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Cooperation and Facets of Psychological Collectivism as Antecedents of Team Mental Model Similarity

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Cooperation and Facets of Psychological Collectivism as Antecedents of Team Mental Model Similarity

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Biography

The author was born in Houston, Texas, on October 23, 1990. He graduated from DeBakey High School for Health Professions, also in Houston. He received his Bachelor's of Science degree in Psychology from Loyola University New Orleans in 2013.

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Abstract

This thesis investigated the role of facets of trait psychological collectivism (Preference, Reliance, Concern, and Goal-Priority) and the personality trait cooperativeness in the development of Team Mental Models. Team Mental Models (TMMs) are shared representations of a work team's context that aid a team in directing behaviors and coordinating actions. I utilized Marks, Mathieu, and Zaccaro's (2001) taxonomy of team processes to explicate and test a model detailing the role of composition in TMM development. Data were collected from 35 teams of 5 individuals who completed a computer simulation in which the team interdependently replicated pictures using blocks. Multiple regression analyses were used to test a mediation model of team trait personality composition, team mental models, team processes and team performance. TMMs and the team traits Reliance and Preference were found to positively predict team performance; however, the mediated model was not supported. Implications and future directions are discussed.

Introduction

In the current dynamic workplace, organizations increasingly turn to teams to handle complex and critical tasks. With such reliance on teams, researchers have noted the immense importance to understanding predictors of team performance (Mathieu, Maynard, Rapp, & Gilson, 2008). One method of understanding teams is to investigate how the team as a whole conceptualizes its context and prepares for interaction towards its goals. For this, researchers have introduced the idea of Team Mental Models (TMMs).

Researchers have increasingly studied TMMs, that is, the extent to which team members share a conceptualization of the team and its surrounding context, to examine effects on team functioning (Mohammed, Ferzandi, & Hamilton, 2010). Teams with members who hold shared understandings communicate more efficiently, interact more seamlessly, and perform better than teams that do not (Fisher, Bell, Dierdorff, & Belohlav, 2012; Marks, Zaccaro, & Mathieu, 2000; Mohammed et al., 2010). Noting the potential benefits of holding shared conceptualizations, uncovering the antecedents of shared understanding is of critical importance. While many studies have examined the outputs of TMMs, fewer have examined their inputs (Fisher et al., 2012; Guchait & Hamilton, 2013; Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008).

As of yet, TMM researchers have considered training interventions and planning processes as antecedents of TMMs (Marks et al., 2000; Mathieu et al., 2008; Smith-Jentsch et al., 2008). Fewer researchers have examined compositional antecedents of TMMs. Fisher and colleagues (2012) examined

facets of personality that predicted TMM emergence through influences on team processes. Additionally, Resick and his colleagues also examined team cognitive ability and collective orientation as antecedent, with positive initial findings (Resick, Dickson, Mitchelson, Allison, & Clark, 2010). However, the relationship between personality variables and TMM emergence remains largely unexamined. A deeper understanding of TMM antecedents could provide a mechanism through which to predict their emergence, thereby allowing leaders or practitioners to anticipate possible training needs of teams, or allowing for the strategic composition of successful teams. Drawing from the existing knowledgebase for TMMs, what remains to be examined is a thorough consideration of the inputs that yield their emergence.

The present study explores potential antecedent variables of both team processes and mental models of teams resembling action teams. This study seeks to augment the TMM literature with consideration of personality factors that may influence particular team processes leading to the development of mental models. Subsequently, mental models are predicted to influence later processes related to team performance. In the following sections, I describe mental models, explain their development and operationalization, and elucidate how facets of collectivism can influence mental model development and performance.

Team Mental Models

Cannon-Bowers and Salas introduced mental models in the context of work and action teams to capture and explain the coordination present in effective teams (Cannon-Bowers & Salas, 1990). This line of research stems from the

cognitive psychology literature. Mental models refer to individuals' mental representations that describe, predict, and explain the surrounding environment (Johnson-Laird, 1983). In teams, members construct mental models to describe, explain, and predict the team environment (Cannon-Bowers, Salas, & Converse, 1993). When multiple members hold similar mental models, these models become a team level phenomenon- a TMM.

TMMs represent organized mental representations of the key elements within a team's environment that are shared among members (Klimoski & Mohammed, 1994). Thus, a TMM captures the shared view of individual conceptualizations of what is happening, what will happen, and why things happen in a team (Mohammed et al., 2010). In sum, TMMs help teams to describe, predict, and explain a team's environment in a similar manner (Mohammed et al., 2010; Rouse, Cannon-Bowers, & Salas, 1992). With a common conceptualization, teams are "on the same page", helping the team to coordinate actions and perform more effectively (Cannon-Bowers et al., 1993; Klimoski & Mohammed, 1994).

Types of Mental Models. TMMs have been conceptualized to cover two main content domains of work teams: teamwork and taskwork (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). Teamwork TMMs represent knowledge of team member roles, responsibilities, interaction and communication channels, and information flow (Mathieu et al., 2000). Taskwork TMMs, on the other hand, describe the representation of operating procedures, possible failures, likely contingencies and scenarios the team will encounter, task strategies,

environmental constraints, and task-component relationships (Mathieu et al., 2000). Both teamwork and taskwork TMMs provide important information pertaining to the team context that members can use to coordinate action to address task demands and, as such, both conceptualizations have been empirically shown to predict team performance (Edwards, Day, Arthur, & Bell, 2006; Lim & Klein, 2006; Mathieu et al., 2000).

Teamwork TMMs incorporate knowledge of team interaction patterns and other members' roles, responsibilities, skills, knowledge, attitudes, preferences, and tendencies (Mathieu et al., 2000). Literature on teamwork mental models have noted that they facilitate team processes and team performance (DeChurch & Mesmer-Magnus, 2010). Specifically, teamwork TMMs predict behaviors such as coordination or back-up behaviors that lead to higher levels of team effectiveness (Fisher et al., 2012; Marks et al., 2000).

Given the direct correspondence between understanding of the task and completing the task, it follows that there has been a strong positive relationship between taskwork TMMs and team performance (Lim & Klein, 2006; Mathieu et al., 2000). Although teamwork and taskwork TMMs demonstrate strong relationships with performance, different research questions necessitate the use of different operationalizations (Fisher et al., 2012). For example, in novel or changing environments, teamwork mental models may be especially useful in predicting performance. In these cases, knowledge of how to interact with other team members is likely to provide a better predictor of team performance than knowledge of specific tasks to engage in. Marks and colleagues (2000) found that

team interaction models were better predictors of team performance in novel situations than in routine ones. Overall, in changing circumstances, necessary task demands may change while teamwork TMMs may be more easily generalized across team types (Rentsch & Klimoski, 2001). Noting this generalizability, teamwork mental models will be examined in this study.

Operationalization of Team Mental Models. In addition to the two types of mental models, there are two ways to conceptualize TMMs: through their similarity or through their accuracy. TMM similarity is defined as "meaning or understandings that are alike among individuals and utilized to make sense of, attribute meaning to, and interpret internal and external events, including affect, behavior, and thoughts of self and others" (Rentsch, Small, & Hanges, 2008; 144). That is, TMM similarity captures the degree to which the team members conceptualize the team context in a similar fashion. TMM accuracy is theorized to show the "true state of the world" (Edwards et al., 2006). In turn, TMM accuracy represents the extent to which the mental models of team members are correct, typically evaluated by comparing a mental model to that of a subject matter expert (SME) (Edwards et al., 2006; Resick et al., 2010).

As evidenced by the sheer number of terms used to capture the sharedness of mental models (e.g. convergence, agreement, compatibility, and commonality), similarity of mental models has been the most common operationalization of TMMs (Mohammed et al., 2010). Similarity has been often assessed via structural assessment programs, where members are asked to make paired comparison ratings regarding the relatedness of multiple concepts related to the team. Each

individual map created by team members can then be compared to each other and indexed for degree of similarity. The most common method for indexing the degree of similarity is the use of structural assessment programs such as Pathfinder (Schvaneveldt, 1990). Structural assessment programs measure similarity by having participants rate relationships between statements in regards to a team process or team task and uses these ratings to create a structural pattern for each respondent. Each respondent's structure, or network, of statements represents how he or she mentally conceptualizes the task or process at hand. With this, a program such as Pathfinder can measure the degree of similarity, operationalized as the proportion of common links to the total number of links in a network, between different respondents (Schvaneveldt, 1990).

A limitation to the utilization of TMM similarity comes from the idea that members may hold similar, yet inaccurate conceptualizations of the team task (Edwards et al., 2006; Mohammed et al., 2010). Considering this, researchers have begun to examine another operationalization of TMMs: TMM accuracy. TMM accuracy has been empirically linked to team performance, suggesting that as the accuracy of a team's mental model increases, so does all necessary team processes and performance (Edwards et al., 2006).

The methods for assessing the accuracy of TMMs are similar to those of TMM similarity. TMM accuracy takes the structural approach of similarity and compares the TMM to the conceptualizations provided by SMEs in the task domain (Edwards et al., 2006). Given the "correct" conceptualization provided by SMEs, there is much logical sense in the findings of TMM accuracy being a

strong predictor of team performance. In fact, given the measurement of TMM accuracy, the more accurate TMM's become, the more similar they become as well (Lim & Klein, 2006).

A limitation to TMM accuracy is that it assumes a limited number of ways to achieve a task. While TMM accuracy may be important and predictive of performance for well-defined tasks with a limited number of ways to completion, many teams do not operate in narrowly defined situations where accuracy could be easily captured. TMM accuracy is also problematic for assessing teamwork as teams may engage in varying combinations of processes to achieve effective outcomes. One explanation of this is provided by Lim and Klein (2006) who suggest that in novel or changing environments, where specific accurate models of team interaction may not exist, it is more important for members to have a shared conceptualization of the emerging context and collective action required.

TMM similarity, on the other hand, predicts team processes that can lead to the team's capacity to adapt to changing circumstances which lead to positive team performance (Burke et al., 2006; Marks et al., 2000). For more complex tasks, there may be any number of ways in which a team can interact to achieve their goal. Additionally, research has not yielded any interactions between TMM similarity and accuracy in predicting performance to taskwork or teamwork mental models (Lim & Klein, 2006). Therefore, Lim and Klein (2006) suggest that accuracy may not be as important as some authors may believe.

