5-2012

Cognitive Style Diversity in Decision Making Teams

Abby Lynn Mello
amello@utk.edu

To the Graduate Council:

I am submitting herewith a dissertation written by Abby Lynn Mello entitled "Cognitive Style Diversity in Decision Making Teams." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Industrial and Organizational Psychology.

Joan R. Rentsch, Major Professor

We have read this dissertation and recommend its acceptance:

Terry Leap, John Haas, Brent Mallinckrodt

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

Cognitive Style Diversity in Decision Making Teams

A Dissertation Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Abby Lynn Mello
May 2012

Dedication

I dedicate this dissertation to every Industrial and Organizational Psychologist who came before me and therefore made this possible.

Acknowledgements

From my first day as a graduate student Dr. Joan Rentsch has been my advisor. Our relationship has grown immeasurably and she remains the one person I credit most for my degree completion. I thank you Joan, for your patience and assistance… mostly for your patience. I thank my committee members Dr. Terry Leap, Dr. Brent Mallinckrodt, and Dr. John Haas for your valuable input to improve this study.

I wish to thank my parents Dr. John and Sandra Mello for their continuous financial and emotional support. My father's first-hand knowledge of this experience made his advice and guidance precious to me during this process. My husband Michael Richardson has supported me with much laughter and understanding. The Richardson family has been very supportive of both of us through this endeavor. My beloved dog Carly inspired me to make the most of my days even when I only had a blank computer screen to look forward to.

Several fellow graduate students and colleagues helped to not only make this process enjoyable but also provided assistance in collecting the data. Lisa Delise has remained my trusted friend and laboratory mentor since the very beginning. Matt Fleisher, Joshua Bazzy, and Adam Smith are like my brothers. Nancy Scott, Melissa Staniewicz, Nastaran Simarasl, and Iby Wellborn assisted in data collection and in the maintenance of my sanity.

Abstract

Rational and intuitive cognitive styles represent two typical manners of acquiring, organizing, and processing information. Rational style is data-driven, slow, and detailed. Intuitive style is feelings-driven, fast, and global. People have a stable preference for one style over the other and style underlies such processes as decision making (Leonard, Scholl, & Kowalski, 1999). The present study took the perspective that cognitive style is an individual difference upon which members of a decision making team may vary and that diversity in cognitive style is related to team processes and outcomes. Specifically, it was hypothesized that diversity in cognitive style would increase task and affective conflict, lead to lowered similarity of teammate's cognitive representations of task information, but ultimately, improve team performance over that of less diverse teams. Teammate's perspective taking ability was hypothesized as a moderating variable. The hypotheses were tested using three-person teams who completed a complex decision making task in a laboratory setting. Linear regression and hierarchical moderated multiple regression were used to test the hypotheses. No support was found for the hypothesized relationships. One explanation could be that the research context and task deviated too much from past research to be analogous. Several results supported previous research findings. Contributions and future research ideas are discussed.

Table of Contents

List of Tables

List of Figures

Cognitive Style Diversity in Decision Making Teams

Organizations frequently use teams for decision making tasks. A common example is a task force made of individuals drawn together to make decisions about organizational problems (Sundstrom, DeMeuse, & Futrell, 1990). By definition, a team is two or more individuals working interdependently toward a common goal (Guzzo & Dickson, 1996). Therefore, a decision making team can be defined as two or more individuals working interdependently with the goal of making a decision.

There are many reasons why an organization would elect to use teams rather than individuals to make decisions. Teams may be employed when it is believed that in order to produce the highest quality solution multiple perspectives on the problem are needed (Guzzo & Dickson, 1996). Alternatively, one person may not hold all of the requisite knowledge or expertise to most effectively render a decision for a complex problem (Scholten, van Knippenberg, Nijstad, & DeDreu, 2007). The adage "two heads are better than one" sums up the notion that teams of individuals have the capability to make higher quality decisions than individuals working alone (Guzzo & Dickson, 1996).

Many factors contribute to the success or failure of teams. A simplistic way to understand the complexity of teams is to think of them in terms of the Input-Process-Output (IPO) model (Hackman, 1987). This model outlines three interrelated aspects of teams and performance. Inputs are initially existing aspects of the team. These could be individual team member characteristics, organizational resources, or the team's task. Processes are the transformation of inputs that ultimately produces the team's outputs. Processes include coordination, conflict, or the development of team cohesion. Outputs (also called outcomes) are the result of the team's

processes and can be the team's product, such as a final decision in a decision making team, or other outcomes such as team viability, trust, or satisfaction with the team's performance.

The present study is focused on a single individual difference input and its effects on team processes and outcomes. The specific individual difference of interest is cognitive style. This is relevant to decision making teams because cognitive style is the manner in which individuals gather and assess information. When applied in a decision context it can be defined as "…the learned, habitual response pattern exhibited by an individual when confronted with a decision situation. It is not a personality trait, but a habit-based propensity to react in a certain way in a specific decision context..." (Scott & Bruce, 1995, p. 820). On a team, each member will bring to the team his or her own "habit-based propensity." This will interact with the other teammate's cognitive styles and with other input variables to produce team processes. These processes will then result in a final decision or outcome.

Teammates may enter the decision making scenario with cognitive styles that are similar or dissimilar to the other team members. The team composition and diversity research suggests that the extent to which teammates are similar on such individual characteristics will affect team processes and outcomes. Although team diversity is not a nascent area of study, the research on cognitive style diversity in teams is sparse and empirical work is almost non-existent. The effects of cognitive style diversity on teams are unknown. Therefore, the goal of the present study is to determine how cognitive style diversity affects decision making teams' processes and outcomes. Specifically, cognitive style diversity was expected to influence team member conflict, performance, and the team's ability to develop cognitive congruence regarding the task. The present study will contribute to at least two areas of research and will represent an initial attempt to bridge the two streams empirically. First, it will extend the cognitive style research by going

beyond the individual level to assess cognitive style at the team level. Second, it will answer calls in the team diversity literature to move beyond demographic diversity toward cognitive types of diversity (van Kippenberg & Schippers, 2007), and to move beyond proxy measures of underlying diversity (such as using nationality as a proxy measure of value differences) toward more direct measures. The following review will therefore cover the construct and relevant findings associated with cognitive style and also the literature on team composition/diversity. It will conclude with hypotheses specific to cognitive diversity effects on decision making teams.

Cognitive Style

In the past few centuries, advances in scientific theory and practice have been able to show that individuals differ in the way they gather and process information (Robey & Taggart, 1981) and the term "cognitive style" has been used to label such differences. Cognitive style has received theoretical attention in the education, career, and management literatures (Kozhevnikov, 2007). The construct has been popularized by recent interest in the role of "intuition" in managerial decision making (Sadler-Smith, 2004) and with the notion that it may be useful as a selection or placement tool. Research on cognitive style is of value to organizations due to its conceptual distinction from cognitive ability, the notion that cognitive styles may differ in their applicability to various problems, and the possibility of creating teams with an optimal mix of styles for particular organizational needs. The following review will offer a definition of cognitive style including its dimensions, review relevant measurement techniques, and discuss literature findings.

Cognitive Style Construct

The cognitive style construct has been of interest to researchers for decades (Robey & Taggart, 1981). It has been found to influence turnover when a misfit between style and the

demands of the job are present (Chan, 1996). Differences in cognitive style have been related to leader-member exchange relationships (Allinson, Armstrong, & Hayes, 2001), team leader behavior (Armstrong & Priola, 2001), teaching style (Evans, Harkins, & Young, 2008), entrepreneurship characteristics (Kickul, Gundry, Barbosa, & Whitcanack, 2009), decisiveness (Hough & ogilvie, 2005), and risk assessment in decision making (Henderson & Nutt, 1980).

It has been described using a several typologies [e.g., Adaptors- Innovators (Kirton, 1976); Convergers, Divergers, Assimilators (Kolb, 1976); Sensing-Feeling, Thinking-Perceiving (Jung, 1971)] but there is considerable consensus on several points. Most researchers agree that cognitive style is stable within person and that it refers to how individuals acquire and process information (Kozhevnikov, 2007). For example, Allinson and Hayes (1996) defined cognitive style as being a stable characteristic associated with how people process and organize information. Similarly, Rayner and Riding (1997) defined "…cognitive style as a person's typical or habitual mode of problem solving, thinking, perceiving and remembering" (p. 6). Ruble and Cosier (1990) noted, "the term "cognitive styles" has been used in a generic sense to refer to individual differences in the way people process information to make decisions" (p. 283). Cognitive style also encompasses information gathering approaches in addition to information *processing* (Vance, Groves, Paik, & Kindler, 2007). That is, cognitive style influences the type of data attended to and preferred. Leonard, Scholl, and Kowalski (1999) suggested that these cognitive differences also influence judgments and ultimately decision making behavior. The definition of cognitive style used in the present study represents a synthesis of these ideas. Cognitive style is defined here as:

> *Cognitive style is an individual's typical manner of acquiring, organizing, and processing information. It is habitual, relatively stable across time and situations, influences preferences, and underlies behavior including decision making.*

Measurement. In an early review of the measurement techniques used in the cognitive style literature, Robey and Taggart (1981) identified several methods. They categorized these methods as being *physiological* such as electroencephalograms (EEG) and skin conduction tests, *behavioral* such as time required to complete a task, eye-movements, and trained observer ratings of behavior, and *self-reported* style. Self reported style is one of the most popular methods for assessing cognitive style because of the inherent difficulties associated with the other methods. For example, it is cumbersome and expensive to assess a large number of individuals' brain waves with an EEG. Similarly cumbersome to administer are timed assessments or measures that must be sent for proprietary scoring. Thus, many researchers have attempted to create paper-and-pencil measures with straight-forward scoring systems to assess cognitive style.

Among the instruments designed or used to measure cognitive style in a self-report format are: the Linear Nonlinear Thinking Styles Profile (LNTSP; Vance et al., 2007), the Judgment and Perceptions scales of the Myers-Briggs Type Indicator (e.g., Hough & ogilvie, 2005; Ruble & Cosier, 1990), Embedded Figures Test, Minnesota Multiphasic Personality Inventory, Kolb's Learning Style Inventory (see Robey & Taggart, 1981), Kirton's Adaptation-Innovation scale (Chan, 1996), Problem Solving Styles Questionnaire (Tepper, Tetrault, Braun, & Romero, 1993), and in an attempt to integrate previous work and to develop a measure that could be used in a managerial context, Allinson and Hayes's (1996) Cognitive Styles Index (CSI).

Due to the number of measures used to assess cognitive style, several attempts have been made to uncover the relationships between the measures to determine their construct validity (Allinson & Hayes, 1996; Tepper et al., 1993; Vance et al., 2007). Some studies have shown that

the measures correlated in expected ways. For example, linear thinking from the LNTSP was positively correlated with higher rational thinking scores on the CSI (Vance et al., 2007). However, other studies have found mixed support for hypothesized relationships (Tepper et al., 1993). Differences between the measures on such features as context specified in the directions and response format may be partially responsible for the lack of stronger interrelationships between measures.

Despite somewhat mixed empirical support, several researchers have argued that overlap exists in the various conceptualizations of cognitive style and that on the whole, many are consistent with the dual-brain (left-right hemisphere) concept (Hayes & Allinson, 1994; Ridding & Cheema, 1991; Sadler-Smith, 1998). This is a general theory of cognition suggesting that the two hemispheres of the brain (right and left) contribute differently to the way people process information and that people inherently favor one side over the other. It has typically been discussed as the idea that people have a tendency toward being right-brained or intuitive versus left-brained or analytical (Robey & Taggart, 1981). Based on these arguments and on some of the above findings suggesting overlap in cognitive style measures (Allinson & Hayes, 1996; Vance et al., 2007), the present study was based on the position that there are two basic cognitive styles (intuitive and rational), that most people tend to prefer one over the other, and that the preferred style affects information acquisition and processing.

Intuitive style. Right-brain driven information processing has been referred to as "intuitive", "holistic", and "non-linear." In general, this style of thinking has been described as being based on internal feelings, a big-picture approach, low amounts of external data gathering, and fast, intuition-based decision making. For example, Hough and ogilvie wrote, "Intuitive processes are fast, associative, and use low-effort heuristics." (p. 426, 2005). Allinson and Hayes

(1996) noted that left-brained or intuitive terminology, "…refers to immediate judgment based on feelings and the adoption of a global perspective" (p. 122). Vance et al. (2007) stated, “Holistic in nature, intuition is often the result of an automatic and unconscious assessment of the interrelated parts of a nonlinear system that scans the integrated “big picture” to point to appropriate decisions and new directions, rather than getting delayed and lost in the detailed analysis of a huge set of data” (p. 169).

