	0.15(.05)**
Personality 2 Squared		0.04(.02)	0.00(.02)	0.02(.04)
R Square	0.17	0.18	0.21	0.18

Note. Run using both Polynomial Regression and MQAP. * = $p < .05$; ** = $p < .01$

Table 2. Coordination Polynomial

	Coordination			
	Baseline	Agreeableness - Polynomial	Extraversion - Polynomial	Openness - Polynomial
Intercept	-0.27(.03)**	-0.29(.04)**	-0.25(.04)**	-0.36(.03)**
Team 1	0.10(.04)*	0.08(.04)*	0.11(.04)*	-0.06(.04)
Team 2	-0.02(.04)	0.01(.04)	0.02(.05)	-0.00(.04)
Team 3	0.32(.04)**	0.32(.04)**	0.33(.04)**	0.36(.04)**
Team 4	0.33(.04)**	0.3(.05)**	0.36(.04)**	0.32(.04)**
Team 5	0.06(.04)	0.04(.04)	0.08(.04)	0.02(.04)
Time	0.03(.00)**	0.03(.00)**	0.03(.00)**	0.03(.00)**
Personality 1		-0.00(.02)	0.03(.02)*	0.01(.02)
Personality 2		0.11(.03)**	-0.05(.02)**	-0.05(.02)*
Personality 1 Squared		-0.02(.02)	-0.04(.02)*	0.34(.03)**
Personality 1*Personality 2		-0.03(.04)	0.00(.02)	0.02(.04)
Personality 2 Squared		0.08(.02)**	-0.02(.02)	-0.00(.03)
R Square	0.06	0.06	0.06	0.10

Note. Run using both Polynomial Regression and MQAP. * = $p < .05$; ** = $p < .01$

Table 3. The Curvature of the Line of Incongruence

	Communication		
	Agreeableness	Extraversion	Openness to Experience
A1	0.16	0.21	0.04
A2	-0.07	-0.14	-0.01
A3	-0.1	0.15	0.04
A4	0.15	-0.26	-0.31

	Coordination		
	Agreeableness	Extraversion	Openness to Experience
A1	0.11	-0.02	-0.04
A2	0.03	-0.06	0.36
A3	-0.11	0.08	0.06
A4	0.09	-0.06	0.32

Table 4. Communication Over Time

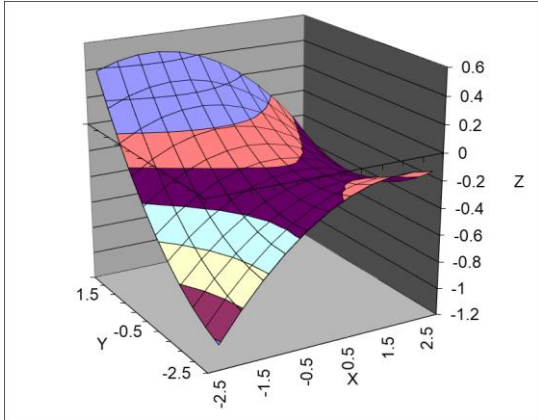
Communication	Agreeableness		Extraversion		Openness	
	Main Effect	Interaction	Main Effect	Interaction	Main Effect	Interaction
Intercept	-0.64(.04)**	-0.64(.04)**	-0.63(.04)**	-0.63(.04)**	-0.63(.04)**	-0.63(.04)**
Team 1	-0.02(.05)	-0.02(.05)	-0.02(.05)	-0.02(.05)	-0.02(.05)	-0.02(.05)
Team 2	-0.07(.05)	-0.07(.05)	-0.07(.05)	-0.07(.05)	-0.07(.05)	-0.07(.05)
Team 3	0.63(.05)**	0.62(.05)**	0.63(.05)**	0.63(.05)**	0.63(.05)**	0.63(.05)**
Team 4	0.53(.05)**	0.53(.05)**	0.53(.05)**	0.53(.05)**	0.53(.05)**	0.53(.05)**
Team 5	0.12(.05)*	0.12(.05)*	0.12(.05)*	0.12(.05)*	0.12(.05)*	0.12(.05)*
Time	0.09(.00)**	0.09(.00)**	0.09(.00)**	0.09(.00)**	0.09(.00)**	0.09(.00)**
Difference	0.00(.02)	0.00(.03)	0.07(.01)**	0.04(.02)	-0.05(.02)**	-0.03(.02)
Time*Difference		0.00(.01)		0.00(.00)		0.02(.00)
R Squared	0.17	0.17	0.18	0.18	0.17	0.17