Researchers can draw a relationship between the two types of mental models (i.e. teamwork and taskwork) and their operationalizations (i.e. similarity

and accuracy). In well-defined tasks with limited strategies for task completions, accuracy may be more important. However, for poorly defined tasks or those that require adaptation, there are numerous effective ways that a team may interact. With this in mind, it may follow that similarity of teamwork mental models may be more relevant than accuracy. Noting my use of teamwork mental models, I will focus on TMM operationalized as similarity.

Mental Model Development. TMMs are not static in nature and must emerge over time, thus representing emergent states. Emergent states are "constructs that characterize properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes" (Marks, Mathieu, & Zaccaro, 2001: 357). From the standard I-P-O model, TMMs have been described as both team inputs (Marks et al., 2000; Mathieu et al., 2005) and outputs (Guchait & Hamilton, 2013; Mathieu et al., 2000).

It is important to note that emergent states are different from team processes. Variables such as cohesion, collective efficacy, or situational awareness represent emergent states. Although they have been incorrectly classified as processes in the past, emergent states describe affective, cognitive, motivational states that guide processes in a team (Marks et al., 2001). Processes, alternatively, describe interdependent activities that a team engages in to achieve its goals (Marks et al., 2001). Processes represent the mechanism through which inputs are translated into team outcomes.

An issue in studying the development of emergent states, researchers must carefully examine the antecedents at multiple time points (Kozlowski, Chao,

Grand, Braun, & Kuljanin, 2013). Thus far, few studies have examined TMMs as either inputs or outputs, though rarely both (Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005; Smith-Jentsch et al., 2008). Thus, the literature is not left with a comprehensive picture of mental model emergence and outputs.

McComb (2007) proposed a 3-phase model of mental model emergence. In her model, individual members first utilize information from the team and the task at hand to orient themselves (orientation). Orientation is followed by differentiation; members examine information for similarities and differences between initial mental models and mental models in light of the new information gathered from the team. Finally, information is integrated into team member's views and the iterative process can begin again. In a similar vein, Cronin and colleagues found that TMMs take time to develop and can change over time depending on how members collectively interact (Cronin, Bezrukova, Weingart, & Tinsley, 2011). Thus, interactions among team members serves as a point of investigation into the emergence of mental models. As such, two main bodies of research have emerged in the investigation of antecedents of TMMs: proximal team processes and individual personality factors. While team processes represent the manners by which members of a team collectively interact, personality factors allow predictions of behaviors that may lead to these collective interactions (Fisher et al., 2012).

Team Member Individual Differences and TMM

Individual differences have been noted for their particular importance in predicting interactions of individuals in teams and team performance (Bell, 2007;

Driskell, Goodwin, Salas, & O'Shea, 2006; Fisher et al., 2012). Of particular note here are personality variables and member values, specifically psychological collectivism, two types of individual differences that have been implicated in various aspects of team performance and functioning, such as cohesion, adaptability, and team cognition (Bell, 2007; Dierdorff, Bell, & Belohlav, 2011; Driskell et al., 2006; Fisher et al., 2012). The next paragraphs will describe research on personality facets and psychological collectivism, proposing unique contributions of each in team processes and, later, TMMs.

Personality refers to enduring characteristics of an individual that influences the actions and thoughts across situations (Costa & McCrae, 1985). The literature suggests that personality variables can be implicated in the development of team cognition (Bell, 2007; Fisher et al., 2012). For example, recent articles have connected team cognition to facets of agreeableness, notably, trust and cooperation (Fisher et al., 2012, Resick et al., 2010). In this case, personality facets influence the likelihood that individuals will trust others, thus facilitating effective interpersonal interactions such as information sharing or helping. These authors rely on the fact that personality exhibits a well-established relationship with behavior in a variety of situations (Bell, 2007). Taking note of the necessity of interactions within a team for the development of TMMs, it may be fruitful to examine personality factors that influence team interactions.

The predominant conceptualization of personality is that of the Big 5 (Costa & McCrae, 1985). The Big 5 represent five dimensions of personality, namely, extraversion, openness to experience, neuroticism or emotional stability,

agreeableness, and conscientiousness. Extroversion describes warm, gregarious, assertive, active and excitement seeking individuals (McCrae & John, 1992). Openness to experience describes individuals that are artistic, curious, imaginative, insightful, and original, with a wide range of interests (McCrae & John, 1992). Agreeableness is characterized by trust, appreciation, generosity, kindness, and sympathy (McCrae & John, 1992). Conscientious individuals are described as efficient, organized, reliable, responsible and thorough (McCrae & John, 1992). Finally, emotional stability describes a lack of anxiety, tenseness, worrying and other nervous tendencies (Driskell et al., 2006).

In the teams literature, personality composition, the configuration of different member attributes has been implicated in team functioning. For example, a meta-analysis by Bell (2007) showed that various facets of team personality along the Big 5 traits predicted team performance. Specifically, team composition in terms of agreeableness, extraversion, conscientiousness, and openness was related to team performance. Bell (2007) found that the team-level operationalization of the composition variable presented a moderating effect of these personality and performance relationships. Team mean and minimum levels of agreeableness were most predictive of team performance, while other traits such as extraversion produced negligible effects when operationalized similarly (Bell, 2007). Overall, this meta-analysis served to clarify that team personality is of high importance when considering team performance and functioning.

It is established that team personality is an important variable to consider when discussing team functioning. However, some authors have suggested that

the general factors of personality are not specific enough to describe or predict interpersonal interactions that explicate team performance (Driskell et al., 2006). To expand upon this idea, Driskell and colleagues (2006) reviewed personality research to suggest specific interactions people may engage in while in groups depending on sub-facets of personality. For example, with the personality variable extroversion, the dominance sub-facet was utilized to explain monopolizing conversations while the social perceptiveness sub-facet could explain extroversion's effect on maneuvering interpersonal interactions by understanding others' thoughts, feelings, or behaviors (Driskell et al., 2006).

Interpersonal interactions within teams manifest later as larger team processes or emergent states. For example, team learning behavior, the aggregation of multiple individuals' learning behavior, has been shown to increase TMM similarity in teams (Guchait & Hamilton, 2013). Another example would be the dependability sub-facet of conscientiousness, which represents a person's tendency toward planfulness and discipline (Driskell et al., 2006). At the team level, planfulness may be presented as the team planning process, which has been shown to predict positive team outcomes (Mathieu & Rapp, 2009). Since these interactions and processes can be predicted by team personality, I will predict team behaviors utilizing sub-facets of personality, where applicable.

Of utmost criticality in team functioning is the ability to cooperate towards task completion, especially in interdependent tasks. Cooperativeness is a sub-facet of agreeableness and represents the extent to which members share or assist in task activities (Driskell et al., 2006). Since team agreeableness has shown to be

such a strong predictor of team performance (Bell, 2007), an examination of its sub-facets, namely cooperativeness, may shed light into the explanatory mechanism behind these findings. For example, more cooperative people have been suggested to willingly approach others cooperatively, to the extent that it is reciprocated (Van Lange, 1999; Van Lange, De Bruin, Otten, & Joireman, 1997). In relation to mental models, agreeableness was found to predict TMM similarity (Resick et al., 2010). Resick and colleagues suggested that teams composed of more agreeable members are able to form similar mental models due to their ability to integrate information and negotiate strategies (Resick et al., 2010). More recently, cooperativeness, a subfacet of agreeableness, was empirically linked to TMM similarity and conceptually linked to team planning (Fisher et al., 2012). As previously stated, this study will explore this hypothesis by examining the role of cooperativeness in TMM similarity emergence through the effects of team processes. In light of the findings from the Bell (2007) meta-analysis, it would follow that a team's minimum level of cooperativeness may predict how the team interacts towards task completion.

Additionally, an emerging variable studied in teams is that of psychological collectivism. As an individual difference variable, psychological collectivism describes the degree to which people have a tendency to prefer to exist within bounds of an in-group, emphasize a sense of collective responsibility and common fate, feel great concern for the wellbeing of in-group members, maintain strict adherence to group norms to guide behavior, and prioritize group goals over personal goals (Jackson, Colquitt, Wesson, & Zapata-Phelan, 2006).

Overall, these facets are theorized to promote effective team interactions and psitively benefit performance (Dierdorff et al., 2011). The following paragraphs will define the different facets of psychological collectivism before making conceptual linkages between psychological collectivism, team processes and TMMs.

Research by Jackson and colleagues (2006) further grouped the overall conceptualization of psychological collectivism into five facets: Preference, Reliance, Concern, Norm Acceptance, and Goal-Priority (Jackson et al., 2006). The five facets of collectivism Preference refers to the tendency to emphasize in-group relationships (Jackson et al., 2006). These individuals prefer to be part of a group and believe that collective efforts are superior to individual efforts (Jackson et al., 2006). Reliance is defined by a person's view that responsibility is shared throughout the group (Jackson et al., 2006). This belief is thought to make individuals comfortable with relying on other members within the team. Concern describes a person's motivation to ensure that interests of team and other members are satisfied (Jackson et al., 2006). Norm acceptance refers to an individual's focus on rules and norms of the group to guide behavior (Jackson et al., 2006). Goal-priority describes the tendency of collectivistic individuals to place the goals of the group above individual goals, even to the point where this causes the individual in question to make concessions in goal achievement (Jackson et al., 2006).

Similar to facets of personality, the facets of psychological collectivism can be utilized to explain behaviors within a team. For example, members high on

preference tend to be more affiliative (Jackson et al., 2006). People that have been found to be more affiliative were more sociable, friendly, and preferred interaction to being alone (Driskell et al., 2006). In a team context, affiliative members have been known to engage in more group interactions including helping and learning behaviors (Driskell et al., 2006; Wageman, 1995).

Reliance represents a person's dispositional view of group work and goals as a collective responsibility (Jackson et al., 2006). Highly reliant members are more comfortable relying on or trusting in other members (Jackson et al., 2006). Such levels of interpersonal trust are suggested to be important determinants of cooperation, helping behaviors, and task commitment, important factors of team performance (Dirks & Ferrin, 2001; Driskell et al., 2006). Given the levels of reliance in a team, members that are more comfortable relying on other members to complete assigned tasks may be less likely to engage in directive behaviors such as team monitoring. Alternatively, members that are low in reliance may engage in more directive team interactions, such as planning or monitoring of other members, to ensure that tasks are completed and the team progresses towards goals.