In a study of self-managed work teams, it was found that intuitives, relative to rationals, were more often selected as the leader by team members. Additionally, the intuitive leaders, as compared to the rational leaders, initiated more socio-emotionally oriented and task-oriented acts (Armstrong & Priola, 2001). Intuitives were found to have higher entrepreneurial self-efficacy for intentions toward entrepreneurship and identifying entrepreneurial opportunities than rationals (Kickul et al. , 2009). Intuitive style has also been found to predict innovativeness whereas an analytic style did not (Scott & Bruce, 1995). Furthermore, those with a style favoring internal information sources and a non-linear processing approach (right-brain) were more likely to report that they use emotions to facilitate thinking (Groves & Vance, 2009).

Rational style. Left-brained led information processing, on the other hand, has been called “analytic”, “rational”, and “linear.” In general, it is characterized by a thorough search for facts and data, deliberate, logical information processing, and a focus on problem details when decision making. For example, Hough and ogilvie (2005) described “Analytical processes…are slow, rule-based, and depend on high-effort systematic reasoning” (p. 426). Allison and Hayes (1996) stated that right-brained, rational thinking "…refers to judgment based on mental reasoning and a focus on detail" p. 122. Moreover, Vance et al. (2007) defined “linear thinking

style as a preference for attending to external data and facts, *and* processing this information through conscious logic and rational thinking…" (p. 170, italics in original).

In a study of school teachers rational/analytics had a teaching style that focused more on structure, rules, organization, planning, and rational thought than on individuality, inter-personal, or social elements (Evans, Harkins, & Young, 2008). Rational thinkers were found to have higher entrepreneurial self-efficacy for planning, marshalling resources, and implementing activities than did intuitives (Kickul et al., 2009). Having a rational style was found to predict an internal locus-of-control (Scott & Bruce, 1995). Rationals were found to prefer work environments with structure, routine, and logic (Allinson & Hayes, 1996). Furthermore, those with a style favoring external sources of data and a linear processing approach (left-brained) reported higher abilities to regulate their emotions than did those with an intuitive style (Groves & Vance, 2009).

Cognitive Style and Influences on Decision Making

As mentioned above, and in the definition of cognitive style for the present study, cognitive style influences decision making (Leonard et al., 1999; Ruble & Cosier, 1990). Because cognitive style affects information gathering, organization, and processing, and influences perceptions and judgment it affects an individual's decision making approach. For example, when attempting to acquire information relevant to making a decision, cognitive style affects the amount of time spent gathering data, the type of information attended to, and the amount of information deemed necessary for a full grasp of the issue (Scott & Bruce, 1995; Vance et al., 2007). Cognitive style will be associated with organizing and processing the acquired information in a global, holistic way, versus a compartmentalized and detailed way (Allinson & Hayes, 1996; Hough & ogilvie, 2005; Vance et al., 2007). Cognitive style is also purported to determine partially the number of alternative solutions generated to solve a problem

and/or the number of alternative options considered for a decision (Scott & Bruce, 1995). Also, the speed with which a final solution is adopted has been attributed to cognitive style (see Robey & Taggart, 1989). Therefore, differences between individuals' in their cognitive style should also manifest in the way they make decisions.

Summary. Cognitive style represents an underlying approach to gathering, organizing, and processing information. Two styles: rational and intuitive are the focus of the present study. People inherently prefer using one style over the other and this tendency is relatively stable across situations and over time. Additionally, cognitive style underlies everyday perception and judgment, and, therefore, it also influences behavior including decision making. The aim of the present study was to examine the relationships between cognitive style *diversity* and team processes and outcomes. Although little empirical research has been conducted in the area of cognitive style diversity, research has investigated other types of diversity in teams. This body of literature is helpful in understanding the general effects of various types of diversity on teams and contributes to a framework for hypothesizing the effects of cognitive style diversity on decision making teams.

Cognitive Style Diversity in Teams

There is a lengthy history of research investigating the effects of various types of diversity on work teams (Horwitz & Horwitz, 2007; Webber & Donahue, 2001). Recently researchers have called for investigations into the effects of cognitive types of diversity in teams (van Kippenberg & Schippers, 2007). Sadler- Smith (1998) recognized the importance of considering cognitive style in a team context and stated that little is known about how members with different cognitive styles will interact. Specifically, elements to consider include how cognitive style diversity will affect conflict, interpersonal relationships, problem solving

effectiveness, and the ability to reach a consensus. Some researchers (Hough & ogilvie, 2005) have suggested that although diversity in cognitive style will lead to interpersonal difficulties, it will ultimately lead to improved performance. To date, there are few studies investigating the effects of cognitive style diversity in teams.

Volkema and Gorman (1998) found no clear effects of cognitive style diversity on decision making teams using the Winter Survival task. In a small sample (three teams) Priola, Smith, and Armstrong (2004) found relationships between cognitive style diversity and outcomes. Specifically, the homogenous intuitive team took a "feeling" approach, did not get the correct solution, but had high cohesiveness. The homogenous rational team took an organized approach, found the correct solution, and the members were satisfied with the team's interactions. Furthermore, the heterogeneous cognitive style team was unsatisfied with its process, found the correct solution, but some members were displeased with the decision of the group. Other researchers have similarly suggested that high cognitive style diversity teams would suffer interpersonally but would outperform homogenous teams. For example, Hough and ogilvie (2005) stated, "…team member cognitions may interact … to create a balance of complementary styles resulting in a more robust approach to decision making" (p.443).

The small body of research specifically addressing cognitive style diversity in teams provides little direction for forming hypotheses in the present study. However, the extensive literature on team composition/diversity in a more general sense can offer guidance. By organizing the literature on diversity in teams, it is possible to show how cognitive style diversity may affect teams in ways similar to other, related types of diversity. Therefore, the next section will offer a framework for organizing the broad diversity literature and suggest a place within that framework that cognitive style diversity fits. Then, the findings on analogous types of

diversity will be reviewed in an attempt to inform hypotheses regarding cognitive style diversity. Specific hypotheses regarding conflict, the development of schema congruence, and performance will be advanced.

Diversity in Teams

The study of diversity's effects on teams is complex because diversity can be conceptualized in myriad ways. Furthermore, the expected relationships between diversity and team processes and outcomes are dependent upon how diversity is conceptualized. For this reason, researchers have offered typologies to differentiate types of diversity and to facilitate understanding of how diversity affects teams (Pelled, 1996; Williams & O'Reilly, 1998). Figure 1 provides a summary of the frameworks that have been advanced for categorizing diversity variables and the direction of relationships that would be expected between different types of diversity, conflict, and the development of schema congruence. The purpose of this section is to categorize cognitive style diversity as a function of established typologies, to review the literature available for types of diversity which are parallel to cognitive style, and to extrapolate from those findings, hypotheses for the effects of cognitive style diversity on team conflict and schema congruence.

Figure 1 shows two primary distinctions between types of diversity. Along the vertical axis, diversity is conceptualized as being either "surface" or "deep" level (Pelled, 1996). This typology focuses on the extent to which a diversity variable is readily apparent. Examples of surface level diversity types are sex, age, and race. Examples of deep level diversity types are values, knowledge, and personality. The horizontal axis of Figure 1 displays task relevance as a second distinction between types of diversity. This categorization focuses on the extent to which the type of diversity under consideration is pertinent to the team's task. For example, on a surgical team, expertise diversity is more germane to the task than is diversity of religious

affiliation. On a military team, tenure diversity may impact the team more than would racial diversity.

When visibility (surface or deep) and task relevance are crossed, four quadrants are produced. Where the type of diversity falls on these axes determines the general theory of diversity that is most applicable. Based on the theoretical perspective that is most applicable, different effects on processes and outcomes can be expected. Two primary theories of the effects of diversity on teams are also shown in Figure 1 (denoted with the dotted line). *Social categorization* is a theory that suggests people judge others by placing them into various groups depending on their characteristics. People then evaluate the similarity of others to themselves based on these groupings (Horwitz & Horwitz, 2007; Williams & O'Reilly, 1998). Social categorization effects are expected to be strongest when the type of diversity is more "surface" in nature (Horwitz & Horwitz, 2007) likely be relatively irrelevant to the team's task.

As the type of diversity becomes closer to the lower left quadrant of Figure 1, the *informational/decision-making* theory becomes more applicable. In general, this theory states that types of diversity which are deeper in level and more relevant to the task, create a team with a greater pool of resources from which to draw when making decisions and solving problems. The theory argues that for such tasks as decision making, having diversity on deep, task relevant aspects such as knowledge, education, and perspectives will ultimately lead to higher performance than teams homogenous on such aspects (Horwitz & Horwitz, 2007; Williams & O'Reilly, 1998). Cognitive style diversity is applicable to the information/decision-making perspective of diversity for two reasons. First, it is a deep level difference because people cannot readily detect the cognitive style of others. Second, it is task relevant because in decision making, the manner in which an individual typically gathers, organizes, and processes

information has implications for the decision outcome. Because little empirical research has been conducted on cognitive style diversity, research on other diversity factors that also fit into the same categorization as cognitive style (i.e., the informational/decision-making perspective) will be reviewed. The next section will review the diversity literature relevant to the variables depicted in Figure 1 and hypotheses are presented.

Conflict. Two types of conflict are presented in Figure 1: affective and task. Types of diversity that evoke social categorization effects have been consistently posited to produce conflict that is affective in nature (Pelled, 1996; Williams & O'Reilly, 1998). Also called "relationship," "interpersonal," and "emotional" conflict, affective conflict reflects frustration with interpersonal compatibilities, irritation, annoyance, and/or general negative emotions toward teammates (Jehn, 1997). Empirical research has supported the notion that the types of diversity that elicit social categorization effects lead to affective conflict (Jehn, Northcraft, and Neale, 1999; King, Hebl, & Beal, 2009; Pelled, Eisenhardt, & Xin, 1999). In contrast, the type of conflict posited to result from diversity relevant to the information/decision-making perspective is task conflict (Pelled, 1996). Whereas affective conflict focuses on interpersonal incompatibilities, task conflict is defined as disagreements with regard to viewpoints, opinions, and ideas about the task content (Jehn, 1995). Numerous studies have supported the notion that deep level, task relevant types of diversity result in task conflict. For example, diversity in work experience, educational background (Zellmer-Bruhn, Maloney, Bhappu, & Salvador, 2008), informational background (Jehn et al., 1999), and functional background (Pelled et al., 1999) have all been found to lead to task conflict.

Because cognitive style is task relevant for a decision making team and also deep level, it should be related to task conflict. A decision making team might experience task conflict related

to how to approach or organize the task information, evaluate the importance of information, or generate solutions or ideas. Diversity in cognitive style should cause members of the team to attempt to approach the task in different ways. For example, an intuitive team member might disagree with a rational member's desire to evaluate thoroughly each piece of information when the intuitive member feels the solution is already clear. Likewise, a rational member might be skeptical of an intuitive member relying on his or her hunches and feelings regarding the task. Therefore, we would expect increased cognitive style diversity to be associated with increased conflict about how to approach the task.

H1a: There will be a positive linear relationship between cognitive style diversity and task conflict.

Although the diversity literature points to cognitive style diversity being primarily related to task conflict, distinctions between the two facets of conflict are not always clear. In many cases researchers have found that task and affective conflict are related. For example, Jehn et al. (1999) found that value diversity was related to both task and affective conflict. In a study by Pelled et al. (1999), although functional background diversity predicted task conflict and the demographic diversity variables (race and tenure) predicted affective conflict, there was a significant positive relationship between the two types of conflict. Therefore, although the two types can be statistically separated (e.g., with confirmatory factor analysis) there does appear to be a considerable interrelationship between them. To illustrate, a recent meta-analysis found an overall correlation of .54 between task and affective conflict in teams (De Drue & Weingart, 2003). It is suspected that the reciprocal relationship between conflict types is due to members' inability to separate mentally criticisms of ideas and approaches (task conflict) from personal criticisms (affective conflict). As teammates disagree about how to approach the task, these

incompatibilities may bleed into interpersonal feelings. In summary, although surface level, task irrelevant types of diversity primarily cause affective conflict and deep level, task relevant types of diversity primarily cause task conflict, the two types have consistently been shown to be positively related. Due to the high correlations found between task and affective conflict, it is also hypothesized that increased cognitive style diversity will be associated with increased affective conflict.

H1b: There will be a positive linear relationship between cognitive style diversity and affective conflict.