Note. Run using both Difference Scores and MQAP Regression. * = $p < .05$; ** = $p < .01$

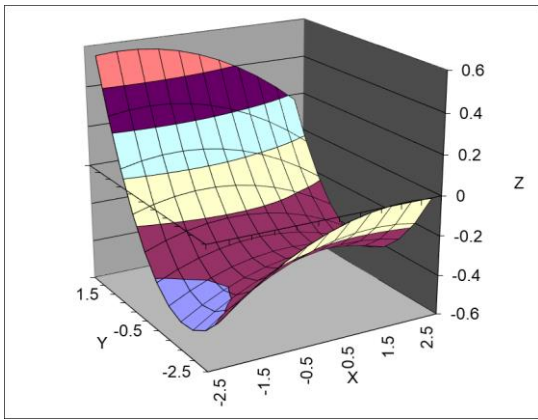
Table 5. Coordination Over Time

Coordination	Agreeableness		Extraversion		Openness	
	Main Effect	Interaction	Main Effect	Interaction	Main Effect	Interaction
Intercept	-0.27(.03)**	-0.27(.04)**	-0.27(.03)**	-0.27(.03)**	-0.27(.03)**	-0.27(.03)**
Team 1	0.10(.04)*	0.10(.04)*	0.09(.04)*	0.09(.04)*	0.09(.04)*	0.09(.04)*
Team 2	-0.02(.04)	-0.02(.04)	-0.02(.04)	-0.02(.04)	-0.02(.04)	-0.02(.04)
Team 3	0.32(.04)**	0.32(.04)**	0.32(.04)**	0.32(.04)**	0.32(.04)**	0.32(.04)**
Team 4	0.33(.04)**	0.33(.04)**	0.33(.04)**	0.33(.04)**	0.33(.04)**	0.33(.04)**
Team 5	0.06(.04)	0.06(.04)	0.06(.04)	0.06(.04)	0.06(.04)	0.06(.04)
Time	0.03(.00)**	0.03(.00)**	0.03(.00)**	0.03(.00)**	0.03(.00)**	0.03(.00)**
Difference	-0.02(.01)	-0.02(.03)	0.04(.01)**	0.06(.02)**	0.02(.01)	0.01(.03)
Time*Difference		0.00(.01)		0.00(.01)		0.00(.01)
R Squared	0.06	0.06	0.06	0.06	0.06	0.06

Note. Run using both Difference Scores and MQAP Regression. * = $p < .05$; ** = $p < .01$