Goal-priority, additionally, is a value that describes the placement of group goals before individual goals, even if this means individual sacrifices must be made (Jackson et al., 2006). According to Aube and Rousseau (2005), this type of commitment may be due to higher attachment or commitment to the team and its goals. With such commitment to a team's goal, members high in this trait may take extra care to engage in actions that will ensure goal achievement (Locke &

Latham, 2002). For example, a high-goal prioritized person may take more time to monitor other members to ensure that a team's tasks were completed satisfactorily.

Concern describes a person's motivation to ensure that interests of the team as a whole and of particular members are satisfied (Jackson et al., 2006). In their study, Jackson and colleagues (2006) linked Concern to member citizenship behaviors whereby members were reported to engage in extra-role behaviors that include, but are not limited to, helping, monitoring, and backup behaviors.

I utilize McComb's (2007) model as a guiding framework for the next paragraphs as I explicate team processes' role in mental convergence. Further, given the possible predictive nature of cooperativeness, a sub-facet of agreeableness, and particular facets of collectivism on team processes, I draw theoretical linkages between the two in order to generate testable hypotheses. Although McComb's theory will not be explicitly tested here, a full model linking personality, collectivism, team processes, and mental model emergence will be examined.

Team Processes and TMM

The effects of TMMs on team processes have been well established in the literature (Fisher et al., 2012; Marks et al., 2000; Mathieu et al., 2000, 2005; Mohammed et al. 2010). Multiple studies demonstrate that TMMs result in more efficient communication processes (Marks et al., 2000, 2002). Additionally, authors have linked TMMs to strategy formation, coordination, cooperation, and communication (Fisher et al., 2012; Mathieu et al., 2000). While only few studies

examined processes as antecedents of TMMs, much of the TMM literature has examined TMMs as inputs in the context of the input-process-output (I-P-O) framework (Levesque, 2001; Stout et al., 1999). However, other research fails to replicate this relationship between TMMs and team processes (Banks & Millward, 2007; Guchait & Hamilton, 2013). The next paragraphs discuss TMMs as outcomes of particular antecedents which then become inputs for later team processes. The processes mentioned, though, differ in their effect on team functioning and in their temporal relevance. I use the Marks et al., (2001) taxonomy of team processes to explain the differences in the processes noted as antecedents and outputs of TMMs and elucidate the temporal relevance of each type of process.

Much literature has been devoted to examining the effects of TMMs on team processes, but, results have been inconsistent (Banks & Milward, 2007; Stout et al., 1999). On one hand, many authors support the idea that TMMs predict team processes and lead to performance (DeChurch & Mesmer-Magnus, 2010; Marks et al., 2000; Mathieu et al., 2000). On the other hand, other authors have failed to demonstrate significant effects for either teamwork or taskwork TMMs in predicting team processes or performance (Banks & Milward, 2007). Recently, support for the idea that team processes may actually lead to TMMs has emerged. As mentioned earlier, TMMs are emergent states that develop over time. This distinction of developing over time may signify that TMMs do not lend well to the typical I-P-O framework as has been previously examined (Banks & Milward, 2007; Ilgen, Hollenbeck, Johnson, & Jundt, 2005). Thus, the differences

found in the literature may lie in the different processes measured in these studies. I propose that some processes serve as inputs to TMMs (i.e. they predict the emergence of TMMs) while other processes serve as outcomes of TMMs. The following paragraphs distinguish these two types of processes and provide information as to how each has been studied in the literature.

Marks et al. (2001) noted that different team processes may be relevant at different points in time. It can be inferred, then, that the temporal interdependencies of TMM emergence may depend on the temporal relevance of the processes studied in their relationships to mental models.

Marks and colleagues describe three types of team processes: transitional processes, action processes, and interpersonal processes (2001). Transitional phases include team processes related to evaluation and planning activities that help to analyze the team's situation, define goals, formulate strategies, and orient the team. Action processes describe time periods when teams engage in activities directly related to goal accomplishment. Examples include: team monitoring behaviors, backup behaviors, and coordination activities (Marks et al., 2001). A straightforward notion, then, is transition processes precede action processes as a team will not be able to monitor behaviors or help where necessary if there is no clear understanding of what the team is attempting to accomplish. Finally, interpersonal processes are those that teams use to build and maintain interpersonal relationships. Interpersonal processes are not distinguished as their own temporal phase as they are present in both transition and action phases. Essentially, interpersonal processes facilitate the effectiveness of both transition

and action phases. Interpersonal processes are those that govern interpersonal activities such as conflict management, motivation and conflict building, and affect management (Marks et al., 2001). In the TMM literature, however, there has been a disproportionate focus on processes explicitly from transition and action phases.

Transition phase. Transition phases describe periods when teams are primarily concerned with orienting the team towards future actions (Marks et al., 2001). Specific processes that constitute this phase of team functioning are mission analysis, goal specifications, strategy formulation and planning. Mission analysis in the interpretation and evaluation of the team's mission. Mission analyses are conducted both within individual members' cognition and through team discussion. These analyses accomplish two objectives: backward evaluation and forward visioning (Marks et al., 2001). Backward evaluation processes allow the team to reflect on previous performance and interpret particular successes and failures. Forward visioning helps the team to anticipate and plan for changes in the future team context.

TMMs are shared conceptualizations of the team context that help members describe, explain, and predict a team's environment. Thus, transition processes present a set of processes that can contribute to members' ability to both explain and predict the team context through diagnosing previous problems and anticipating future actions. The literature has found support for this relationship; For example, Marks et al. (2000) found that leader debriefings positively related to mental model similarity in teams and Smith-Jentsch et al.

(2008) found that guided reflections led to increased TMM similarity. These findings lend support to the idea that transition processes are particularly relevant and take temporal precedence to TMM similarity.

Goal specification is a transition process whereby teams assign overall mission goals and agree on what is to be accomplished and how. Goal specification may contribute to mental models by explicitly stating the expected outcomes of the team. The goal-setting literature has established a wide base of research describing the positive effects of goal-setting on individual and team performance (Locke & Latham, 2002). To date, though, no study has examined the effects of goal-setting or, in this case, the process of goal specification, to TMMs. As seen in much of the TMM literature, goal specification is taken for granted. For instance, in defining a team, many of the authors use Salas and colleagues (1992) definition of a team as two or more people interacting towards a common and valued goal objective or mission, whereby commitment to a particular goal is assumed (Salas, Dickinson, Converse, & Tannenbaum, 1992).

Strategy formulation and planning are processes teams utilize to develop alternative courses of action for mission accomplishment (Marks et al., 2001). Effective strategy formulation will include consideration of the context in terms of situational and time constraints, resources, member expertise, and possible changes in the environment. It is generally supported that planning leads to TMMs (Levesque, 2001; Stout et al., 1999).

Marks and colleagues (2001) also describe planning. Planning takes on multiple forms: deliberate planning, contingency planning, and reactive strategy

adjustment. Deliberate planning normally occurs at the beginning of a team's life cycle and refers to an original course of action the team decides upon (Marks et al., 2001). Contingency planning is proactive planning for anticipated changes in team context (Marks et al., 2001). Finally, reactive strategy planning is the adaptation or change in strategy to respond to unanticipated changes (Marks et al., 2001). The planning process has repeatedly been shown to produce beneficial outcomes in teams (Mathieu & Rapp, 2009; Stout et al., 1999). Planning clarifies the intended actions of the team and therefore may help the team develop similar conceptualizations of the team and the team context; hence planning may contribute to the development of similar TMMs.

Action Phase. Action phases are described at the periods of time in which the team is engaging in activities that directly affect performance (Marks et al., 2001). Marks and colleagues name four processes that contribute to action phases: monitoring progress toward goals, systems monitoring, team monitoring and backup responses, and coordination activities.

Monitoring progress towards goals is where team members track progress towards team accomplishment of goals (Marks et al., 2001). This process includes where members calculate the discrepancy between team progress and the ultimate objective of the team by communicating the team's status, en route to goal achievement, to members. This process is an effective form of self-regulation and has been well reported as an outcome of TMMs (Mohammed et al., 2010).

Systems monitoring describes the process whereby members track team resources and environmental conditions (Marks et al., 2001). For example, in a

military team, internal systems monitoring may be a point where members ensure that everyone has the proper weaponry while environmental monitoring may include watching out for enemies or watching weather patterns. System monitoring may help members identify changes in the environment, in addition to changes that are noticed due to deviation from the expectations provided by the mental model.

Team monitoring and backup responses are defined as the assistance team members provide to each other to perform tasks. This assistance manifests in three ways: providing verbal feedback or coaching, assisting behaviorally in carrying out actions, or assuming and completing a task for a teammate (Marks et al., 2001). Team monitoring has been noted as an outcome of TMMs and is also implicated in team performance (Mohammed et al., 2010). From a mental model standpoint, team monitoring is facilitated by mental models through information regarding what tasks should be engaged in by other members. In addition to this, team monitoring may aid in TMM similarity. As team monitoring or backup behaviors may be administered through feedback or coaching, this help can affect the mental model of the individual and contribute to the overall similarity of the TMM.

Coordination activities are the orchestration and timing of interdependent actions (Marks et al., 2001). This process involves information exchange in the alignment of actions among members. While coordination often occurs during action phases, there may be signs of this process in transition phases where planning may make explicit attempts to coordinate activities (Marks et al., 2001).

Some authors have made the distinction between the noted explicit coordination and implicit coordination, that is, where teams' conceptualizations are so similar that help and other necessary activities in a group may be completed or initiated before an explicit request is made (Fisher et al., 2012). Fisher and colleagues found that TMM similarity positively predicted implicit coordination, which in turn, positively predicted performance.

The relationship between transition processes and action processes may elucidate their temporal contingencies and overall interdependence. Teams that have not specified goals will not be able to monitor progress. Also, without knowledge of the context, teams will not be able to monitor systems or other members. Lacking this knowledge, teams will be unable to provide backup behaviors or coordinate activities. Thus, it seems logical that transition processes, in tandem with their proposed effect on TMMs, may explain the relationships found between TMMs and team processes. It is prudent to note here, my review of the literature revealed a stronger focus on action processes in the TMM and team process performance, so this causal linkage is an important contribution to the literature.