Development of schema congruence. Figure 1 shows that as the type of diversity becomes closer to the lower left quadrant, teams are expected to have greater difficulty developing schema congruence. Schemas are mental representations of information and ideas. Similarity or *congruence* can be said to exist among team members when there is substantial overlap in the content and organization of these mental representations (Rentsch & Hall, 1994). It has been suggested that types of diversity which apply to the informational/decision-making perspective impede team members' ability to develop congruence in the way they understand the task and task information. Clark, Anand, and Roberson (2000) stated, "…the same diversity that enriches the availability of multiple viewpoints may create difficulties in arriving at shared meanings" (p. 212). Cronin and Weingart (2007) suggested that diversity in such factors as knowledge, values, or norms, cause team members to hold differing views of how to approach the same problem. Due to such differences, team members may attend to and encode different aspects or pieces of information regarding the problem. Empirical research has supported these notions. Deep level, task relevant diversity variables such as diversity in educational background

(Rentsch & Klimoski, 2001) and mental ability (Edwards, Day, Arthur, & Bell, 2006) have been found to be related to lower schema congruence.

In general, the information/decision-making perspective on diversity suggests that differences in deep level, task relevant variables will ultimately be positive for the team's performance by bringing a variety of unique perspectives to the decision. However, it appears that these differences in perspective also cause difficulty communicating and integrating information to solve problems (Millikan & Martins, 1996). Communicating about unique perspectives and combining information into new ideas are some of the types of team processes which have been shown to lead to higher schema congruence (Mello, Rentsch, Delise, Staniewicz, & Letsky, 2009). Research and theory has substantiated the notion that types of diversity relevant to the informational/decision-making perspective have these effects on these types of team processes. For example, Dose and Klimoski's (1999) work on value diversity suggested teams with differing values will have more difficulty reaching consensus due to decreased desire to incorporate other's information and views into their own interpretation of the decision. Gebert, Boerner, and Kearney (2006) suggested functional diversity will impede team members from engaging in "synergistic communication", defined as the extent to which members' diverging positions are specified and recombined into new solutions, due to decreased ability and desire to share ideas. Empirical results follow from these theories. For example, differences in knowledge and experience created difficulty between team members in communication and understanding each other, and was found to relate to low amounts of information sharing within the team (Bunderson & Sutcliffe, 2002). Educational background diversity had a negative linear relationship with the team's ability to integrate task information (Dahlin, Weingart, & Hinds, 2005). In summary, when teams are diverse with respect to deep

level, task relevant variables such as knowledge, values, or cognitive style, their ability to perform such processes as sharing and integrating task information is impeded, which ultimately increases the difficulty for members to develop similar schemas.

Cognitive style diversity would be expected to interfere with members' ability to develop similar schemas for several reasons. When people differ in the way they assess, organize, and process information, they will differ in their overall interpretation of that information. They may differ in what they see as important or relevant, and how they cognitively categorize the information. This will create difficulty in communicating about the task and inhibit team members' ability to relate similarly to the information and task. The present study addressed cognitive style diversity effects on *task* schema congruence. Therefore, the focus was on similarity between team members' schemas about the task information.

H2: There will be a negative linear relationship between cognitive style diversity and the development of task schema congruence.

Performance. The primary tenant of the informational/decision-making perspective on diversity is that diverse teams are expected to increase performance over that of homogenous teams because the overall pool of resources is greater (Horwitz & Horwitz, 2007; Williams & O'Reilly, 1998). On a decision making team, diversity on deep level, task relevant variables should produce a team with various viewpoints, perspectives, and approaches to the decision. This should create a scenario where the team takes a robust approach to the task and ultimately has better performance outcomes than would a homogenous team. Research on other deep level, task relevant diversity factors have been shown to improve certain performance metrics (Pelled, 1996). For example, Jehn et al. (1999) found that when tasks were complex, such as decision making tasks, informational diversity predicted performance. Rodriguez (1998) found that when

teams were charged with a task requiring them to identify, evaluate, and implement a solution to organizational issues, value diversity predicted the performance metrics of creativity and effectiveness. Additionally, personality diversity in teams has been found to predict customer satisfaction and task completion (Neuman, Wagner & Christiansen, 1999). Results of the Neuman et al. (1999) study supported the *complementary* model of diversity. This viewpoint suggests that differences between members fit together such that the full spectrum of the diversity variable is realized on the team. In short, "… each member adds unique attributes that are necessary for the team to be successful" (Neuman et al., 1999, p. 31).

Cognitive style diversity will increase overall differences in approaches to the task. This should create a larger pool of ideas and perspectives and ultimately lead to improved performance over that of homogenous teams. Conversely, homogenous teams might be expected to lack enough differences in approach to have a well-rounded set of perspectives on the decision. For example, a homogenous intuitive team might quickly agree on a course of action, but fail to consider fully all the available information. In contrast, a homogenous rational team might become so caught up in the details of the information that they become stagnant in generating new ideas, or fail to see the larger picture. It is in this way that having diversity in cognitive style will create a complement of opinions on how to perform the task, allowing for a more robust approach to the decision and ultimately, better performance (Hough & ogilvie, 2005).

H3: Cognitive style diversity will have a positive linear relationship with performance.

Perspective Taking as a Moderator

In an attempt to capture aspects of team dynamics beyond those influenced by cognitive style diversity, an additional variable was proposed as a moderator. Perspective taking has been

identified as an individual difference variable that can affect decision making teams (Kemp & Smith, 1994; Falk & Johnson,1977; Johnson, 1977). It has been found to influence information exchange, understanding of others' information, and conflict type. Next, perspective taking is defined, relevant empirical findings are reviewed, and hypotheses for moderated relationships are presented.

Perspective Taking.

"Perspective taking may be defined as the cognitive process of putting oneself in the place of another and understanding how the other thinks about a problem" (Falk & Johnson, 1977, p. 64). Often studied in the negotiation literature, higher self-reported perspective taking has been linked to decisions that are more beneficial to both sides than deals brokered between individuals with lower perspective taking (Galinsky, Maddux, Gilin, &White, 2008; Kemp & Smith, 1994). This was found to be true for not only mean dyad-level perspective taking but also for the perspective taking ability of only one team member in a key role (Galinsky et al., 2008). Perspective taking has been theorized to relate to non-egocentric behavior that subverts one's own desires to those of the greater group (in this case the team) (Davis, 1983). Furthermore, this ability should lead to "smoother and more rewarding interpersonal relationships" (p. 115).

Perspective taking has also been studied with respect to conflict style and type of conflict (e.g., Falk & Johnson, 1977). In a study of conflict style with close friends and family, Rizkalla, Wertheim, and Hodgson (2008) found that the ability to take another's perspective was associated with positive styles of conflict. Specifically, high perspective takers, more often than low perspective takers, elected to use conflict styles that focused on finding mutually satisfying solutions rather than focusing solely on their own interests.

Perspective taking and conflict has also been studied in work teams. Higher mean team-level perspective taking in nursing teams was related to perceptions of conflict as task-oriented

rather than as relationship-oriented (Sessa, 1996). Thus, perspective taking may alter the relationships between cognitive style diversity and task and affective conflict. Taken together, this evidence suggests that the willingness and ability to take another team member's perspective on the problem might heighten the benefits of task conflict while minimizing the damage that may be caused by affective conflict.

Task and affective conflict have different effects on team outcomes. When a team is engaged in a non-routine task, task conflict has been suggested to have a positive effect on team performance and affective conflict, a negative effect (De Dreu & West, 2001). These relationships have been found to hold true for decision making tasks (De Drue & Weingart, 2003). Because perspective taking has been shown to alter conflict styles (Rizkalla et al., 2008), it would be expected to enhance conflict that is beneficial to team outcomes (task conflict) and decrease conflict which may be detrimental to team outcomes (affective conflict). Specifically, the ability to see the task from others' perspectives should increase discussions of various viewpoints and reasons behind differences of opinion, and generally assist members in exposing their task-related conflicts. At the same time, perspective taking should allow members to perceive disagreements as purely task-oriented and not as interpersonal attacks (Sessa, 1996). Thus, perspective taking should increase the positive effect of cognitive style diversity on task conflict and decrease the positive effect of cognitive style diversity on affective conflict.

H4a: Perspective taking will moderate the relationship between cognitive style diversity and task conflict such that the positive relationship will be stronger under conditions of high perspective taking than it will be under conditions of low perspective taking.

H4b: Perspective taking will moderate the relationship between cognitive style diversity and affective conflict such that the positive relationship will be weaker under conditions of high perspective taking than it will be under conditions of low perspective taking.

Perspective taking has also been found to influence information exchange and understanding of others' information. For example, perspective taking was found to increase performance in negotiation tasks where full disclosure of information was crucial to achieving high joint profits (Kemp & Smith, 1994). Falk and Johnson (1977) found that higher proportions of perspective taking behaviors in groups led to higher quality interactions about task information and increased cooperation between members. Similarly, Johnson (1977) found that teams instructed in perspective taking created higher quality problem solutions and viewed more favorably their teams' information exchange than did teams using other interaction styles. Furthermore, Johnson found that people in the perspective taking condition perceived their team as more helpful in presenting information, as more accurately understanding their information, and as valuing their information and views more than did members of other conditions. Finally, perspective taking behaviors such as inquiring about the reasoning for others' preferences, accepting others' viewpoints as legitimate, and incorporating others' perspectives into one's own interpretation have been found to increase cognitive congruence in diverse perspective teams (Mohammed & Ringseis, 2001). Because it has been shown to influence understanding of another's information and ideas, perspective taking would be expected to reduce the negative effect of cognitive style diversity on the development of task schema congruence.

H4c: Perspective taking will moderate the relationship between cognitive style diversity and task schema congruence such that the negative relationship will be weaker under conditions of high perspective taking than it will be under conditions of low perspective taking.

Method[1]

Participants

The sample consisted of 126 University of Tennessee psychology undergraduate students assigned to 42 three-person teams. One team was unable to complete the task due to equipment malfunction. These participants were included in analyses of individual-level variables but were excluded from analyses of team-level variables. The sample was 48.4% female, 79.4% Caucasian, with an average age of 19.3 years, and 94.4% were born in the United States. Eighty-five percent were lower classman (freshman or sophomore). Twenty-nine percent reported holding a job at the time of their participation. All of those who reported holding a job worked less than full-time and 75% reported their job was one of convenience rather than career-oriented. Participants were recruited using the online Human Participants in Research (HPR) system. This system allows students to view a description of current studies being conducted at the University of Tennessee and to sign up to participate in the study of their choice. Participants received $20 and course credit for participating.

Task

The task was a simulated military non-combatant rescue mission which required teams to plan the evacuation of stranded civilians from a combat area. The task was developed with the use of Navy SEALs and the materials included an optimal rescue plan (Biron, Burkman, & Warner, 2008). Each team member received general background information (e.g., number of available troops) that was held in common by all members. Additionally, members were randomly assigned unique role-specific information regarding weapons (e.g., artillery specifications), intelligence (e.g., U.S. military locations), or environment (e.g., tide levels, fauna). Each team member's unique information was only meaningful in relation to the other members' unique information and to the general information. Therefore, the optimal plan could be achieved only if members shared and integrated common *and*

[1] Portions of the following section were adapted from Rentsch, Delise, Salas, and Letsky (2010).

unique information. Teams were allowed one hour for virtual discussion of the task including designing and recording their rescue plan (Biron et al., 2008).

Measures

Cognitive style. In order to determine the most appropriate measure of cognitive style for use in the present study, a pilot study was conducted to examine several measures (Mello, Scott, Delise, Staniewicz, & Rentsch, 2011). A literature search revealed a number of measures purported to assess cognitive style or similarly labeled constructs. The measures varied in their intended audience, context, and response formats. The purpose of the pilot study was to uncover relationships between the measures, to estimate the psychometric properties of each measure, and to establish discriminant and convergent validity evidence. An additional goal was to determine the extent to which the measures elicited a social desirability bias. Four self-report style measures were selected. The measures were expected to converge with one another on dimensions of rational and intuitive style and also to converge with several dimensions of personality, goal orientation, and self-monitoring. Discriminant variables included the remaining personality dimensions, perspective taking, self-esteem, collectivism, and social desirability. Appendix A contains information on the sample, method, and results of the study.

Based on the findings of the pilot study, in the present study cognitive style was assessed with the Cognitive Style Index (CSI, Allinson & Hayes, 1996). The measure contained 38 true/uncertain/false questions. Twenty-two items were worded such that a true response indicated a preference for rational style and 16 items were worded such that a true response indicated a preference for intuitive style (i.e., were reverse scored). Two points were given to rational responses, 0 points to intuitive responses, and 1 point to uncertain responses. Therefore, the theoretical maximum for the scale was 76 and the minimum was 0. In the present sample (n = 126), CSI scores

ranged from 10 to 74, the mean score was 43.58, and the internal consistency reliability estimate was .88. See Appendix B for items.