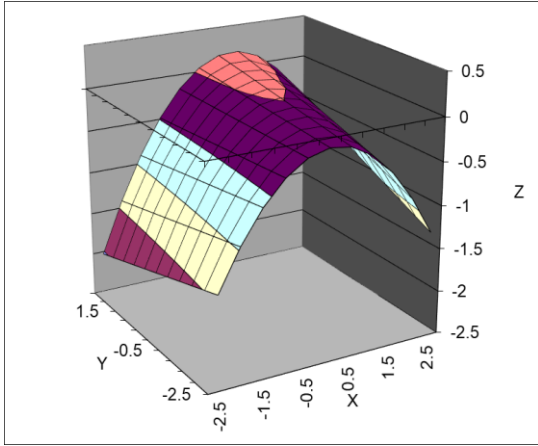


Note: Communication

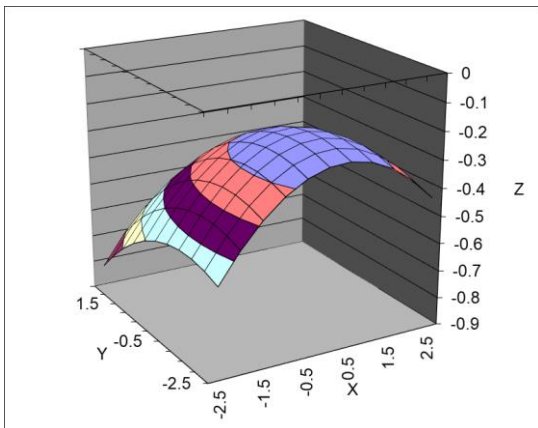


Note: Coordination

Figure 1. *Agreeableness Response Surface Areas*

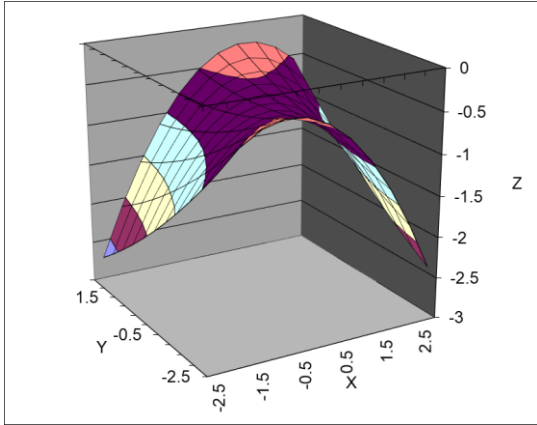


Note: Communication

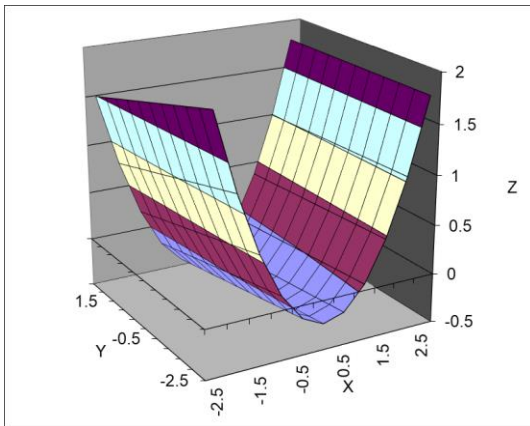


Note: Coordination

Figure 2. *Extraversion Response Surface Areas*



Note: Communication



Note: Coordination

Figure 3. *Openness to Experience Response Surface Areas*

Chapter Five: Discussion

The goal of the present study was to examine the relationship between personality homophily and communication and coordination over time *within* teams at the dyadic level. Similarity on agreeableness, extraversion, and openness to experience was expected to predict higher reported levels of communication and coordination. As expected, similarity on extraversion and openness to experience predicted higher levels of communication, whereas being similar on agreeableness did not. Extraversion was also related to higher levels of coordination. Contrary to expectations, similarity on agreeableness and openness to experience did not predict higher levels of coordination, in fact dissimilarity on these traits were related to coordination. As communication is frequently thought of as the preceding process to coordination, this was an unexpected result. The differences may come down to the way in which the process questions were worded, in which communication was posed as a question of frequency and coordination was phrased as a question of quality. So while homophily may predict whether individuals engage with each other on a team, it may not necessitate that what is discussed or how well that discussion translates to better coordination.

In addition to the three a priori hypotheses, I tested whether the relationship between personality homophily and team process remained stable or changed over the lifespan of the team. After interacting the aforementioned relationships with time using difference scores, the relationships did not significantly differ. This indicates that the relationship between personality homophily and process remained stable over time. These results were somewhat unexpected, as

previous research would demonstrate that similar types of relationships either get stronger or diminish over time (Harrison et al., 2002). This indicates that personality has the same impact on the quantity of communication and quality of coordination later in the team compared to earlier. When looking at the results of the difference scores, significant values were found for the same relationships as above, however the direction of the relationships indicated an opposite effect (i.e. the larger difference on extraversion the higher reported communication and coordination). As such, the polynomial regression results provide a better view of the process under investigation, something that is lost when conducting the analysis using difference scores over time.

Theoretical Implications

The first theoretical implication that can be drawn from this study is the importance of taking a within-team perspective when considering personality and process. Despite previous recognition that within-team variance can be meaningful within the context of teams, most current studies do not try to disentangle the source of this variability and the implications associated with those differences. When looking at the relationship between personality and process, the aggregation of team personality does not allow researchers to identify strong and weak links within the team. This study indicates that there is variability between personality and process relationships in teams. This study also indicates that this variability is predictably dependent on personality similarity. Through the oversimplification of teams through researchers' propensity to aggregate team phenomenon, researchers may want to be more balanced between taking a team-level and within-team level perspective to understanding team processes. Continuing to explore teams using sociometric data allows for a better way to examine the patterns of relationships and behaviors within teams (Wasserman & Faust, 1994).