Rationale

McComb (2007) suggests there are three iterative stages to mental model development: orientation, differentiation, and integration. I explained and utilized the taxonomy of team processes (Marks et al., 2001) to explicate exactly how members traverse orientation, differentiation, and integration stages.

Transition phases, marked by planning and strategy formulation, represent a series of processes that help members orient themselves to the team task and team context (Marks et al., 2001). Members may enter a team with a specific model in place and, following a transition phase where members exchange information about the task at hand and clarify perspectives, will be able to update their mental models through understanding the differences in perception, discussing them, and integrating the information (McComb, 2007). For example, in transition phases, teams specify goals and formulate action plans to achieve the goals (Marks et al., 2001). These processes allow for the sharing of information relevant to a member's mental model. Thus, I predicted that engaging in transition processes (i.e. Mission Analysis, Goal Specification, Strategy Formulation) would positively relate to TMM similarity (Hypothesis I).

Cooperativeness represents team members' disposition to share or assist in task activities (Driskell et al., 2006). Individuals higher on the cooperative facet of agreeableness have been shown to willingly approach and cooperate with others (Van Lange, 1999). However, if cooperative behaviors are not reciprocated, cooperative tendencies may no longer produce positive interpersonal processes (Van Lange, 1999). Noting minimum team agreeableness' reported strong effect on team performance, it logically follows that the agreeableness subfacet of cooperation could be an important individual difference to investigate. Since it has been shown that the presence of competitive individuals can be detrimental to interactions (Kelley & Stahelski, 1970), a minimum level of cooperativeness would explain the level of positive interpersonal interactions in a

team. In line with Bell's (2007) finding that minimum level agreeableness being a strong predictor of team performance, I hypothesized that team minimum level of cooperativeness would be positively related to transition processes (Hypothesis II).

While transition processes may predict TMM similarity early on (e.g., time 1), not all teams may engage in transition processes equally. To explain the variance in team transition processes I drew on the earlier explanation of team psychological collectivism. Teams differing in their mean-levels of Reliance may report varying levels of transition processes given differential levels of trust of other members to handle such tasks (Jackson et al., 2006). Thus, I predicted that team mean levels of trait reliance would be negatively related to transition processes (Hypothesis III). Additionally, given cooperativeness' and reliance's effect on transition processes, and transition processes' subsequent effect on TMM similarity, I predicted that the relationship between team minimum trait cooperativeness, mean trait reliance, and TMM similarity would be partially mediated by transition processes (Hypothesis IV).

Next, in action phases, teams are actively engaged directly in the task at hand. Therefore, action processes reflect behaviors that are directly related to task completion (Marks et al., 2001). Multiple researchers have validated action processes and identified them as strong influencers of team performance (LePine et al., 2008; Mathieu et al., 2000; Smith-Jentsch et al., 2008). Thus, I predicted that action processes would be positively related to team performance (Hypothesis V). In addition to this, multiple authors have tied TMMs to processes and

performance (Fisher et al., 2012; Mathieu et al., 2000; Mohammed et al., 2010). Consistent with this, I predicted that TMM similarity would be positively related to action processes (Hypothesis VI).

Although TMMs have been shown to predict action processes (Mohammed et al., 2010), team member collectivism may still exert a significant relationship on the prevalence of monitoring behaviors. Particularly, low-reliance individuals are less comfortable trusting other group members to handle their respective parts of a task (Jackson et al., 2006). When teams do not trust that members will complete their tasks yet still must achieve collective goals, it has been suggested that there will be increased engagement in minimally intrusive activities that ensure task achievement (Dirks & Ferrin, 2001). For this I proposed that monitoring, which is minimally intrusive, would be a mechanism through which low-reliance teams attempt to ensure task achievement. Specifically, I predicted that team mean trait reliance would be negatively related to team and system monitoring (Hypothesis VII).

Additionally, teams that report higher levels of concern and preference may be more likely to monitor team progress, monitor teammates and engage in backup behaviors. Jackson and colleagues (2006) found that members higher in concern were more highly reported to engage in helping, monitoring, and backup behaviors by managers. Affiliative team members have also been found to engage in more group helping and learning behaviors (Driskell et al., 2006; Wageman, 1995). Thus, team mean levels of trait concern and preference were hypothesized

to be positively related to team monitoring and backup behaviors (Hypothesis VIII and IX).

Finally, individuals that are high in team goal priority are committed to achieving group goals, even putting them before their own individual goals (Jackson et al., 2006). Team goal priority is a positive predictor of team performance (Aube & Rousseau, 2005; Dierdorff et al., 2011). Aube and Rousseau (2005) found that the high levels of goal commitment, as would be characterized by teams high in trait goal priority, was positively related to supportive behaviors to ensure goal accomplishment. Thus, I predicted that team mean trait goal priority would positively related to goal monitoring, as goal monitoring behavior is theoretically a behavior to ensure a team's goal accomplishment (Hypothesis X). Finally, noting action processes' strong predictive power of team performance, I predicted that action processes would serve as a partial mediator between both TMM similarity and mean team trait psychological collectivism on team performance (Hypothesis XI & XII).

Statement of Hypotheses

Hypothesis Ia. Mission analysis will be positively related to TMM similarity.

Hypothesis Ib. Goal specification will be positively related to TMM similarity.

Hypothesis Ic. Strategy formation will be positively related to TMM similarity.

Hypothesis IIa. Team minimum trait cooperativeness will be positively related to mission analysis.

Hypothesis IIb. Team minimum trait cooperativeness will be positively related to goal specification.

Hypothesis IIc. Team minimum trait cooperativeness will be positively related to strategy formation.

Hypothesis IIIa. Team mean trait reliance will be negatively related to mission analysis.

Hypothesis IIIb. Team mean trait reliance will be negatively related to goal specification.

Hypothesis IIIc. Team mean trait reliance will be negatively related to strategy formation.

Hypothesis IVa. Transition processes will partially mediate the effect of team trait cooperativeness on TMM similarity.

Hypothesis IVb. Transition processes will partially mediate the effect of team trait reliance on TMM similarity.

Hypothesis V. Action processes will be positively related to team performance.

Hypothesis VIa. TMM similarity will be positively related to monitoring progress towards goals.

Hypothesis VIb. TMM similarity will be positively related to systems monitoring.

Hypothesis VIc. TMM similarity will be positively related to team monitoring and backup processes.

Hypothesis VId. TMM similarity will be positively related to coordination.

Hypothesis VIIa. Team mean trait reliance will be negatively related to monitoring progress towards goals.

Hypothesis VIIb. Team mean trait reliance will be negatively related to team monitoring and backup behaviors.

Hypothesis VIII. Team mean trait preference will be positively related to team monitoring and backup behaviors.

Hypothesis IX. Team mean trait concern will be positively related to team monitoring and backup behaviors.

Hypothesis X. Team mean trait goal-priority will be positively related to goal monitoring.

Hypothesis XI. Action processes will partially mediate the relationship between TMM similarity and team performance.

Hypothesis XIIa. Action processes will partially mediate the relationship between team trait reliance and team performance.

Hypothesis XIIb. Action processes will partially mediate the relationship between team trait concern and team performance.

Hypothesis XIIc. Action processes will partially mediate the relationship between team trait preference and team performance.

Hypothesis XIId. Action processes will partially mediate the relationship between team trait goal-priority and team performance.

Method

An archival data was used to test the hypotheses. The data were collected as a part of a large scale data collection effort for Army research grant W911NF-07-2-0079 (Gerding et al., 2009).

Participants

A total of 175 (106 male, 69 female) participants were recruited through psychology undergraduate classes at a large urban catholic university. Participants ages ranged from 18 to 39 years, (M=19.40, SD= 2.12). On average, participants reported high GPAs (M=3.30/4, SD=.47) and played an average of 2.82 hours of video games per week (SD=5.85).

Five participants were scheduled in each time slot. There were a total of 35, 5 person teams. Research participants received 2.5 hours of research participation credit for participating in the project. Prior to playing the game, participants were told that each member of the three top performing teams received $100, $75, and $50 bonus, respectively (Gerding et al., 2009).

Procedure

Upon entering the lab, participants were asked to complete an informed consent for the project, and individual difference measures. Additionally, participants were designated aliases and assigned to a workstation. There were a total of five workstations, separated so that participants could not easily communicate with each other except through provided microphone and headsets.

Participants first completed a measure of teamwork mental models at their station before engaging in the task, Construct. Next, participants were read instructions on how to play Construct. After this, they engaged in a 10-minute practice session where they were instructed to try out different strategies. Following the 10-minute practice session, participants filled out another mental model measure. Finally, the participants engaged in a 20-minute session that would be considered for prize money.

After the two sessions, members were asked to self-report familiarity with other members prior to coming to the lab. The approximate total time in the lab for each team was three hours. The team interactions in the task and verbal interactions were all recorded and later coded for team behaviors by trained graduate assistant coders.

Teams engaged in a task named Construct. Construct is a virtual game that requires teams to work in a first-person virtual environment. Specifically, members must coordinate moving blocks with other members in attempt to replicate provided pictures. The task was difficult in that the picture was difficult to replicate. Blocks were only correctly placed with they matched the color of the blocks in the picture, and the picture could only be replicated by building from the ground up. So, for example, if an incorrect block was placed toward the bottom of the replication, the blocks above it would have to be removed to change out the block. Further, the scoreboard did not indicate which block was incorrect, just how many were correct or incorrectly placed. In addition, the project was

designed so that it would be difficult for a team to finish the whole replication in the allotted time.

The task was highly interdependent and was designed such that team members were required to coordinate to effectively complete the task. For example, the scoreboard which indicated the number of blocks correctly or incorrectly placed in the building area could not be viewed by the same team member who was building the replica. Neither the building area nor the scoreboard could be viewed by the team members who were gathering the blocks of different colors from the field and moving them to a building area. Team performance was calculated with the total number of correct blocks, total number of incorrect blocks, and the amount of time taken to build the entity as outlined in the picture.