Perspective taking. Perspective taking was assessed using the Perspective Taking subscale of the Interpersonal Reactivity Index (Davis, 1983). The Perspective Taking scale, "assesses the tendency to spontaneously adopt the psychological point of view of others" (pp. 113-114). It contained seven items rated on a 1 (*does not describe me well*) to 5 (*describes me very well*) scale. In the present sample (n = 126), perspective taking scores ranged from 2 to 28, the mean score was 17.46, and the internal consistency reliability estimate was .77. See Appendix C for items.

Task conflict. Task conflict was assessed using four items adapted from Jehn's (1994, 1997) relationship conflict scale and used in Hinds and Mortensen (2005). Items were rated on a five-point scale with anchors 1 (*not at all*) to 5 (*very much*). In the present sample (n = 123), task conflict scores ranged from 4 to 18, the mean score was 9.17, and the internal consistency reliability estimate was .80. See Appendix D for items.

Affective conflict. Affective conflict was assessed using six items adapted from Jehn's (1994, 1997) relationship conflict scale and used by Hinds and Mortensen (2005). Items are rated on a five-point scale with anchors 1 (*not at all*) to 5 (*very much*). In the present sample (n = 123), affective conflict scores ranged from 6 to 27, the mean score was 7.93, and the internal consistency reliability estimate was .86. See Appendix D for items.

Task schema congruence. Task schema congruence was assessed using the Adaptive Structured Knowledge Assessment (Rentsch, 2006). The ASK Assessment was developed to ensure the content of the task schema measure was relevant to each particular team. There were two main steps to the ASK Assessment: a recall procedure and a sorting with paired comparison procedure. The recall, sorting, and paired comparison procedure is consistent with previous work assessing the congruence of team member's cognitive representations of task information (see Rentsch et al.,

2010). Members completed all parts of the ASK Assessment individually. First, following the team's planning session team members were allowed 10 minutes to freely recall any of the information discussed during the interactions. They listed discrete pieces of information as words, phrases, or sentences (e.g., "SEALS teams are a Navy asset"; "Sunrise and sunset times"). These items contained pieces of a member's own unique information, another member's unique information, general information, or new ideas. Next, team members were allowed 3 minutes to review their list of information and to select the top 10 pieces of information that they felt were most important to the team for planning the mission. This procedure was designed to ensure that the content used for the remainder of the ASK Assessment was information the team actually used while planning their mission. Because teams were free to discuss any information during their planning time, discussions, rescue plans, and recalled information were unique to each team. Therefore, teams were likely to develop schema congruence regarding the task based on their team's own unique discussion. To assess the schema congruence of all teams using the same task stimuli would yield a measure with content that is potentially irrelevant to some teams. That is why the ASK Assessment requires that each team generate its own content for the task schema congruence measure (Rentsch, 2006).

For each team, the 10 most important items each team member generated in step one (the free recall) were pooled to create a set of 30 items. Each information item was presented on electronic "cards" so that all team members had the same set of 30 cards on their computer screen. Still working independently, each team member sorted his/her information cards into "stacks" or categories of information represented by separate boxes on the screen. They were instructed to sort the information into categories according to the similarity of the information on each card. For example, a participant might have chosen to place information about helicopters into one category, and information about the stranded civilians into another category, etc. Participants then generated a label for each category. After creating these categories and labels, each team member independently rated the degree of similarity among each of the category labels using a paired comparison process. The computer

program presented the category labels in pairs until all possible pairs were presented. Team members rated the similarity of the information in the categories by selecting a number from an 11-point scale which ranged from -5 (*very dissimilar*) to +5 (*very similar*). The number assigned to each category pair was extrapolated to all cards contained within that category. Cards in the same category were assigned the highest rating of similarity. Therefore, for each team member, a 30 x 30 matrix was established that contained his or her similarity ratings of the team's 30 information cards. For each team, the three team members' similarity matrices were submitted to an individual difference multidimensional scaling analysis. This procedure is based on Euclidian distances and evaluated the distances between data points (pieces of information) for each team member's matrix. It produced a measure of goodness of fit in the form of a R^2. R^2 represents the variance accounted for in the given data. A higher R^2 corresponds to greater similarity in the teammate's ratings, and was used as the index of task schema congruence. This method is consistent with past research (e.g., Rentsch, 1990; Rentsch & Klimoski, 2001). In the present sample (n = 40), R^2 values ranged from .43 to .99.

Team performance. Team performance was evaluated based on the written final plan submitted by the team. A scoring system was used to evaluate several aspects of the quality of the team's plan. High performance was evidenced by a plan that met requirements outlined in the team's mission (e.g., rescue must be completed within 24 hours; forces are to avoid contact with the enemy), took into account vital elements of the information, integrated crucial pieces of information from various roles to reach proper conclusions, and met criteria for feasibility and efficiency. A standardized list of the most important aspects a team must consider, areas where connections between information existed, and particularly positive or negative actions a team could have taken were used to evaluate the final plans. Points were awarded or deducted for each item on the list. Four graduate students very familiar with the task assisted in refining the coding system. Seven final plans

were each coded by two such independent raters. Each rater provided feedback and suggestions that were compiled into a set of scoring rules. Next, 10% of the final plans were coded by two independent raters using the scoring rules. The raters resolved discrepancies in their scoring by achieving consensus, which is consistent with Smith-Jentsch, Campbell, Milanovich, and Reynolds's (2001) rating methods. Simple interrater agreement was 95%. Krippendorf's alpha was .92 (Hayes & Krippendorf, 2007). Acceptable alphas are .667 or above (Krippendorff, 2004). Given the high levels of agreement on the scoring system, the remaining final plans were scored by only one rater.

Three performance measures were calculated to capture different aspects of performance. The first metric represented the proportion of positive to negative decisions made in the rescue plan. This was calculated as the percentage of points awarded (for correct or positive actions) to points deducted (for incorrect or negative actions) which produced a percentage "good" score for each teams' plan. Percentage "good" scores ranged from 38% to 94%. The second measure was based on an optimal plan produce by Navy SEALS (Biron et al., 2008). Each team's plan was compared to the optimal plan and points were awarded or deducted based on similarity. "Optimal" plan scores ranged from -8 to 13 points. The final measure of performance was a completeness score. There were twelve portions of the plan teams were required to complete (e.g., "What mode(s) of transportation will the SEALS use to get to the island?"; "What time will they leave the island?"). Teams were awarded 1 point for completing each part of the final plan sheet and scores ranged from 2 to 12 points.

Procedure

The proposed study was part of a larger study. Participants signed up for the study via the online system described above. Data was collected from participants in two phases. In the first phase, participants were provided a link to an online survey which contained the CSI, perspective taking, and demographic items. Participants were required to complete these measures at least 48 hours before participating in the remainder of the study. This was done to prevent participants from altering

their behavior during the second phase because of nature of the items presented in the first phase. After completing the online measures, participants were assigned a time to come to the laboratory to complete the team portion. Data from the surveys was linked to the laboratory participants using an alphanumeric code. Two participants completed the surveys in Phase 1 twice. For these participants, their two sets of survey responses were averaged.

In the second phase, participants came to the laboratory to complete the rescue mission planning with two other participants (creating a three-person team). Upon entering the laboratory, participants granted their informed consent and were assigned to a team and role. Then, teams received a task overview. Teams were given training on how to use the communication software on their individual computers. This software allowed the three members of the team to chat about the task (share information, develop ideas, etc.) during their mission planning time. Next, team members reviewed the information packets independently for 35 minutes. After a short break, members were reassembled and read a short statement regarding their role's expertise aloud to their teammates. The experimenter then explained the final plan sheet that the team needed to complete with the details of their rescue plan. Team members were escorted to their individual workstation (computer and desk) that were connected virtually with their teammates' computers. Teams were allowed 60 minutes to chat electronically with their teammates about the task and to complete the teams' written final plan sheet. Following the task, teammates were allowed 2 minutes to review the official plan submitted by the selected member. Then, teammates completed the first step of the ASK Assessment by recalling and selecting the top 10 pieces of information from the team's discussion as described above. Following a short break, during which they were forbidden from speaking, members independently completed the remainder of the ASK Assessment by sorting (categorizing), labeling, and rating the similarity of information generated in the first step. After completion of the ASK Assessment, participants completed the affective and task conflict scales. Then participants were debriefed and paid for their participation.

Results

Preliminary Scale Analyses

Internal consistency reliability (Cronbach's alpha) estimates for the CSI, perspective taking, task conflict, and affective conflict are reported above and each estimate reached acceptable levels.

In order to determine if the self-report and perceptual variables were distinct constructs, factor analysis was conducted with the items from the cognitive style, perspective taking, task conflict, and affective conflict scales at the individual level. A confirmatory factor analysis with maximum likelihood estimation was used. The approach was to construct and compare two models: a null model and a four-factor model. The null model was used to test the assumption that a single factor (i.e., self-report method) underlay the data and all indicators (survey items) were fully free to inter-correlate. The second model was a four-factor model and was based on the assumption that the indicators (survey items) are associated with the four constructs, cognitive style, perspective taking, task conflict, and affective conflict. Because affective and task conflict were expected (and have been shown, Jehn et al., 1999) to be interrelated, these two were allowed to correlate in the specified model. They were specified to be uncorrelated with cognitive style and perspective taking, which were specified to be uncorrelated with each other. In order to show that the data represent four distinct constructs, the fit of the null model and four-factor model were compared. Evidence in favor of the four-factor model would show that, a) the four-factor model was good fit to the data and, b) the four-factor model was *better fit* to the data than the null model. Two fit indices, chi-square and the root mean square error of approximation (RMSEA), were used to compare the models. Chi-squared is an assessment of overall model fit and tests if deviations in the observed fit from the proposed fit could be explained by random chance. Both the null model and the four-factor model showed χ^2 probability levels $< .001$

suggesting that the deviations in observed fit compared to proposed fit were not due to chance. Chi-squared, although a useful statistic for initial summaries of model fit, has known problems such as over-sensitivity to sample size (Byrne, 2001; Loehlin, 2004). It is not uncommon for the χ^2 to suggest poor model fit while other fit indices suggest adequate or good model fit. For this reason, the second test of fit was the RMSEA. RMSEA takes into account sample size, model degrees of freedom, and the chi-square and essentially estimates how well the model can account for variation in the population rather than in the given sample. RMSEA values of < .10 are considered acceptable fit and < .05, excellent fit (Loehlin, 2004). In order to show that the measures are distinct the four-factor model needed to be a good fit to the data and also a better fit than the one-factor model. The four factor model had a RMSEA value of .06 showing that it was a good fit to the data. The RMSEA value of the one factor (null) model also showed an acceptable value of .09. However, the four factor model was a better fit to the sample data. Therefore, the remainder of analyses will consider cognitive style, perspective taking, and task and affective conflict to be separate constructs.

Aggregation to Team Level

Cognitive style. Separation diversity is indicated for a variable when observations fall along a continuum. "Such differences reflect … horizontal distance along a single continuum representing dissimilarity in a particular attitude or value, for example" (Harrison & Klein, 2007, p. 1200). For the present study, three basic assumptions about separation diversity are that, a) members within team differ with respect to the variable (cognitive style), b) teams differ from one another in how dispersed members are along the variable continuum (in some teams, members will have scores that are close together whereas in other teams, members' scores will vary widely), and c) differences between degree of dispersion are systematically related to other

variables (e.g., performance) (Harrison & Klein, 2007). Separation diversity is appropriately indexed by calculating absolute distances of individuals' scores from the teams' mean.

In the present study, cognitive diversity was assessed as separation diversity. Because the cognitive style measure (CSI) produces interval-level data, team cognitive style diversity was indexed with the within-team standard deviation. Cognitive style diversity in the present sample (n = 42) ranged from 1.53 to 30.45 with an average value of 11.04. In addition to calculating each team's cognitive style diversity, each team's mean cognitive style was also calculated and used in preliminary analyses described below. Mean cognitive style (n = 42) ranges from 24.67 to 56.67 with an average value of 43.57.