Through the use of aggregation, researchers may be missing meaningful and interesting relationships within teams. By acknowledging that there is variability within teams, using a within-team perspective could allow for a better understanding of dyadic level processes like the formation of clicks within the team and the development of potential fractures within the team.

The second theoretical implication that can be drawn from this study is understanding dyadic level homophily and its relationship to processes *over time*. Because this relationship was measured at 11 different time points of the teams' 12 week long lifespan, the change of this relationship, or lack thereof, was able to be captured. Very few studies measure processes over time, and if they do, they only tend to capture these relationships at a few time points. This study provided 11 measurements at equal intervals to observe the. Surprisingly, the results remained stable over time, which while unexpected, adds to the understanding about how the relationship between personality and process changes over time. The results may suggest that personality similarity stays consistently important for predicting communication and coordination throughout the life or task cycle of the team. In other words, there are no diminishing returns for communication over time for choosing individuals who are similar on extraversion and openness to experience. Early impressions are likely consistent and predictive over time, so for an intervention perspective, it is likely best to take action early.

The final theoretical implication is related to measurement. This study suggests that there is meaningful variability within team teams and therefore researchers should be measuring and theorizing at the dyadic level. Using behavioral trace and novel sociometric data collection approaches could help to better understand and leverage within-team insights. By avoiding data collection methods that lead to aggregation or losing within variability, researchers can continue to gain insights into the inputs, processes, and output that can occur at the within-team level.

Practical Implications

The largest practical implication regarding the outcomes of this study are for building and hiring for teams. Because the results demonstrated that homophily on extraversion and openness to experience predicts consistently higher levels of communication at the dyadic level, this could be leveraged for teams in which interpersonal communication is critical for team success. Using the results from this study, when considering team composition it may be important to look at individual's personality relative to other members of their team, rather than using the dominant assumption that higher levels of a trait are always better. As researchers continue to understand the importance of complimentary and supplementary fit, (Kristof-Brown, Zimmerman, & Johnson, 2005), the notion that given the profile of who else is on the team, human resource members can determine what level of a trait would be most effective. When considering the need to bring new members of a team, companies could use the personality of the existing team to determine which potential hire would likely engage in process with the other members.

The second practical implication that can be taken from this study is – that the presence of meaningful with-team variance in quantity and quality of process equals the potential and need for targeted interventions. Companies may want to utilize a within-team, dyadic level, approach when measuring the processes that their workers are engaging in. Taking a within-team approach could help provide information about where weak communication and coordination ties may exist within the team, and potentially where functioning may break down. Companies could then leverage this information for more targeted interventions, in which they can focus on problematic dyads rather than the whole team. Being able to pinpoint communication breakdown at the dyadic level would allow for efficiency when addressing problems in the work team where

companies can focus on fixing the dyad in which the breakdown occurs rather than the whole team.

Limitations and Future Directions

The first limitation in this study is the sample. While the overall sample size for statistical analyses was quite large and adequate ($n = 3,520$), all data came from six moderately sized student teams. While this sample is appropriate for understanding intra-team phenomena, it prevents one from being able to look at team level outcomes. The low number of teams was chosen to allow for more dyads per team, the level of analysis in which this study was based. Future research would ideally have large amounts of large teams to allow for conclusions at both the within and between team levels. These individuals also had limited knowledge of one another prior to working together, and knew that the team had a finite life span, a situation not reflective of all work teams. Using student teams allowed for control over the task, ensuring that the task required team members to work together in an intensive fashion and making sure that each team had the same tasks and goals. In addition, the teams' lack of experience together provided information about relationships from inception, which is necessary for studying emergence (Epstein, 1999). Future research should examine intra-team personality homophily and process with different types of teams to determine the generalizability of these relationships (Highhouse, 2009).

The second limitation with the current study is that the data were collected exclusively through self-report. Given the nature of using a student sample, surveys were the most realistic method to gather process related data over time. In future studies, processes like communication could be measured using behavioral metrics of communication like sociometric badges (Santoro, Dixon, Chang, & Kozlowski, 2015). This could provide a more objective measure of frequency

of communication within the team. This study also looked at frequency of communication rather than quality of communication. A future study should look at both quantity and quality of communication to better understand this process, potentially through qualitative analysis.