Teamwork Mental Model Similarity. Teamwork Mental model similarity was collected along 12 concepts identified by Lim and Klein (2006). The concepts included were: (a) team members work well together, (b) team members often disagree with each other on issues faced by the team, (c) team members trust each other, (d) team members communicate openly with each other, (e) team members agree on decisions made in the team, (f) team members interact with one another outside of this context, (g) team members back each other up in carrying out team tasks, (h) team members are similar to each other, (i) team members are aware of other team members' abilities, (j) team members are aware of other team members' personal backgrounds, (k) team members treat each other as friends, and (l) the team is highly effective.

Mental Model Similarity was measured using Pathfinder (www.interlinkinc.net). Pathfinder calculates weighted paths that link all terms based on the paired comparisons completed in J-rate (DeFranco, Neill, & Clariana, 2011). This results in a network for each participant and represents the team member's mental model. Pathfinder then calculates the total number of shared links between maps. This number of shared links ranges from 0 to however many terms were included in the paired comparisons (DeFranco et al., 2011). Finally, to calculate a team's level of similarity, Pathfinder calculates "similarity values" by dividing the number of common links by the number of total links. The resulting similarity values can range between 0 (no similarity) to 1 (perfectly similar) (DeFranco et al., 2011).

Team Processes. To measure team processes, team interactions were coded into team processes using Marks et al.'s (2001) team process typology. Team interactions were recorded via the computer program, which allowed the session to be played back. Coders annotated the team interactions into Marks et al.'s (2001) team process typology using special notation software that was developed as part of the larger project. The software allowed for the playback of the team interaction and allowed the coder to indicate the stop and start of the team process, and then categorize it into Marks et al., (2001) team process taxonomy using a drop down box.

Coders were graduate students who had completed a seminar on teams research and were extensively trained to code team processes. Each team session

was coded by two coders. The coders were blind to the study hypotheses and coder agreement exceeded 90% for all team process dimensions.

Psychological Collectivism. Psychological collectivism was collected using the five-facet scale by Jackson et al. (2006). The measure consists of 15 items, with 3 for each facet. Items each on a 5-point scale (1=strongly disagree; 5= strongly agree). Items began with the prompt "Think about groups (work or class) to which you currently belong and/or have belonged to in the past". Example items include: Working in those groups was better than working alone (Preference); I felt comfortable trusting group members to handle their tasks (Reliance); I cared about the well-being of those groups (Concern); and Group goals were more important to me than my personal goals (Team Goal Priority).

Given the focus of my hypotheses on the positive relationship between psychological collectivism and team performance, team-level psychological collectivism was operationalized as the team mean. Utilizing the team mean of composition variables such as psychological collectivism has been supported in the literature (Bell, 2007). In this meta-analytic examination of composition variables effect on performance, the mean operationalization of composition variables consistently yielded stronger relationships with team performance than when operationalized as other descriptive properties such as variability. Cronbach's alphas were .90 for preference, .87 for reliance, .89 for concern, and .91 for goal priority.

Cooperativeness. Cooperativeness was measured with the public the public domain International Personality Item Pool (IPIP) developed by Goldberg

(1998). This instrument has 10 items, each on a 5-point Likert scale ranging from 1(strongly disagree) to 5(strongly agree). Cooperativeness was operationalized as the minimum score within a team. Team minimum operationalizations utilize the lowest team member scores of a particular variable. This team-level operationalization of agreeableness (the factor for which cooperativeness is a subfacet) has been shown to be a strong predictor of team outcomes (Bell, 2007). Cronbach's alpha for cooperativeness was .70.

Video Game Experience. To control for task-related experience (video game playing), team members self-reported the number of hours of video games played weekly. Team video game experience, operationalized as the average number of hours spent playing video games in a team, was used as a control variable. This follows procedures of similar studies utilizing video game simulations in the study of mental models (Resick et al., 2010).

Performance. Following each round in Construct, the program generated performance scores for each team. These scores included number of correct blocks, number of incorrect blocks, and the amount of time taken to complete the task. The task was designed to be difficult, and none of the teams completed the task in the amount of time allotted so team performance will be operationalized as the number of correct blocks assembled.

Results

Assumption Testing

Before testing hypotheses, assumptions of normality, skewness, and kurtosis were examined for all main study variables. Shapiro-Wilks test of

normality was utilized to assess univariate normality. Additionally, normality was assessed by comparing skewness and kurtosis against a standard z-distribution by dividing skewness and kurtosis values by their standard errors (Tabachnick & Fidell, 2007). Variables containing absolute values greater than 1.96 were considered significantly skewed or kurtotic. This examination resulted in the identification of strategy formation, mission analysis, system monitoring, and goal monitoring as non-normal by the Shapiro-Wilks test. Log transformations were applied to strategy formation, mission analysis and system monitoring (Warner, 2008). Goal monitoring was transformed by raising values to the power of ½ (Warner, 2008). Two different transformations were used to accommodate the type of skew present in the variables; while strategy formation, mission analysis, and systems monitoring were significantly positively skewed, requiring a logarithmic transformation, goal monitoring was only moderately positively skewed, thus requiring a square-root correction. Following these transformations, data were not significantly different from normal. The transformed variables were used for all further analyses. Descriptive statistics and correlations are available in Table 1.

For regression assumptions, normality, multicollinearity, influential observations, and heteroscedasticity were examined. Any violations of assumptions and how they were handled are discussed within each specific analysis. Due to the somewhat small sample size, observations were marked as influential if they had a Cook's distance larger than 4/(n-k-1) (Cohen, Cohen, West, & Aiken, 2003). Analyses were run both with and without influential

observations, where applicable. Homogeneity of variance was examined by plotting regression residuals against predicted scores. Goldfield-Quandt tests were conducted on models yielding plots suggesting deviation from predicted scores (Goldfield & Quandt, 1965). All possible controls (Age, Cognitive ability, Video game experience, and Familiarity) were tested for relationships with outcomes. No significant relationships were found so no controls were used in the analyses. Finally, given the small sample size and directional hypotheses an a priori decision was made to test all hypotheses at the $p < .10$ level of significance to increase statistical power.

Table 1

Correlations Between Study Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
1. Mean Reliance												
2. Minimum Cooperativeness	.12											
3. Mean Concern	.28	-.33†										
4. Mean Goal Priority	.09	-.08	0.28									
5. Mean Preference	.48*	-.18	0.25	.10								
6. Strategy Formation	.15	.06	.10	.28	.09							
7. Mission Analysis	-.09	-.15	-.19	-.16	.19	-.10						
8. Goal Specification	-.13	-.18	.12	-.02	.14	-.12	-.25					
9. System Monitoring	-.23	-.09	-.12	-.04	.02	.38†	-.03	.35				
10. Goal Monitoring	-.16	.02	-.08	-.14	-.08	-.03	-.09	.51**	.25			
11. TMM Similarity	-.01	-.01	-.42*	-.19	-.17	-.02	.05	.13	-.05	.07		
12. Coordination	-.01	-.10	.05	.08	.10	-.10	-.13	.28	.21	.01	.16	
13. Performance	-.17	-.03	-.16	.07	.14	.04	-.17	.41*	.18	.19	-.27	-.26

Note. † indicates p <.10; * indicates p < .05; ** indicates p < .01. Correlations are calculated with transformed variables, where applicable. All variables are measured at the team level

Hypothesis Testing

Hypothesis I. The first hypothesis predicted a significant positive relationship between transition processes and TMM similarity. Specifically, it was predicted that mission analysis, goal specification, and strategy formation would have significant positive relationships with TMM similarity. Linear regression was employed to test this hypothesis with TMM similarity as the dependent variable. Results of the regression can be found in Table 2. Due to missing data, only data on 23 of 35 teams were used. The overall model was nonsignificant ($F[2, 20] = .61, p = \text{ns}$) suggesting that transition processes do not predict mental model emergence.

One influential observation was discovered. After examining the data, there was no indication that the observation was due to data collection or calculation error. Analyses were rerun without the influential observation, and the model remained non-significant ($F[2, 19] = .79, p = \text{ns}$). The results of the regression used to test Hypothesis I both with and without the influential observation can be found in Table 2. Therefore, Hypothesis I is not supported.

Table 2

Summary of Regression Results of Transition Processes as Predictors of TMM Similarity

	b	SE	ß	sr^2	r	Model Summary
(Intercept)	0.41*	0.10				
Strategy Formation	-0.02	0.02	-0.17	.03	-.19	
Mission Analysis	0.01	0.02	0.15	.02	.16	
						R^2 = .057
						$F(2, 20) = 0.61$
Without Influential Observations						
(Intercept)	0.47*	0.10				
Strategy Formation	-0.03	0.02	-0.38	.08	-.28	
Mission Analysis	0.00	0.02	-0.02	.00	.04	
						R^2 = .077
						$F(2,19) = 0.79$

Note. *N for full model* = 23; *N for trimmed model* = 22, † indicates $p < .10$; * indicates $p < .05$; ** indicates $p < .01$. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights; SE represents the standard error of the unstandardized regression weights; ß indicates the beta-weights or standardized regression weights; sr^2 represents the semi-partial correlation squared; r represents the zero-order correlation

Hypothesis II-III. The second and third hypotheses predicted that team personality trait composition would significantly predict team transition processes. Specifically, team minimum cooperativeness was predicted to be positively related to team transition processes and team mean reliance was predicted to be negatively related to team transition processes. Linear regression was used to test these hypotheses with strategy formation and mission analysis as

the dependent variables. There were 12 cases of missing data for this analysis, resulting in 23 cases of viable data.

The overall model was non-significant (F [2,20] = 0.03, p = ns), however the presence of two influential observations was discovered. After examining the data, there was no indication that the observation was due to data collection or calculation error. Running the analyses without the influential observations produced a nonsignificant model as well (F [2,18] = 0.04, p = ns). Neither Reliance (ß = -0.01, $p < .05$) nor Cooperativeness (ß = 0.03, $p < .1$) exhibited significant relationships with transition processes. The results are presented in Table 3. Thus, Hypotheses II and III are not supported.