Task conflict. In order to justify aggregation of the task conflict scale to the team level, adequate agreement between teammates as to the level of task conflict present in the team must be established. James, Demaree, and Wolf (1984) advocated the use of the within-group interrater reliability statistic for multi-item measures: $r_{WG(J)}$. This statistic compares the variance present in the observed responses to the variance that would be assumed under random responding. For the present scale a uniform distribution served as the comparison. The expected variance under a uniform distribution is $\sigma_{EU}^2 = (A^2 - 1)/12$ where A = the number of alternatives on the response scale. For the current measure's five-point likert scale this was calculated as $(5^2 - 1)/12$ or 2. Because task conflict is a four-item measure, Equation 1 will be used for evaluating a given team's within team interrater reliability:

(1)

$$r_{WG(J)} = \frac{4\left[1 - \left(\overline{S_{xJ}^2}/2\right)\right]}{4\left[1 - \left(\overline{S_{xJ}^2}/2\right)\right] - \left(\overline{S_{xJ}^2}/2\right)}$$

where $\overline{s_{xj}^2}$ = the observed variance for a given team. To the extent that teammates respond similarly to one another, the value obtained will approach 1.0, or perfect agreement. To the extent that teammates responded dissimilarly (they did not agree as to the level of task conflict) the value will be less than 1.0. Sample-level average values above .70 are typically considered acceptable agreement to aggregate data to the team level (Zellmer-Bruhn et al., 2008). The average $r_{WG(J)}$ value for task conflict for the present sample was .73. Because there were some teams that did not have $r_{WG(J)}$ values above .70, tests of hypothesis regarding task conflict were conducted on the full sample and also a subset of the sample with acceptable agreement levels. The overall direction, magnitude, and significance of results was the same for both sets of data. Therefore, the entire sample was used in all tests of hypotheses.

In addition to the $r_{WG(J)}$ statistic, an inter-class correlation coefficient (ICC) served as a further test to justify aggregation to the team level. ICC(1) is a test of the reliability of individual ratings compared to the team's average. This is an appropriate statistic when raters (teammates) are nested within team and the within-team agreement is of primary interest (James, 1982). ICC(1) is, in essence, a form of analysis of variance that compares the within-team variability to the between-team variability. It tests that there is less variability in scores within a team than between the teams and can be calculated using Equation 2:

(2)

$$ICC(1) = \frac{BMS - WMS}{BMS + (k-1)WMS}$$

Where BMS = the between team mean square, WMS = the within team mean square and k = the number of teammates on a team (Shrous & Fleiss, 1979). Evidence that there is justification to aggregate within team task conflict scores is shown with a significant F- statistic at the $p < .05$ level. Additionally, Lebreton and Senter (2008) advocate viewing ICC values similarly to effect

sizes such that, for example, a value of .05 could be viewed as a small effect, .10 a medium effect, and .25 a large effect (p. 838). In the present sample, the ICC(1) for task conflict was .15 (p = .057). Although this did not quite reach significance, a value of .15 can be considered a "moderate" effect. This suggests that membership on a particular team contributed to the variance in ratings of task conflict on that team. In summary, the sample average $r_{WG(J)}$ was > .70 and the ICC(1) could be interpreted as a moderate effect for group membership.

Affective conflict. Affective conflict scores were subjected to the same $r_{WG(J)}$ and ICC(1) statistics described above in order to test for adequacy of agreement before aggregating responses to the team level. The only difference was that affective conflict was a 6-item scale and thus, J = 6 in Equation 1 above. The average $r_{WG(J)}$ value for affective conflict for the sample was .87. Because there were some teams that did not have $r_{WG(J)}$ values above .70, tests of hypothesis regarding task conflict were conducted on the full sample and also a subset of the sample with acceptable agreement levels. The overall direction, magnitude, and significance of results was the same for both sets of data. Therefore, the entire sample was used in all tests of hypotheses. The ICC(1) value for affective conflict was .16 (p = .04) suggesting a moderate and significant effect of group membership on ratings of affective conflict. The high average $r_{WG(J)}$ and significant ICC(1) for rating of affective conflict provide acceptable evidence to justify aggregating to the team level.

Perspective taking. Perspective taking is an individual difference variable and therefore it is unnecessary to justify aggregation prior to averaging the team's perspective taking scores. Because mean team level perspective taking had been shown to predict team level outcomes in previous research (Galinsky et al., 2008), the average perspective taking score for each team

served as the team's perspective taking in analyses. The team level perspective taking scores (n = 42) ranged from 9 to 24.33 with an average of 17.45.

Tests of Hypotheses

Means, standard deviations, and inter-correlations for all study variables are shown in Table 1. Hypotheses 1a-3 are listed below and were tested with linear regression using the ordinary least-squares (OLS) model. For all tests of Hypotheses a significance level of $p < .05$ was be applied.

H1a: There will be a positive linear relationship between cognitive style diversity and task conflict.

H1b: There will be a positive linear relationship between cognitive style diversity and affective conflict.

H2: There will be a negative linear relationship between cognitive style diversity and the development of task schema congruence.

H3: Cognitive style diversity will have a positive linear relationship with performance.

According to Harrison and Klein (2007), when using separation measures of diversity it is prudent to first assess the mean-level effects before attempting to determine diversity effects. Therefore, as a preliminary control, tests of Hypotheses 1a-3 first included a test of the mean effect of cognitive style on the outcome variables task conflict, affective conflict, task schema congruence, and performance. Table 1 shows that there was a significant relationship between mean cognitive style and task conflict (r = -.36, p = .01). This was the only outcome variable related to mean cognitive style. To account for this relationship, the test of Hypothesis 1a was conducted in a hierarchical fashion with mean cognitive style entered into the regression equation in Step 1 and cognitive style diversity entered in Step 2. Step 1 showed that mean cognitive style accounted for 13% of the variance in task conflict (R^2 = .13, p = .02). However,

the inclusion of cognitive style diversity in Step 2 failed to show a significant incremental improvement in the prediction of task conflict above that already accounted for by mean cognitive style ($\Delta R^2 = .013$, p = n.s.). These results are shown in Table 2. Therefore, Hypotheses 1a was not supported.

Because affective conflict was unrelated to mean cognitive style, the test of Hypotheses 1b included only cognitive style diversity. Task conflict was regressed onto cognitive style diversity. The resulting R^2 was not significant ($R^2 = .00$, p = n.s.) therefore, Hypotheses 1b was not supported. Hypotheses 2 was tested by regressing schema congruence onto cognitive style diversity. The resulting R^2 was not significant ($R^2 = .00$, p = n.s.) therefore, Hypotheses 2 was not supported. A separate regression was conducted for each of the operationalizations of performance: percent good, optimal plan, and completeness. The result were not significant (R^2 = .01,.01 .02, respectively, p = n.s.). Taken together, there was no support for Hypotheses 3.

Hypotheses 4a-c are listed below and were tested using moderated hierarchical multiple regression.

H4a: Perspective taking will moderate the relationship between cognitive style diversity and task conflict such that the positive relationship will be stronger under conditions of high perspective taking than it will be under conditions of low perspective taking.

H4b: Perspective taking will moderate the relationship between cognitive style diversity and affective conflict such that the positive relationship will be weaker under conditions of high perspective taking than it will be under conditions of low perspective taking.

H4c: Perspective taking will moderate the relationship between cognitive style diversity and task schema congruence such that the negative relationship will be weaker under conditions of high perspective taking than it will be under conditions of low perspective taking.

First, in accordance with Cohen, Cohen, West, and Aiken (2003) perspective taking was mean-centered by subtracting the mean value from all observed values. This created a linearly transformed variable retaining all of its original distributional properties. Next, a series of regression equations were conducted to test the interaction effect of cognitive style diversity and perspective taking on the outcome variables (Cohen et al, 2003; Frazier, Tix, & Barron, 2004). In Step 1 the outcome variable was regressed onto cognitive style diversity and perspective taking simultaneously. In Step 2 the outcome variable was regressed onto cognitive style diversity, perspective taking, and the cross product (interaction) of cognitive style diversity and perspective taking simultaneously. A significant F test for the change in R^2 (ΔR^2) obtained from Step 2 would indicate that the interaction makes a unique contribution to the explanation of variance in the dependent variable above and beyond the main effects.

To test Hypothesis 4a, task conflict was first regressed onto cognitive style diversity and perspective taking simultaneously in Step 1. In Step 2, the cross-product of cognitive style diversity and perspective taking was included in the regression. The result of adding the interaction produced an increase in R^2 ($\Delta R^2 = .03$); however, this change was not significant. Therefore, Hypotheses 4a was not supported. Perspective taking did not moderate the relationship between cognitive style diversity and task conflict. These results are shown in Table 3.

Hypothesis 4b was similarly tested with affective conflict regressed onto cognitive style diversity and perspective taking in Step 1 of the hierarchical regression. In Step 2 the cross-product of cognitive style diversity and perspective taking was also included in the regression. The inclusion of the interaction term in Step 2 increased the explained affective conflict variance from 1% to 16% and this change was significant ($\Delta R^2 = .15$, $p = .01$). These results are shown in

Table 4. To aid in interpreting the direction and magnitude of the interaction effect, the simple slopes of the relationship between cognitive style diversity and affective conflict were plotted (Cohen, et al., 2003) at high and low levels of perspective taking. Given that there were no theoretical reasons to posit specific levels of perspective taking, the values of perspective taking selected were one standard deviation above and below the mean. The regression lines for high and low perspective taking are shown in Figure 2. Unfortunately, the relationships were counter to the hypothesized direction and therefore, there was no support for Hypothesis 4b.

To test Hypothesis 4c, schema congruence was regressed onto cognitive style diversity and perspective taking in Step 1. In Step 2 the cross-product of cognitive style diversity and perspective taking was also included in the regression. The inclusion of the interaction term produced an increase in ($\Delta R^2 = .05$); however, this change was not significant. Therefore, Hypotheses 4c was not supported. Perspective taking did not moderate the relationship between cognitive style diversity and schema congruence. These results are shown in Table 5.

Post-Hoc Analyses

The formal hypotheses argued for linear relationships between cognitive style diversity and the outcome variables. Because no support was found for the linear relationships, one possible explanation is that the relationships are actually curvilinear. For example, it is possible that some cognitive style diversity increases performance but that too much cognitive style diversity hinders performance. For this reason, analyses were conducted to test for curvilinear relationships between cognitive style diversity and task conflict, affective conflict, schema congruence, and the three performance scores. First, a new variable was created representing the quadratic function by squaring cognitive style diversity for each team. Then, hierarchical regressions were conducted with cognitive style diversity entered in Step 1 and cognitive style

diversity plus the quadratic function entered in Step 2. No significant curvilinear relationships were found.

Discussion

This primary purpose of this study was to explore the effects of cognitive style diversity in decision making teams on conflict, schema congruence, and performance. This represents a move from the individual level of analysis, which is typical in past research, to the team level, which has not been examined. A secondary purpose was to examine the moderating effects of perspective taking on these relationships. Cognitive style is an individual difference defined as one's typical manner of gathering, organizing, and processing information. Diversity in team members' cognitive styles was expected to create more conflict, decrease the team's ability to develop schema congruence, and improve performance. Perspective taking was expected to decrease affective conflict, increase task conflict, and make developing schema congruence less difficult. Hypotheses were tested in data obtained from three-person distributed teams collected in a laboratory study using a high fidelity military task. No support was found for the hypothesized relationships. The main variable of interest, cognitive style diversity, displayed no significant relationships with any study variables. Perspective taking, the moderating variable, also did not demonstrate expected relationships.

There are several possible explanations for the lack of anticipated findings in the present study. The study was conducted to extend current research by examining the hypothesized relationships at the team level of analysis and by investigating them within the context of a complex decision task in a virtual communication environment. There is sound reasoning in defense of the study context as an advancement over past research contexts. The complex task used in the present study, which included unique role information and a time constraint, is more

analogous and therefore more generalizable to that of work teams than previous studies which used simpler tasks such as the Winter Survival task (Volkema & Gorman, 1998). The virtual communication medium also closely approximated the trend toward virtual teamwork and communication in the workplace (e.g., Bosch-Sijtsema, Ruohomäki, & Vartiainen, 2009).

However, the wide deviation of the present context from that of past cognitive style research may have contributed to the unexpected findings. Past research studied cognitive style in a correlational manner with other variables such as teaching style (Evan et al., 2008) but no known studies have investigated cognitive style's interaction with various decision context factors such as task type or team context factors such as interdependence. The present task crossed multiple categories of task types (McGrath, 1984) for groups and teams. It is a "generating" task requiring planning future actions, a "choosing" task requiring a final decision that is compared to an optimal answer, and also a form of "cognitive conflict" task where various viewpoints must be combined. It is possible that the complexity of the task type created difficulty in parceling out the effects of cognitive style diversity on the other variables. Perhaps cognitive style diversity has different effects on the various sub-categories of task type. For example, maybe it increases idea generation but decreases viewpoint integration. It is possible that in simpler, less complicated research contexts the effects of cognitive style are clearer than in a more complex and realistic research environment and perhaps these advances in research context should have been approached more incrementally.