Conclusion

As teams are increasingly utilized in today's organizations, it is important to understand personality compositions that foster good process. This study demonstrates the important role of personality homophily on communication and coordination. Taking a within-team perspective, this study demonstrated that having a higher similarity on extraversion and openness to experience was related to higher amounts of communication. Interestingly, homophily on extraversion was the only personality trait related to coordination. Relationships suggested that dissimilarity on agreeableness and openness to experience was related to coordination. Overall, the results imply that understanding similarity at the dyadic level is important for process.

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Appendices

Appendix A.

Archival Variables

Individual Differences	Current Study	Manuscript Under Review
Big 5 Personality	X	
Gender		
Age		
Ethnicity		
Major		
GPA		
SAT/ACT		
Affectivity		
Psychological Collectivism		
Motivation to Lead		
Goal Orientation		
Narcissism		
Generalized Self-Efficacy		
Adaptability		
Teamwork Skills		

Sociometric Variables	Current Study	Manuscript Under Review
Familiarity		
Leadership		
Followership		
Cohesion		X
Communication	X	X
Trust		X
Conflict		
Collective-Efficacy		
Advice		X
Hindrance		X
Workload		
Coordination	X	
Transactive Memory		

Appendix B.

Personality Measure

Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Indicate for each statement whether it is:

1	2	3	4	5
Very Inaccurate		Neither Accurate Nor Inaccurate		Very Accurate

Note: The number next to each item indicates which personality trait is being measured, and the negative sign indicates that the item is reverse scored

1 = Extraversion

2 = Agreeableness

3 = Conscientiousness

4 = Emotional stability

1.	Am the life of the party.	(1+)
2.	Feel little concern for others.	(2-)
3.	Am always prepared.	(3+)
4.	Get stressed out easily.	(4-)
5.	Have a rich vocabulary.	(5+)
6.	Don't talk a lot.	(1-)
7.	Am interested in people.	(2+)
8.	Leave my belongings around.	(3-)
9.	Am relaxed most of the time.	(4+)
10.	Have difficulty understanding abstract ideas.	(5-)
11.	Feel comfortable around people.	(1+)
12.	Insult people.	(2-)
13.	Pay attention to details.	(3+)
14.	Worry about things.	(4-)
15.	Have a vivid imagination.	(5+)
16.	Keep in the background.	(1-)
17.	Sympathize with others' feelings.	(2+)
18.	Make a mess of things.	(3-)
19.	Seldom feel blue.	(4+)
20.	Am not interested in abstract ideas.	(5-)
21.	Start conversations.	(1+)
22.	Am not interested in other people's problems.	(2-)
23.	Get chores done right away.	(3+)
24.	Am easily disturbed.	(4-)
25.	Have excellent ideas.	(5+)
26.	Have little to say.	(1-)
27.	Have a soft heart.	(2+)
28.	Often forget to put things back in their proper place.	(3-)
29.	Get upset easily.	(4-)
30.	Do not have a good imagination.	(5-)
31.	Talk to a lot of different people at parties.	(1+)
32.	Am not really interested in others.	(2-)
33.	Like order.	(3+)
34.	Change my mood a lot.	(4-)
35.	Am quick to understand things.	(5+)
36.	Don't like to draw attention to myself.	(1-)
37.	Take time out for others.	(2+)
38.	Shirk my duties.	(3-)
39.	Have frequent mood swings.	(4-)
40.	Use difficult words.	(5+)
41.	Don't mind being the center of attention.	(1+)
42.	Feel others' emotions.	(2+)
43.	Follow a schedule.	(3+)
44.	Get irritated easily.	(4-)
45.	Spend time reflecting on things.	(5+)

46.	Am quiet around strangers.	(1-)
47.	Make people feel at ease.	(2+)
48.	Am exacting in my work.	(3+)
49.	Often feel blue.	(4-)
50.	Am full of ideas.	(5+)

Appendix C.

Permission for IPIP

Obtaining Permission

Because the IPIP has been placed in the public domain, permission has already been automatically granted for any person to use IPIP items, scales, and inventories for any purpose, commercial or non-commercial..

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