Table 3

Summary of Regression Results of Team Trait Personality Facets as Predictors of Transition Processes

	b	SE	ß	sr^2	r	Model Summary
(Intercept)	6.26**	0.26				
Reliance	-0.01	0.26	-0.01	.00	-.01	
Cooperativeness	0.04	0.27	0.03	.00	.03	
						$R^2 = .001$
						$F(2, 20) = 0.03$
Without Influential Variables						
(Intercept)	6.07**	0.23				
Reliance	0.03	0.26	0.03	.00	.03	
Cooperativeness	0.03	0.23	0.03	.00	.03	
						$R^2 = .002$
						$F(2, 18) = 0.04$

Note. *N for full model* = 23; *N for trimmed model* = 21, † indicates $p < .10$; * indicates $p < .05$; ** indicates $p < .01$. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights; SE represents the standard error of the unstandardized regression weights; ß indicates the beta-weights or standardized regression weights; sr^2 represents the semi-partial correlation squared; r represents the zero-order correlation.

Hypothesis IV. The fourth hypothesis predicted that transition processes would mediate the relationship between cooperativeness and reliance on TMM similarity. Hierarchical regression analyses were utilized to test this hypothesis. Team minimum cooperativeness and team mean reliance were inserted into the regression equation in the first step. This yielded a nonsignificant model (F[2,32] = 0.00, p = ns). Two influential observations were discovered. Running the analyses without these observations still yielded a nonsignificant model (F[2,30] = 1.329, p = ns).

Transition processes were entered in step two of the analyses. Listwise deletion of missing data resulted in removal of 12 observations. This model was also nonsignificant ($F[4,18] = .45$, p = ns). To test for mediation, the process outlined by Koopman and colleagues was utilized (Koopman, Howe, Hollenbeck, & Sin, 2015). This included examining the confidence intervals of Bayesian estimated indirect effects of individual differences (i.e. Reliance and Cooperativeness) on TMM similarity. Regression results are presented in Table 4. Bayesian estimation was conducted with a Markov chain Monte Carlo (MCMC) procedure using 10,000 iterations for each sample. As the confidence intervals all included zero, this suggests a nonsignificant mediation effect. Thus, Hypothesis IV is not supported.

Table 4

Summary of Hierarchical Regression Results of Team Trait Personality and Transition Processes as Predictors of TMM Similarity

	b	SE	ß	sr^2	r	Model Summary
Step 1						
(Intercept)	0.38**	0.01				
Reliance	0.01	0.01	0.10	.01	.10	
Cooperativeness	0.02	0.02	0.27	.07	.27	
						R^2 = .081
						$F(2, 30) = 1.33$
Step 2						
(Intercept)	0.41**	0.10				
Reliance	0.01	0.02	0.11	.01	.07	
Cooperativeness	0.01	0.02	0.15	.02	.16	
Strategy Formation	-0.02	0.02	-0.18	.03	-.19	
Mission Analysis	0.01	0.02	0.15	.02	.16	
						R^2 = .091
						$F(4, 18) = 0.45$

Note. *N for full model* = 33; *N for step 2* = 23, † indicates $p < .10$; * indicates $p < .05$; ** indicates $p < .01$. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights; SE represents the standard error of the unstandardized regression weights; ß indicates the beta-weights or standardized regression weights; sr^2 represents the semi-partial correlation squared; r represents the zero-order correlation.

Hypothesis V. The fifth hypothesis predicted that action processes would positively predict team performance. Specifically, it was predicted that system monitoring, goal monitoring, and coordination would have significant positive relationships with team performance. Linear regression was employed to test

these hypotheses. Due to missing data, five cases were removed from the analyses, resulting in 30 cases of viable data. The overall model was nonsignificant ($F[3,26] = 1.47, p = \text{ns}$).

One influential observation was present. When running the analyses without the influential observation, the overall model remained nonsignificant ($F[3,25] = 2.01, p = \text{ns}$). Thus, Hypothesis V is not supported. The results are presented in Table 5.

Table 5

Summary of Regression Results of Action Processes as Predictors of Performance

	b	SE	ß	sr^2	r	Model Summary
(Intercept)	50.72**	13.20				
System Monitoring	5.42	4.41	0.24	.05	.18	
Goal Monitoring	0.14	0.65	0.04	.00	.12	
Coordination	-0.03	0.01	-0.34	.11	-.29	
						R^2 = .145
						$F(3, 26) = 1.47$
Without Influential Variables						
(Intercept)	34.69*	15.28				
System Monitoring	8.31	4.49	0.34	.11	.34	
Goal Monitoring	0.46	0.65	0.13	.02	.21	
Coordination	-0.02	0.01	-0.23	.05	-.23	
						R^2 = .194
						$F(3, 25) = 2.01$

Note. *N for full model* = 30; *N for trimmed model* = 29, † indicates $p < .10$; * indicates $p < .05$; ** indicates $p < .01$. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights; SE represents the standard error of the unstandardized regression weights; ß indicates the beta-weights or standardized regression weights; sr^2 represents the semi-partial correlation squared; r represents the zero-order correlation.

Hypothesis VI. The sixth hypothesis predicted that TMM similarity would be positively related to team action processes. Due to missing data, five

cases were removed from the analyses, resulting in 30 cases of viable data. Regression analyses yielded a non-significant model ($F[1,28] = 0.10, p$ = ns). Results are presented in Table 6.

Two influential observations were present. Running the analyses without the influential observations yielded a nonsignificant model ($F[1,26] = 0.07, p$ = ns). Accordingly, Hypothesis VI is not supported.

Table 6

Summary of Regression Results of TMM Similarity as a Predictor of Action Processes

	b	SE	ß	sr^2	r	Model Summary
(Intercept)	654.85**	221.19				
TMM Similarity	-178.24	550.77	-0.06	.00	-.06	
						$R^2 = .004$
						$F(1, 28) = 0.10$
Without Influential Variables						
(Intercept)	673.72**	228.26				
TMM Similarity	-153.24	572.57	-0.05	.00	-.05	
						$R^2 = .003$
						$F(1, 26) = 0.07$

Note. *N for full model* = 30; *N for trimmed model* = 28, † indicates $p < .10$; * indicates $p < .05$; ** indicates $p < .01$. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights; SE represents the standard error of the unstandardized regression weights; ß indicates the beta-weights or standardized regression weights; sr^2 represents the semi-partial correlation squared; r represents the zero-order correlation.

Hypothesis VII-X. The seventh through tenth hypotheses predicted that team psychological collectivism composition would be significantly related to team action processes. Specifically, it was predicted that team mean reliance would be negatively related to action processes, while team mean preference, concern, and goal priority would be positively related to action processes. 5 cases of missing data were removed from the analyses. Regression analyses yielded a non-significant model ($F[4,25] = .32$, p = ns). Thus, Hypotheses VII through X were not supported. Results are demonstrated in Table 7.

Table 7

Summary of Regression Results of Team Trait Personality as Predictors of Action Processes

	b	SE	ß	sr^2	r	Model Summary
(Intercept)	592.62**	46.84				
Reliance	24.49	54.06	0.10	.01	.07	
Preference	10.77	51.27	0.05	.00	.06	
Goal Priority	52.77	51.18	0.21	.04	.17	
Concern	-28.12	53.30	-0.11	.01	-.01	
						$R^2 = .048$
						$F(4, 25) = 0.32$

Note. $N = 30$, † indicates $p < .10$; * indicates $p < .05$; ** indicates $p < .01$. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights; SE represents the standard error of the unstandardized regression weights; ß indicates the beta-weights or standardized regression weights; sr^2 represents the semi-partial correlation squared; r represents the zero-order correlations.

Hypothesis XI. The eleventh hypothesis predicted that action processes would partially mediate the relationship between TMM similarity and team

performance. Hierarchical regression analyses were utilized to test this hypothesis. TMM similarity was first entered as a predictor of team performance. TMM similarity positively predicted performance (ß = -.38, $F[1,31] = 5.33$, $p < .05$). Action processes were entered into the second step of the regression equation. Due to listwise deletion of missing data, 5 observations were removed from the analyses. This yielded a significant model ($F[4,23] = 3.20$, $p < .05$). However, only TMM similarity (ß = -.44, $p < .05$) and Coordination (ß = -.35, $p < .10$) significantly predicted performance.

Again, confidence intervals were examined to test for mediation effects. Since the confidence intervals all included zero, this suggests a nonsignificant mediation effect. Thus, Hypothesis XI is not supported. Results are reported in Table 8.

Table 8

Summary of Regression Results of TMM Similarity as a Predictor of Team Performance

	b	SE	ß	sr^2	r	Model Summary
Step 1						
(Intercept)	76.49**	12.00				
TMM Similarity	-72.35*	31.34	-0.38*	.15	-.38*	
						$R^2 = .147$
						$F(1, 31) = 5.33$
Step 2						
(Intercept)	84.38**	18.45				
TMM Similarity	-93.09*	35.19	-0.44*	.20	-.44*	
System Monitoring	5.46	3.77	0.26	.06	.22	
Goal Monitoring	0.17	0.56	0.05	.00	.16	
Coordination	-0.02	0.01	-0.35†	.12	-.28	
						$R^2 = .357$
						$F(4, 23) = 3.20$

Note. *N for step 1* = 33; *N for step 2* = 28, † indicates $p < .10$; * indicates $p < .05$; ** indicates $p < .01$. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights; SE represents the standard error of the unstandardized regression weights; ß indicates the beta-weights or standardized regression weights; sr^2 represents the semi-partial correlation squared; r represents the zero-order correlation.

Hypothesis XII. The twelfth hypothesis predicted that action processes would partially mediate the effect of team personality on performance. Personality variables were first entered into the regression equation. Analyses

revealed a non-significant model ($F[4,30] = 1.21, p = .36$). Two influential observations were found. Running the regression analyses without these observations revealed a significant model ($F[4, 28] = 3.31, p < .05$) and accounted for 32% of the variance in team performance, suggesting that personality trait composition significantly predicts team performance. Team mean reliance (ß = -.58, $p < .05$) and team mean preference (ß = .59, $p < .05$) exhibited significant relationships with team performance. Team mean concern (ß = .19, $p = .50$) and team mean goal-priority (ß = -.18, $p = .31$) were not significantly related to team performance. Results are presented in Table 9.