The addition of virtual communication to the task context added another layer of complexity which may have contributed to the unclear findings. Virtual communication is different from face-to-face communication in a number ways (Driskall, Radtke, & Salas, 2003). First, it qualitatively changes information sharing behavior. A recent meta-analysis of virtual

team communication found that as virtuality increased towards total virtuality (such as in the present study) teams shared more unique than common information but shared less information overall (Mesmer-Magnus, DeChurch, Jimenez-Rodriguez, Wildman, & Shuffler, 2011). Some explanations for these findings included that teams tended not to repeat information or "waste" time on common information due to the cumbersome nature of typing versus speaking and because the medium itself leaves a history of past information shared. It might be expected that changes in information sharing behavior may alter cognitive styles' relationships with other variables because cognitive style affects how people search for and process information (Allinson & Hayes, 1996; Ruble & Cosier, 1990; Vance et al., 2007). In addition to its effects on information sharing, virtual communication is well-known to inhibit important communication cues related to expressing and interpreting meaning, feelings, and understanding (Driskall et al., 2003; Thompson & Coovert, 2003). This is often referred to as "degrading" the quality and richness of the teams' communication relative to face-to-face or less virtual (e.g., video conferencing) environments (Mesmer-Magnus et al., 2011). It is possible that the ability to perspective take is altered or hindered by virtualness. Although no research to date has explicitly tested the effects of virtualness on perspective taking ability, related research exists. For example, Bertacco (2007) found that when participants were expecting e-mail communication from another person they engaged in less perspective taking than when expecting handwritten ground mail communication. Therefore, the virtual communication medium used in the present study may have impacted participants' ability or willingness to engage in perspective taking during the task. In summary, the complexity of the task and virtuality of the communication medium may have overwhelmed team members' typical decision making and perspective taking behavior altering expected relationships.

In the same way that the task context may have contributed to the unexpected findings with respect to cognitive style diversity, it may have also been a factor in the unanticipated results for perspective taking. One contribution of the present study was to extend perspective taking research into different contexts. Therefore, necessarily the present context differed from past research and the findings may show that this different context is not analogous to past contexts. Past research on perspective taking has been largely conducted in negotiation situations where the interest was in whether the parties came to decisions that benefited both sides but not whether their decisions met external criteria of effectiveness or correctness (Kemp & Smith, 1994). In these scenarios, seeing the other's perspective led to willingness to create mutual cooperative outcomes rather than competitive ones. In the context of the present study, the objective was to create the best solution, not necessarily the solution that incorporated everyone's ideas or suggestions. In other studies, perspective taking was manipulated or trained (Falk & Johnson, 1977; Johnson, 1977; Sessa, 1996) rather than self-reported. In these studies, the notion of perspective taking and/or benefits of perspective taking was made salient to participants. In the present study, it was not suggested to participants that they should engage in perspective taking. In fact, participants took the perspective taking measure days in advance of performing the task to minimize any priming effect. It is possible that effects for perspective taking are most prominent when performing perspective taking behaviors is strongly encouraged through manipulation or training. Therefore, these differences between the present and past research might explain the unanticipated findings. A final possible explanation is that although the self-report measure used in the present study (Davis, 1983) has a long history of use in research, other measures of perspective taking may be more accurate. Recently Park and Raile (2010) found no relationship between self and other ratings of perspective taking using the Davis

(1983) measure suggesting that people may not be very accurate judges of their own perspective taking abilities.

Although the hypothesized relationship were not supported in the present study, notable and interesting findings did emerge from the study. For example, task and affective conflict were related in several ways to other study variables. Task conflict was negatively correlated with mean cognitive style indicating that more rational teams had less task conflict. People with a rational cognitive style prefer to engage in a detailed, linear decision making process (Vance et al., 2007). If all members were more rational than intuitive, they may have agreed that a methodical, linear approach to the task was best and therefore, may have experienced less conflict about the decision making method. On the other hand, intuitive people jump to conclusions and rely on their gut-instincts (Hough & ogilvie, 2005). If each intuitive teammate came into the task discussion with his/her own notions about the best solution, this may have caused friction and disagreements about how to perform the mission.

Task and affective conflict had several other interesting relationships that would be expected based on the literature. First, task and affective conflict displayed a significant positive correlation with each other. This finding is consistent with past research on team conflict which has shown that although people are capable of mentally separating task and affective conflict, there is often a "bleed over" effect (Jehn et al., 1999; Pelled et al., 1999). For example, criticisms of ideas and suggestions may become emotional, and personality clashes may turn to criticisms of substantive ideas. The .59 correlation between task and affective conflict found in the present study is consistent with the .54 correlation found in a meta-analysis of intra-group conflict (De Drue & Weingart, 2003). Therefore, the direction and magnitude of this relationship was expected.

In general, the present study found that higher conflict was related to lower performance. Task and affective conflict were negatively related to performance measured as completeness of the team's rescue plan and performance measured as percentage of "good" or correct rescue plan decisions. These relationships are consistent with recent meta-analytic findings which showed a steady negative relationship between affective conflict and team outcomes including performance (de Wit, Greer, & Jehn, 2011). This meta-analysis also found that when the association between task and affective conflict was strong within a study, and when the study was conducted in a laboratory setting, task conflict was related to poorer performance. An earlier meta-analysis similarly found a consistent negative relationship between task conflict and team performance (De Drue & Weingart, 2003). Therefore, the findings in the present study regarding the relationships between conflict and performance are consistent with those found in past research.

A final relationship found in the present study was between schema congruence and performance as compared to the optimal plan. Task schema congruence refers to the similarity of teammates' cognitive representations of task information which can be similar with respect to the content and structure of that information (Rentsch & Hall, 1994). The more similarly teammates mentally categorized and organized information related to the task, the closer their final rescue plan came to the optimal plan developed by Navy SEALS. The finding that teams whose final plans most closely approximated the optimal plan provided by subject experts is similar to other findings that suggest experts' schemas tend to converge and show greater similarity than do schemas produced by novices (Rentsch, Heffner, & Duffy, 1994). It seems that in the present study, when teams were able to produce a plan of near optimal "expert" quality, they also developed task schemas that were similar. The relationship between schema congruence and

performance is well-supported in the literature (DeChurch & Mesmer-Magnus, 2010). It has been found that some of the mechanisms through which task schema similarity may facilitate high performance is by increasing the teams' ability to communicate about the task and coordinate their actions to accomplish the task (Mathieu, Heffner, Goodwin, Salas, and Cannon-Bowers, 2000). The direct effects of cognitive similarity on team performance have also been demonstrated empirically (Lim & Klein, 2006; Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005) and across studies in a recent meta-analysis (DeChurch & Mesmer-Magnus, 2010). In summary, although the present study did not find support for the hypothesized relationships, other interesting relationships were uncovered that add to or support the literature on decision making teams.

Contributions

The literature from several disparate areas of research was synthesized in the conceptual framework shown in Figure 1. The framework offered a cross-disciplinary perspective and advanced theoretical understanding of interrelatedness amongst the research in several sub-disciplines of psychology including social, educational, counseling, and industrial-organizational, and several areas of management including managerial/organizational cognition, organizational behavior, and human resources. The framework contributed to these literatures by illustrating how cognitive style research can be extended beyond the individual level to the team level. It also addressed the calls in the team diversity literature to move beyond demographic diversity toward cognitive types of diversity (van Kippenberg & Schippers, 2007). Additionally, the previously unrecognized role of perspective taking to team diversity and cognitive style was integrated into the framework.

The present study contributes to theory and research by demonstrating appropriate multi-level research techniques. In this study a construct typically associated with the individual level

of analysis was examined at the team level of analysis. According to Chan (1998) this represents an *elemental* type of composition, one in which data from a lower level (individual cognitive style) is used as a basis for a higher level construct (team cognitive style diversity). "In other words, the higher level construct is of a collective or aggregate nature and is construed as some form of combination of the lower level units" (Chan, 1998, p. 235). Multi-level data issues to consider include the functional relationship between the levels, maintaining the integrity and validity of the construct across levels, and the manner of aggregation (Chan, 1998). Five composition models exist. Cognitive style diversity is best described in Chan's typology by the "dispersion" model. In the dispersion model it is the *variance* of scores at the lower level that is of interest. This is in contrast to, for example, the "direct consensus" model where *agreement* at the lower level is of interest and variance is viewed as error. When it is precisely this variance, or diversity, in scores that is the value of interest, selecting the appropriate diversity conceptualization is critical to proper operationalization. Harrison and Klein (2007) discussed three configurations of group diversity and the appropriate statistic for aggregation in each instance. For example, diversity of a categorical variable such as sex, is necessarily aggregated differently than a continuous variable. Cognitive style diversity represents "separation" diversity where team members vary in points across a continuum of scores. Separation diversity is best indexed by a measure of distances between pairs of team members on the cognitive style measure (Harrison & Klein, 2007). Appropriate indices include within team standard deviation (as used in the present study) and average Euclidean distances. In summary, when a researcher is interested in a phenomenon at the team level and that construct is most appropriately measured at the individual level he or she must remain cognizant of maintaining congruence between the measure and the aggregate as to not distort the construct across the levels. The present study

contributed to future cognitive style diversity studies by outlining this process properly and providing an exemplar for continuing this stream of research.

The limited findings from this study also contribute to research on teamwork, team cognition, and virtual communication. Somewhat mixed evidence has accumulated in the literature regarding team conflict. Convergence is found in support of affective conflict being generally negative for team processes and outcomes (De Dreu & West, 2001). However, the role of task conflict is less agreed-upon. Many researchers have posited that task conflict, especially in a decision making scenario, would lead to improved performance due to a greater variety of ideas exposed and the avoidance of negative processes like groupthink (De Drue & Weingart, 2003). The present study found that conflict, in both its forms, was related to lower team performance and decision quality. It appears that in the specific context of an ad hoc decision team, working virtually under time constraint, conflict may impede performance. Conversely, this study found that cognitive similarity was related to improved performance and decision quality that more closely approximated expert quality. This finding contributed to the growing body of evidence supporting the connections between team cognition and performance (DeChurch & Mesmer-Magnus, 2010). If in fact the lack of anticipated findings in the present study can be traced in part to the virtual nature of the communication medium, this may have implications for virtual teamwork. Virtual contexts may change our capabilities to perspective take and alter the nature of information sharing in decision making.

Limitations

As with any study, the present study had constraints and trade-offs which imposed limitations. It was determined that, given the novel nature of the research, a laboratory setting would allow for control over extraneous factors. Laboratory settings provide the ability to ensure high levels of internal consistency through randomization, careful monitoring, and scripted

procedures. This diminishes the effects of between-team differences in variables unrelated to the study. However, for all of the advantages provided by a laboratory setting, there are constraints associated with it. Locating adequate laboratory space and enticing participants are primary concerns but these can be ameliorated somewhat easily in the educational and research-friendly environments of a university setting. In the present study university students were selected as the sample because the study variables were individual differences associated with all typical adults. The use of university students has advantages and disadvantages. Two advantages include that they are readily available, and they can be motivated to participate by external incentives. In the present study, students enrolled in undergraduate psychology courses were required to participate in five hours of research to fulfill their course objectives. This provided motivation to participate in the present study but also imposed the constraint that students would be unlikely to participate in the study if more than five hours was required. Additionally, available participants were limited to those enrolled in a given semester and this study competed with others for the fixed pool of participants. Therefore unavoidably this study was limited to one hour's worth of pre-session surveys and four-hours of laboratory time. A finite amount of individual and team data could be collected in this time frame while allowing adequate time to complete the task. Therefore, two limitations were the inherent constraints on time and amount of information that could be collected from each participating team and individual. With more time, additional variables might have been included that would have allowed for a wider ability to test or probe the proposed relationships and to uncover unanticipated relationships.