Next, action processes were entered into the regression equation. The overall model remained significant ($F[7,20] = 2.63, p < .05$). Reliance (ß = -.61) and preference (ß = .60) remained significant predictors of team performance while no other predictors exhibited significant relationships. Confidence intervals were examined to test for mediation effects. All confidence intervals included zero, thus, Hypothesis XII was not supported. Overall, none of the hypotheses were supported.

Table 9

Summary of Regression Results of Team Trait Personality and Action Processes as Predictors of Team Performance

	b	SE	ß	sr^2	r	Model Summary
Step 1						
(Intercept)	53.26**	2.60				
Reliance	-10.23**	3.45	-0.58**	.21	-.25	
Preference	9.92**	3.26	0.59**	.23	.22	
Goal Priority	3.12	2.66	0.19	.03	.12	
Concern	-3.14	2.86	-0.18	.03	-.13	
						$R^2 = .321$
						$F(4, 28) = 3.31$
Step 2						
(Intercept)	60.80**	11.60				
Reliance	-11.48*	4.27	-0.61*	.19	-.35	
Preference	10.33**	3.50	0.60**	.23	.21	
Goal Priority	3.70	3.10	0.21	.04	.12	
Concern	-5.36	3.30	-0.29	.07	-.23	
System Monitoring	3.15	4.14	0.14	.02	.16	
Goal Monitoring	-0.58	0.64	-0.17	.02	.07	
Coordination	-0.01	0.01	-0.18	.03	-.23	
						$R^2 = .479$
						$F(7, 20) = 2.63$

Note. *N for step 1* = 33; *N for step 2* = 28, † indicates $p < .10$; * indicates $p < .05$; ** indicates $p < .01$. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights; SE represents the standard error of the unstandardized regression weights; ß indicates the beta-weights or standardized regression weights; sr^2 represents the semi-partial correlation squared; r represents the zero-order correlation.

Discussion

This study first sought to explicate the relationship between team trait personality composition and TMM development. Hypotheses II and III collectively suggest that team trait personality predicts mental model development. Neither of these hypotheses were supported. Neither team mean trait reliance nor team minimum trait cooperativeness significantly predicted mental model similarity. Although correlations were in the expected direction, none of the relationships reached significance. A potential explanation of these findings could be that lack of relying on others does little to increase the mental model similarity of the team as a whole. That is, less-reliant teams may take more initiative to complete work that needs to be completed, however, completing work may not necessarily lead to the communication of what needs to be done or why, both of which may contribute to other individuals' and, therefore, the group's understanding of the task. Additionally, cooperativeness may not necessarily be a driving factor of mental model similarity. Cooperativeness is associated with approaching tasks with a willingness to assist in task activities (Driskell et al., 2006). Approaching tasks with motivation to help may not, in itself lead to an understanding of the what needs to be done or how, which would increase the team's mental model similarity. Future research should examine these possibilities.

Additionally, Hypotheses I and IV explicate this relationship further by suggesting a mediating effect of transition processes. These two hypotheses were also unsupported as neither goal specification, strategy formation, nor mission

analysis mediated the effect of personality on TMM similarity. Goal specification, mission analysis, and strategy formation are all processes that are related to task relevant information exchange (Marks et al., 2001; Smith-Jentsch et al., 2008; Stout et al., 1999). Thus the lack of relationship between these processes and team mental model similarity is surprising. A possible explanation may be the fact that mental models here were conceptualized as teamwork mental models, that is, members' representation of how team members will work together to achieve goals. Since team transition processes are associated with task relevant information exchange, teams may not be focusing specifying on how members will interact. Future research should examine examine the extent to which team transition processes predict other conceptualizations of TMMs.

Another goal of this study was to address the relationship between team trait personality, action processes, and team performance. Specifically, Hypotheses VII, VIII, IX, and X, predict that team personality traits of reliance, preference, concern, and goal-priority would positively predict action processes, and, subsequently, team performance.

Team personality traits were not strong predictors of action processes. It was hypothesized that teams lower in mean trait reliance would be less comfortable trusting others to complete their tasks and would engage in minimally intrusive activities such as monitoring. Additionally, teams with higher mean trait levels of concern and preference were hypothesized to engage in more monitoring behaviors. Concern and preference are trait personality facets associated with being more affiliative. Affiliative members have been associated

with attending to group interactions and engaging in behaviors such as helping (Driskell et al., 2006; Wageman 1995). Finally, teams with higher mean trait goal-priority were thought to be more committed to achieving and tracking goal progress (Jackson et al., 2006). However, none of the proposed team trait personality variables were significantly correlated with system monitoring, goal monitoring, nor coordination. A possible explanation for the lack of significant findings could lead to alternative interpretations of teams higher in average trait collectivism. As teams increase in overall levels of affiliative trait composition, they may be more likely to trust members and less likely to monitor team behaviors. Future research might examine predictors of team monitoring behaviors.

Further, this study examined the relationship between mental model similarity, action processes, and team performance. Specifically, Hypotheses VI and XI predicted that TMMs would be positively related to action processes and team performance. TMMs were not found to be a significant predictor of team action processes. Additionally, in contrast to the hypotheses, TMM similarity was negatively related to team performance. This finding is particularly troublesome given the consistent positive relationship between mental model similarity and team processes (Marks et al., 2002; Mathieu et al., 2000; Mohammed et al., 2010). When considering the task, teams engaged in a puzzle task that required communication between members that could act (i.e. move blocks) and members that could communicate progress. Thus, an examination of TMM similarity reflects the extent to which a team shares a conceptualization of how members

will interact in their achievement of goals. In light of the findings, explanation may lie in understanding the accuracy of the team mental models endorsed by teams. Though teams may have held similar understandings of member interactions, there is no evidence available to examine whether or not the conceptualizations used by each team represented an effective manner in which to approach the task.

Finally, this study predicted that action processes would explicate the relationship between team trait personality, TMM similarity and team performance. Hypotheses V and XII predicted that action processes would positively predict performance and partially mediate the effects of TMM similarity and team trait personality. Action processes were not significant predictors of performance. Additionally, although TMM similarity was significantly related to team performance, this relationship was not mediated by any action processes. Furthermore, reliance and preference were the only team personality facets found to exhibit a significant relationship with performance. Again, action processes did not mediate these relationships. This suggests that a team's trait personality and maintenance of similar interpretations of how to interact is important for performance but these effects are not explained by the processes of coordination, system monitoring, nor goal monitoring. Future research should seek to understand the mediating mechanisms of TMM similarity, team mean trait reliance and team mean trait preference on performance.

Study Limitations. There were several limitations to the current study that should be noted that may help explain the findings. First, this study may have

been impacted by observed statistical power. In fact, power analyses revealed that observed statistical power ranged from .16 to 1.00. The most often used criterion for power is .8 (Cohen, 1992), higher than the power observed in some of the analyses. There are two explanations for the lack of statistical power: small sample size and missing data. Small sample sizes make analyses less stable and decrease likelihood of finding true effects. Further, missing data compounds this effect as missing data in small samples decreases power even further. A larger sample size would have allowed for more robust calculations and more confident estimates of results. However, it is difficult to conclude whether the lack of findings is solely attributable to a lack of power.

Low power may not be the only explanation for the lack of findings. Other studies examining the effects of individual differences on mental model development were able to find significant relationships (Randall et al., 2011). A main difference between Randall's study and this one is the task. Randall and colleagues presented teams with a task that provided feedback to their decision making. Particularly, teams discussed various options and ultimately came to decisions on how to manage a simulated city. Once these decisions were made, teams were able to see changes in the city and evaluate their strategy or decision making process. Thus, teams were able to adapt their processes and change over the course of the study. The present study did not institute a feedback mechanism for teams. Although teams could track their progress towards goal completion, they were not given feedback that would influence adjustments in their

functioning. Future research would do well to include mechanisms for teams to adjust their strategies over the course of the simulation.

Finally, the use of TMM similarity measurement in this study may serve as an important point of discussion. TMM similarity in this study represents the degree to which members hold similar conceptualizations of how members are to interact with one another. Although the larger study gathered TMM similarity at two time points, this study utilized TMM similarity from one point in time, gathered after the team had completed their performance episodes. Using TMM similarity at one point in time cannot account for the mental model development and updating process that occurs during task completion (McComb, 2007). This suggests that for an uncertain task, such as puzzle completion by members with different roles, understanding team member interactions may change during the team's performance episode. Thus measurement of TMM similarity at one point in time may have limited the ability to draw confident conclusions to the nature of the construct and relationships with other variables.

Practical Implications. In light of the above limitations, this study has tentative implications that can be drawn. Noting the small sample size, however, implications should be taken with caution. Primarily, team average trait collectivism exhibits significant relationships with performance even when accounting for process variables. Given the small sample, the strength of these relationships provides more confidence of their role in team functioning. Thus, teams that are on average less-reliant on other team members yet still maintain an attraction to the group may yield strong performance relationships. Particularly,

this was found for a task that was had an uncertainty. Organizations could consider these qualities of teams when assigning new, abstract, or uncertain tasks to work groups.

An additional implication lies in the counterintuitive finding that mental model similarity was negatively related to team performance. Though this finding should be replicated before being used as a basis for business decisions, it may be a liability for all members to hold similar mental models on uncertain, creative, or novel tasks. Particularly, endorsing similar TMMs that are either inaccurate or not updated throughout a team's lifespan could be detrimental to that team's performance. However, as discussed earlier, it should be noted that only one of two data points of TMM similarity was used in the analyses. Perhaps controlling for earlier measures of similarity would yield different results.

Summary. The current study examined antecedents of both team cognition and performance from the perspective of team trait personality. To further explicate relationships found, team processes were utilized to outline mediating mechanisms. Theory and research concerning team processes, trait personality, and cognition suggest that certain trait personality compositions may lead to effective team processes, cognitions, and subsequently performance. Specifically, it was hypothesized that team trait personality would positively predict TMM similarity. This relationship was hypothesized to be mediated by transition processes engaged in by the team. It was further hypothesized that TMM similarity and trait personality composition would be positively related to team performance, with these relationships mediated by team action processes.

Team trait personality composition did not yield significant effects on TMM development. Additionally, TMMs demonstrated a significant negative relationship with team performance. Finally, team trait reliance and preference were significant negative and positive predictors of team performance, respectively.