The final sample consisted of 126 participants in three-person teams which yielded a team sample size of 42. This sample size is consist with, and even surpasses, that of past teams research (e.g., Mohammed & Ringseis, 2001). However, it still constrains statistical power to

find relationships. This is underscored when considering the magnitude of some relationships found in the present study that did not reach traditional levels of significance. Therefore, the sample size restriction on statistical power was a limitation of this study. Some final limitations concern measurement. Specifically, the self-report nature of several of the main variables and issues with compounding unreliability are possible limitations. Self-report measurement is often criticized for such characteristics as transparency, fakability, and lacking reliability (Chan, 2009). The pilot study conducted in preparation for the present study took these factors into account and these results were considered in the selection of the self-report measures used. Additionally, confirmatory factor analysis was conducted and showed the distinctness of the constructs. None-the-less, alternative forms of measurement may also be appropriate, and possibly more accurate, for the variables in this study. Additionally, it is not clear how unreliability in the predictor, cognitive style, may be compounded when composed to the team level using the standard deviation. In the present study, the Cognitive Style Index had a internal consistency reliability estimate of .88. This is considered acceptable and even high reliability (Nunnally & Bernstein). However, without additional evidence of its reliability such as test-retest it may not be clear how small issues with unreliability are multiplied when combined using the standard deviation.

Future Research

Given the present findings, the path is open for future studies to replicate and extend this line of research. Several broad directions in which future research could proceed include studying team cognitive style diversity with other task types or environmental contexts, investigating its relationships with other process or outcome variables, and testing alternative operationalizations or measurement techniques. The present study was conducted in a laboratory setting with university students which may pose constraints on generalizing to working

populations and environments. Therefore, future research should test the proposed relationships in other teamwork contexts. One possible avenue is in the area of teams in new venture creation with a focus on team cognition and decision making (West, 2007). Evidence has shown that cognitive style diversity in these situations may affect strategic decisions. Cognitive style has been associated with entrepreneurial self-efficacy and showed that rational and intuitive styles contribute differently to the various functions (e.g., identifying opportunities, marshalling resources) of the new venture process (Kickul et al., 2009). This may suggest that a complementary blend of styles is necessary to cover all aspects of the process. Cognitive style has also been associated with differences in the assessment of risk in decision making (Henderson & Nutt, 1980) and in the quantity and quality of strategic business decisions (Hough & ogilvie, 2005). Therefore, future research could investigate new venture teams' cognitive style diversity and their decision processes and outcomes.

Above it is noted that the present task and element of virtual communication may have contributed to the unexpected lack of findings. Future research should consider closely the task to communication medium fit. Although the task used in this study was highly realistic and therefore generalizable outside of the laboratory, the additional of the virtual communication medium may have been less realistic. The extent to which crisis decisions are made using virtual communication is not known. Future research could incorporate "richer" mediums such as teleconferencing which might more closely approximate how these types of decisions are made in the real world. Similarly, the type of information presented in the task might have been too foreign for undergraduates to grasp fully. For this reason, future research should consider the sample to task fit and make alterations to maximize their compatibility. It might be possible to use a sample with more military knowledge or a task more suited to the know base of

undergraduates. Another avenue for future research is in testing the relationship between team cognitive style diversity and alternative types of team cognition. Although a relationship between cognitive style diversity and *task schema congruence* was not found in the present study, it is possible that cognitive style diversity affects forms or content of team cognition other than congruence of task information. Teams may develop many forms of cognition about their work together and these forms of cognition can be about different types of content (Rentsch, Small, & Hanges, 2008). For example, Mathieu et al. (2000) suggested that at least one other model of cognitive content exists in addition to the task model and called it the teamwork model. They explained that a teamwork model contains content about how the teammates interact, their roles and responsibilities, and each other's knowledge and skills. Rentsch et al. (2008) delineated several different forms of cognition including perceptual, structured, and interpretive. Rentsch, Delise, and Hutchison (2010) also discussed various forms of congruence such as similarity and complementary forms. Additionally, other general categories of team cognition in exist. Transactive memory (Austin, 2003) is a concept which is concerned with awareness of and ability to retrieve each other's expert knowledge. Cross-understanding is concerned with the accuracy of teammate's understanding of each other's mental models (Huber & Lewis, 2010). Therefore, simply because cognitive style diversity did not have a significant effect on task schema congruence in the present study, does not mean it may not have effects on other types of team cognition. Future research could investigate the relationship between cognitive style diversity and other forms, content, and/or categories of team cognition.

Future research could also explore alternative measurement and operationalizations of the present study variables. In the present study, diversity was measured as an individual difference variable and aggregated to the team level. This technique measured diversity on the variable

directly but did not assess the extent to which this diversity was experienced by the team. Harrison and Klein (2000) suggested that perceived diversity may have more explanatory power than actual diversity because perceptions of the social environment are often better predictors of behavior than the objective environment. Others have similarly suggested that subjective experience of diversity is more likely to explain other subjective experiences in teams such as conflict than are more objective measures of diversity (Garcia-Prieto, Bellard, & Schneider, 2003). Therefore, measures could be created that assess the extent to which team members perceive they have different cognitive styles. A measure could take the form of a multi-item survey addressing the various parts of cognitive style such as information gathering, organizing, and processing and be conducted in a round-robin fashion where each teammate rates their perceived similarity in cognitive style to each other teammate. Different measurement techniques could likewise be applied to the perspective taking construct. Some success has been found with other-ratings (as opposed to self-ratings) of perspective taking such as the relationship Park and Raile (2010) found between other-rated perspective taking and communication satisfaction. Reimer (2001) measured perspective taking by assessing the accuracy of predictions about another's future actions. Therefore, future studies could assess perspective taking with different measures such as other member ratings of perspective taking or an objective criteria of accuracy about another's perspective.

Conclusion

Cognitive style varies between individuals and can therefore create diversity within a team. Because cognitive style has traditionally been studied at the individual level of analysis, there was scant literature to draw upon in formulating expectations for the effects of cognitive style diversity in teams. However, a large body of research has accumulated on a host of other types of diversity in teams. As part of the present study, a framework in which cognitive style

was embedded was developed to organize the team diversity literature. Using this framework as a review of the literature on comparable types of diversity, hypotheses about cognitive diversity effects were extrapolated. It was expected that diversity in team member cognitive styles would affect task and affective conflict, the development of schema congruence, and performance. Additionally, perspective taking was anticipated to moderate these relationships. Hypotheses were tested in a laboratory study using three-person teams completing a simulated military planning mission while using computers to communicate. None of the hypotheses were supported. It was presumed that the study context differed too widely from that of past research to be analogous. However, the present study highlighted the need to study cognitive style diversity in other contexts, with different process or outcome variables, and/or with novel measurement techniques to illuminate further these relationships. This study serves as an initial step to what will hopefully be a productive line of future inquiry on cognitive style diversity in teams.

List of References

Allinson, C. W., & Hayes, J. (1996). The cognitive style index: A measure of intuition-analysis for organizational research. *Journal of Management Studies, 33*(1), 119-135.

Allinson, C. W., Armstrong, S. J., & Hayes, J. (2001). The effects of cognitive style on leader-member exchange: A study of manager-subordinate dyads. *Journal of Occupational and Organizational Psychology, 74*, 201-220.

Armstrong, S. J., & Priola, V. (2001). Individual differences in cognitive style and their effects on task and social orientations of self-managed work teams. *Small Group Research, 32*(3), 283-312.

Austin, J. R. (2003). Transactive memory in organizational groups: The effects of content, consensus, specialization, and accuracy on group performance. *Journal of Applied Psychology, 88*(5), 866-878.

Bertacco, M. (2007). Social norms and behavioral regulation in asynchronous communication: The shift of attention during speed communication. *Human-Computer Interaction, 22*, 299-324.

Bettenhausen, K., & Murnighan, J. K. (1985). The emergence of norms in competitive decision making groups. *Administrative Science Quarterly, 30*, 350-372.

Biron, C., Burkman, L., & Warner, N. (2008). *A re-analysis of the collaborative knowledge transcripts from a non-combatant evacuation operation scenario: The next phase in the evolution of a team collaboration model.* (Naval Air Systems Command Technical Report, NAWCADPAX/TR-2008/43, April 15).

Bosch-Sijtsema, P., Ruohomäki, V., & Vartiainen, M. (2009). Knowledge work productivity in distributed teams. *Journal of Knowledge Management, 13*, 533-546.

Bunderson, J. S. & Sutcliffe, K. M. (2002). Comparing alternative conceptualizations of functional diversity in management teams: Process and performance effects. *Academy of Management Journal. 45*(5), 875-893.

Byrne, B. M. (2001). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum Associates

Chan, D. (1996). Cognitive misfit of problem-solving style at work: A facet of person-organization fit. *Organizational Behavior and Human Decision Processes, 68*(3), 194-207.

Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology, 83*(2), 234-246.

Chan, D. (2009). So why ask me? Are self report data really that bad? In C E. Lance and R. J. Vandenberg (Eds.), *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences* (pp. 309-335). New York, NY: Routledge.

Clark, M. A., Anand, V., & Roberson, L. (2000). Resolving meaning: Interpretation in diverse decision-making groups. *Group Dynamics: Theory, Research, and Practice, 4*(3), 211-221.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Cooke, R. A., & Szumal, J. L. (1994). The impact of group interaction styles on problem-solving effectiveness. *Journal of Applied Behavioral Science, 30*(4), 415-437.

Cortina, J. M. (1993). What is Coefficient Alpha? An examination of theory and application. *Journal of Applied Psychology, 78*(1), 98-104.

Cronin, M. A. & Weingart, L. R. (2007). Representational gaps, information processing, and conflict in functionally diverse teams. *Academy of Management Review, 32*(3), 761-773.

Dahlin, K. B., Weingart, L. R., & Hinds, P. J. (2005). Team diversity and information use. *Academy of Management Journal. 48*(6), 1107-1123.

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 44*(1), 113-126.

De Dreu, C. K. W. & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology, 88*(4), 741-749.

De Dreu, C. K. W., & West, M. A. (2001). Minority dissent and team innovation: The importance of participation in decision making. *Journal of Applied Psychology*, *86*, 1191–1201.

de Wit, F. R. C., Greer, L. L., & Jehn, K. A. (2012). The paradox of intragroup conflict: A meta-analysis. *Journal of Applied Psychology*, *97*(2), 360-390.

DeChurch, L. A, & Mesmer-Magnus, J. R. (2010). Measuring shared team mental models: A meta-analysis. *Group Dynamics: Theory, Research, and Practice, 14*(1), 1-14.

Dose, J. J. & Klimoski, R. J. (1999). The diversity of diversity: work values effects on formative team processes. *Human Resource Management Review, 9*(1), 83-108.

Driskell, J. E., Radtke, P. H. & Salas, E. (2003). Virtual teams: Effects of technological mediation on team performance. *Group Dynamics: Theory, Research, and Practice, 7,* 297-323.

Edwards, B. D., Day, E. A., Arthur, W., & Bell, S. T. (2006). Relationships among team ability composition, team mental models, and team performance. *Journal of Applied Psychology, 91*(3), 727-736.

Evans, C., Harkins, M. J., & Young, J. D. (2008). Exploring teaching styles and cognitive styles: Evidence from school teachers in Canada. *North American Journal of Psychology, 10*(3), 567-582.

Falk, D. R., & Johnson, D. W. (1977). The effects of perspective-taking and egocentrism on problem solving in heterogeneous and homogenous groups. *The Journal of Social Psychology, 102*, 63-72.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology. *Journal of Counseling Psychology, 51*(1), 115-134.

Galinsky, A. D., Maddux, W. W., Gilin, D., White, J. B. (2008). Why it pays to get inside the head of your opponent: The differential effects of perspective taking and empathy in negotiations. *Psychological Science, 19*(4), 378-384.

Garcia-Prieto, P., Bellard, E., & Schneider, S. C. (2003). Experiencing diversity, conflict, and emotions in teams. *Applied Psychology: An International Review, 52*(3), 413-440.

Gebert, D., Boerner, S., & Kearney, E. (2006). Cross-functionality and innovation in new product development teams: A dilemmatic structure and its consequences for the management of diversity. *European Journal or Work and Organizational Psychology, 15*(4), 431-458.

Groves, K. S. & Vance, C. M. (2009). Examining managerial thinking style, EQ, and organizational commitment. *Journal of Managerial Issues, 21*(3), 344-366.

Guzzo, R. A. & Dickson, M. W. (1996). Teams and organizations: Recent research on performance and effectiveness. *Annual Review of Psychology, 47*, 307-338.

Hackman, J. R. (1987). The design of work teams. In J. Lorsch (Ed.), Handbook of organizational behavior (pp. 315-342). Englewood Cliffs, NJ: Prentice Hall

Harrison, D. A., & Klein, K. J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *Academy of Management Review, 32*(4), 1199-1228.

Hayes, A. F., & Krippendorf, K. (2007). Answering the call for a standard reliability measure for coding data. *Communication Methods and Measures, 1*(1), 77-89.

Hayes, J. & Allinson, C. W. (1994). Cognitive style and its relevance for management practice. *British Journal of Management, 5*, 53-71.