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Appendix A

Regression Models

Figure 1: Conceptual model for Hypotheses 1-4

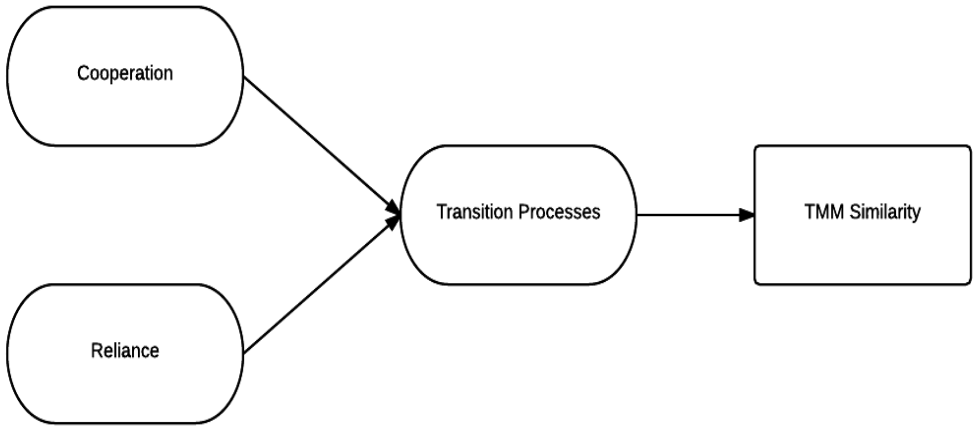
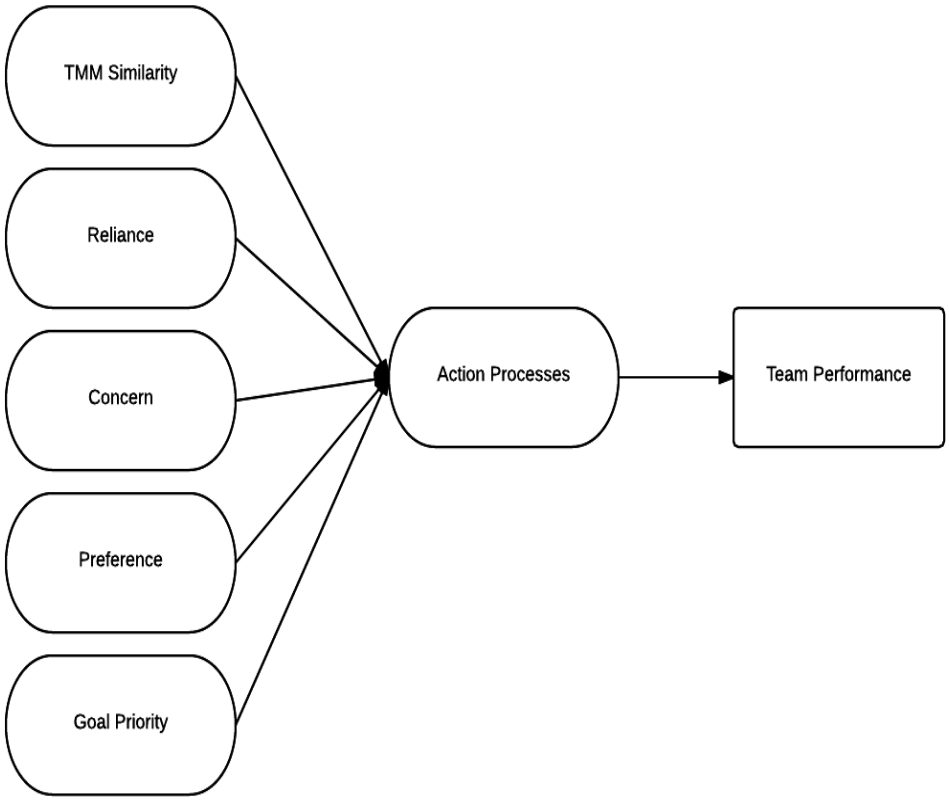


Figure 2: Conceptual model for Hypotheses 5-12



Appendix B

Demographic Questionnaire

1. How old are you? _____

2. What is your gender (check one)?

   - Female
   - Male

3. What is your ethnicity (check one)?

   - African American/Black
   - American Indian/Alaska Native
   - Asian/Pacific Islander
   - Caucasian/White
   - Hispanic
   - Biracial/Multiracial
   - Other

Appendix C

Teamwork Mental Model Measure

On the following pages, you will be presented with pairs of concepts related to TEAMWORK. Your task is to rate how related the concepts in each pair are until all pairs have been rated. Please respond by entering how closely you deem the two concepts in each pair to be related using a 1-9 scale (1 = unrelated and 9 = related).

1	2	3	4	5	6	7	8	9
Unrelated								Related

Teamwork Concepts

1. Working well together.
2. Often disagreeing with each other on issues faced by the team.
3. Trusting each other.
4. Communicating openly with each other.
5. Agreeing on decisions made in the team.
6. Backing each other up in carrying out team tasks.
7. Being similar to each other (for example in personality and ability).
8. Being aware of other team members' abilities.
9. Treating each other as friends.
10. Being a highly effective team.

Appendix D

Psychological Collectivism Measure

Think about the work groups to which you currently belong, and have belonged to in the past. The items below ask about your relationship with, and thoughts about, those particular groups. Respond to the following questions, as honestly as possible, using the response scales provided. (1 = Strongly Disagree to 5 = Strongly Agree).

1	2	3	4	5
Strongly Disagree		Neither Agree nor Disagree		Strongly Agree

1. I preferred to work in those groups rather than working alone. (Preference)

2. Working in those groups was better than working alone. (Preference)

3. I wanted to work with those groups as opposed to working alone. (Preference)

4. I felt comfortable counting on group members to do their part. (Reliance)

5. I was not bothered by the need to rely on group members. (Reliance)

6. I felt comfortable trusting group members to handle their tasks. (Reliance)

7. The health of those groups was important to me. (Concern)

8. I cared about the well-being of those groups. (Concern)

9. I was concerned about the needs of those groups. (Concern)

10. I cared more about the goals of those groups than my own goals. (Goal priority)

11. I emphasized the goals of those groups more than my individual goals. (Goal

priority)

12. Group goals were more important to me than my personal goals. (Goal priority)

Appendix E

Cooperation Measure

For each statement below, indicate how accurately the statement describes YOU. 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 the same age. Please read each statement carefully and respond by filling in the appropriate bubble.

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

1. ____ I contradict others.
2. ____ I hate to seem pushy.
3. ____ I insult people.
4. ____ I love a good fight.
5. ____ I am easy to satisfy.
6. ____ I hold a grudge.
7. ____ I have a sharp tongue.
8. ____ I get back at others.
9. ____ I yell at people.
10. ____ I can't stand confrontations.

Appendix F

Construct task Instructions

Thank you for volunteering to participate in our research study on team behavior. You and four other players will have the task of reproducing a simple picture by stacking colored blocks within a computer game.

Directions for Playing Construct:

Each of you controls an avatar in a virtual arena. Your screen will show you what your avatar can see based on what direction it is facing. A small crosshair shows the center of your field of view. Some people call them "crosshairs".

Things you can see are:

--Other players

--A goal image: this is the picture your team will attempt to reproduce.

--The project platform: this is where your team will stack blocks in order to produce a picture.

--The inventory area: this is where your team finds blocks to pick up.

--The scoreboard: this shows the available time counting down, as well as a score showing how many blocks are in the right place and how many blocks are in the wrong place.

You can move your avatar around the arena by using W (forward), A (left), S (back), or D (right) keys. You can also rotate your avatar left, right, up, and down by moving the mouse to change your view without moving your avatar.

To accomplish the task, your team will need to create a picture by stacking colored blocks on the project platform. You may pick up a block by pressing the left mouse button when the block is in the center of your field of view (and you are close enough to the block). When you are holding a block you can put down a block by pressing either the left or right mouse button. If you are facing the project (and close enough) while holding a block, then a position will light up in the project. If you release the block while the position is lighted up, the block will be placed in that position. Blocks can also be picked up and taken back out of the project.

You are a part of a five-person team. Only two team members will be allowed to use their keyboards and mouse once you have begun to place blocks on the project platform. The other three team members will be limited to using their mouse and therefore can only see with their avatars and cannot move them. It is up to your team to determine which two team members will be allowed to use both the keyboard and mouse. Once time has begun, you can determine which team members will be allowed to use both the keyboard and mouse. You must notify the researcher of your decision before placing the first block on the project platform.

As you place blocks in the project the scoreboard will change to show the number of blocks placed in correct and incorrect positions. The game finishes when the picture has been correctly reproduced, or when the time expires. Performance will be based on how quickly your team creates the picture. Teams that are performing well tend to create a picture in under 10 minutes. In addition, the top three teams with the best performance on the task will receive a bonus payment. The top three teams will receive $100, $75, and $50, respectively.

Appendix G
Coding Instructions

The Coding Task

Your job is to indicate:

1) when a team is engaged in a particular team process by marking the start and stop in Human Coding column of the AVT, and

2) choosing which of Marks et al. (2001) team process dimension the team is engaged in using the drop down box.

Please consider the following GENERAL CODING GUIDELINES:

1) Generally, processes require the verbal/oral interaction of two or more team members. Therefore, a comment is not a process unless another team member responds. Note, however, that Goal Monitoring, System Monitoring, and certain manifestations of Back-Up behaviors (providing corrective/developmental feedback) do NOT require responses.

2) Within a given interaction, ask yourself what the dominant process is. If one team member says something different and/or unrelated during a process, but no one responds, this does NOT substantively change the process.

3) Switch to another process only if the topic substantively changes. It is ok if there are silences. Again, if only one team member says something different during a process, but no one responds, this does not represent a switch in processes. Only when there is a shift in the dominant topic, as represented by the

interaction of at least two team members, does the process change.

4) Do not feel compelled to code every interaction. Only code interactions that are clearly team processes. It is possible for there to be discourse related to the task that does not represent a process.

5) Base your decision regarding process choice on overt conversation, rather than assumptions or conjecture based on individual utterances. In other words, do not assume what team members are doing or thinking, rather base your decision on what they say.

6) Consider whether the team is actively engaged in completing the task (e.g., moving blocks), as this has implication for whether the team is in a transition or action phase.