Henderson, J. C. & Nutt, P. C. (1980). The influence of decision style on decision making behavior. *Management Science, 26*(4), 371-386.

Henningsen, D. D. & Henningsen, M. L. M (2004). The effect of individual difference variables on information sharing in decision-making groups. *Human Communication Research, 30*(4), 540-555.

Hinds, P. J., & Mortensen, M. (2005). Understanding conflict in geographically distributed teams: The moderating effects of shared identity, shared context, and spontaneous communication. *Organization Science, 16*(3), 290-307.

Hirokawa, R. Y. & Johnston, D. D. (1989). Toward a general theory of group decision making: Development of an integrated model. *Small Group Behavior, 20*(4), 500-523.

Hmieleski, K. M., & Corbett, A. C. (2006). Proclivity for improvisation as a predictor of entrepreneurial intentions. *Journal of Small Business Management, 44*(1), 45-63.

Horwitz, S. K., & Horwitz, I. B. (2007). The effects of team diversity on team outcomes: A meta-analytic review of team demography. *Journal of Management. 33*(6), 987-1015.

Hough, J. R., & dt ogilvie. (2005). An empirical test of cognitive style and strategic decision outcomes. *Journal of Management Studies, 42*(2), 417-448.

Huber, G. & Lewis, K. (2010). Cross understanding: Implications for group cognition and performance. *Academy of Management Review, 35*(1), 6-26.

Hunt, R. G., Krzystofiak, F. J., Meindl, J. R., & Yousry, A. M. (1989). Cognitive style and decision making. *Organizational Behavior and Human Decision Processes, 44*, 436-453.

James, L. R. (1982). Aggregation bias in estimates of perceptual agreement. *Journal of Applied Psychology, 67*(2), 219-229.

James, L. R., Demaree, R. G. & Wolf, G. (1984). Estimating within-group interrater reliability with and without response bias. *Journal of Applied Psychology. 89*(1) 85–98.

Jehn, K. A. (1995). A Multimethod examination of the benefits and detriments of intragroup conflict. *Administrative Sciences Quarterly, 40*, 256-282.

Jehn, K. A. (1997). A qualitative analysis of conflict types and dimensions in organizational groups. *Administrative Sciences Quarterly, 42*, 530-557.

Jehn, K. A., Northcraft, G. B., & Neale, M. A. (1999). Why differences make a difference: A field study of diversity, conflict, and performance in workgroups. *Administrative Sciences Quarterly, 44,* 741-763.

Johnson, D. W. (1977). The distribution and exchange of information in problem-solving dyads. *Communication Research, 4*(3), 283-298.

Jung, C. G. (1971). *Psychological Types*. Princeton, N.J.: Princeton University Press.

Kemp, K. E., & Smith, W. P. (1994). Information exchange, toughness, and integrative bargaining: The roles of explicit cues and perspective-taking. *The International Journal of Conflict Management, 5*(1), 5-21.

Kickul, J., Gundry, L. K., Barbosa, S. D., & Whitcanack, L. (2009). Intuitition versus analysis? Testing differential models of cognitive style on entrepreneurial self-efficacy and new venture creation process. *Entrepreneurship: Theory and Practice*, *33*(2), 439-453.

King, E. B., Hebl, M. R., & Beal, D. J. (2009). Conflict and cooperation in diverse workgroups. *Journal of Social Sciences, 65*(2), 261-285.

Kirton, M. (1976). Adaptors and Innovators: A description and measure. *Journal of Applied Psychology, 61*(5), 622-629.

Knight, D., Pearce, C. L. Smith, K, G., Olian, J. D., Sims, H. P., Smith, K. A., Flood, P., (1999). Top management team diversity, group process, and strategic consensus. *Strategic Management Journal, 20*(5), 445-465.

Kolb, D. A. (1976). *Learning Style Inventory: Technical Manual*. Englewood Cliffs, NJ: Prentice Hall.

Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. *Psychological Bulletin, 133*(3), 464-481.

Krippendorff, K. (2004). *Content Analysis: An Introduction to its Methodology*. Thousand Oaks, CA: SAGE Publications.

Lebreton, J. M. & Senter, J. L. (2008). Answers to 20 questions about interrater reliability and interrater agreement. *Organizational Research Methods, 11*(4), 815-852.

Leonard, N. H., Scholl, R. W., & Kowalski, K. B. (1999). Information processing style and decision making. *Journal of Organizational Behavior, 20*, 407-420.

Lim, B. C. & Klein, K. J. (2006). Team mental models and team performance: A field study of the effects of team mental model similarity and accuracy. *Journal of Organizational Behavior*, 27, 403-418.

Loehlin, J. C. (2004). *Latent variables models: An introduction to factor, path, and structural equation analysis* (4th ed.). Mahwah, N.J.: Lawrence Erlbaum Associates Publishing.

Loo, R. (2000). A psychometric evaluation of the general decision-making style inventory. *Personality and Individual Differences, 29*, 895-905.

Martinsons, M. G., & Davison, R. M. (2007). Strategic decision making and support systems: Comparing American, Japanese and Chinese management. *Decision Support Systems, 43*, 284-300.

Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Cannon-Bowers, J. A., & Salas, E. (2005). Scaling the quality of teammates' mental models: Equifinality and normative comparisons. *Journal of Organizational Behavior, 26*, 37–56.

Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. (2000). The influence of shared mental models on team process and performance. *Journal of Applied Psychology, 85*, 273–283.

McGrath, J. E. (1984). *Groups: Interaction and Performance*. Englewood Cliffs, NJ : Prentice-Hall.

Mello, A. L., Rentsch, J. R., Delise, L. A., Staniewicz, M. J., & Letsky, M. (2009, April). Information sharing, knowledge transfer, and cognition in distributed teams. Poster presented at the 24th annual meeting of the Society of Industrial and Organizational Psychology, New Orleans, LA.

Mello, A. L., Scott, N. M, Delise, L. A., Staniewicz, M. J., & Rentsch, J. R. (2011, August). Rational and intuitive styles: Construct validation of four measures. Presented at the 119th Annual Convention of the American Psychological Association, Washington, D.C.

Mesmer-Magnus, J. R., DeChurch, L. A., Jimenez-Rodriguez, M. J., Wildman, J., & Shuffler-Porter, M. (2011). A meta-analytic investigation of virtuality and information sharing in teams. *Organizational Behavior and Human Decision Processes, 115*(2), 214-225.

Milliken, F. J., & Martins, L. L. (1996). Searching for the common threads: Understanding the multiple effects of diversity in organizational groups. *Academy of Management Review, 21*(2), 402-433.

Mohammed, S., & Ringseis, E. (2001). Cognitive diversity and consensus in group decision making: The role of inputs, processes, and outcomes. *Organizational Behavior and Human Decision Processes, 85*(2), 310-335.

Neuman, G. A., Wagner, S. H., & Christiansen, N. D. (1999). The relationship between work-team personality composition and the job performance of teams. *Group & Organization Management, 24*(1), 28-45.

Nunnally, J. C. & Bernstein, I. H. (1994). *Psychometric theory*. (3rd Ed.) New York, N.Y.: McGraw-Hill.

Olson, B. J., Parayitam, S., & Bao, Y. (2007). Strategic decision making: The effects of cognitive diversity, conflict, and trust on decision outcomes. *Journal of Management, 33*(2), 196-222.

Park, H. S. & Raile, A. N. W. (2010). Perspective taking and communication satisfaction in coworker dyads. *Journal of Business Psychology, 25*, 569-581.

Pelled, L. H. (1996). Demographic diversity, conflict, and work group outcomes: An intervening process theory. *Organization Science, 7*(6), 615-631.

Pelled, L. H., Eisenhardt, K. M., & Xin, K. R. (1999). Exploring the black box: An analysis of work group diversity, conflict, and performance. *Administrative Sciences Quarterly, 44*, 1-28.

Priola, V., Smith, J. L., & Armstrong, S. J. (2004). Group work and cognitive style: A discursive investigation. *Small Group Research, 35*(5), 565-595.

Rayner, S. & Riding, R. (1997). Towards a categorisation of cognitive styles and learning styles. *Educational Psychology, 17*(1/2), 5-30.

Reimer, T. (2001). Attributions for poor group performance as a predictor of perspective-taking and subsequent group achievement: A process model. *Group Processes and Intergroup Relations, 4*(1), 31-47.

Rentsch, J. R. & Hall, R. J. (1994). Members of great teams think alike: A model of team effectiveness and schema similarity among team members. In Beyerlein, M. M. & Johnson, D. A. (Eds). *Advances in Interdisciplinary Studies of Work Teams: Theories of Self-Managing Work Teams, Vol. 1.* (pp. 223-261). Greenwich, CT: JAI Press.

Rentsch, J. R. & Klimoski, R. J. (2001). Why do 'great minds' think alike?: Antecedents of team member schema agreement. *Journal of Organizational Behavior, 22,* 107-120.

Rentsch, J. R., Delise, L. A., Salas, E., & Letsky, M. P. (2010). Facilitating knowledge building in teams: Can a new team training strategy help? *Small Group Research, 41*(5), 505-523.

Rentsch, J. R., Delise, L.A. & Hutchison, S. (2010). Cognitive similarity configurations in teams: In search of the team MindMeld. In E. Salas, G. F. Goodwin, and C. S. Burke (Eds.)

Team effectiveness in complex organizations (pp. 237-262). New York, NY: Taylor & Francis.

Rentsch, J. R., Heffner, T. S., & Duffy, L. T. (1994). What you know is what you get from experience: Team experience related to teamwork schemas. *Group & Organization Management, 19*, 450-474.

Rentsch, J. R., Small, E. E. & Hanges, P. J. (2008). Cognitions in organizations and teams: What is the meaning of cognitive similarity? In D. B. Smith (Ed.). *The people make the place: Dynamic linkages between individuals and organizations*. (pp. 127-156) .NY: Lawrence Erlbaum.

Rentsch, J.R. (2006, January). Developing shared understanding through knowledge management: Collaboration and meaning analysis process (C-MAP). Paper presented at the Collaboration and Knowledge Management Workshop, Boston, MA.

Riding, R. & Cheema, I. (1991). Cognitive styles – an overview and integration. *Educational Psychology, 11*(3/4), 193- 226.

Rizkalla, L., Wertheim, E. H., & Hodgson, L. K. (2008). The roles of emotion management and perspective taking in individuals' conflict management styles and disposition to forgive. *Journal of Research in Personality, 42*, 1594-1601.

Robey, D., & Taggart, W. (1981). Measuring managers' minds: The assessment of style in human information processing. *Academy of Management Review, 6*(3), 375-383.

Rodriguez, R. (1998). Challenging demographic reductionism: A pilot study investigating diversity in group composition. *Small Group Research, 29*(6), 744-759.

Romero, J. E., Tepper, B. J., & Tetrault, L. A. (1992). Development and validation of new scales to measure Kolb's (1985) learning style dimensions. *Educational and Psychological Measurement, 52*, 171-180.

Rowe, A. J., & Mason, R. (1987). *Managing with style: A guide to understanding, assessing, and improving decision making*. San Francisco: Jossey-Bass.

Ruble, T. L., & Cosier, R. A. (1990). Effects of cognitive styles and decision setting on performance. *Organizational Behavior and Human Decision Processes, 46*, 283-295.

Sadler-Smith, E. (1998). Cognitive style: Some human resource implications for managers. *International Journal of Human Resource Management 9*(1), 185-202.

Scholten, L., van Knippenberg, D., Nijstad, B. A., De Drue, C. K. W. (2007). Motivated information processing and group decision-making: Effects of process accountability on information processing and decision quality. *Journal of Experimental Social Psychology, 43*(4), 539-552.

Scott, S. G., & Bruce, R. A. (1995). Decision-making style: The development of a new measure. *Educational and Psychological Measurement*, 55(5), 818-831.

Sessa, V. I. (1996). Using perspective taking to manage conflict and affect in teams. *Journal of Applied Behavioral Science, 32*(1), 101-115.

Sessa, V. I. (1996). Using perspective taking to manage conflict and affect in teams. *Journal of Behavioral Science, 32*(1) 101-115.

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*(2), 420-428.

Sims, R. R., Veres, J. G., & Shake L. G. (1989). An exploratory examination of the convergence between the learning styles questionnaire and the learning style inventory II. *Educational and psychological Measurement, 49*, 227-233.

Smith-Jentsch, K.A., Campbell, G.E., Milanovich, D.M. & Reynolds, A.M. (2001). Measuring teamwork mental models to support training needs assessment, development, and evaluation: Two empirical studies. *Journal of Organizational Behavior,* 22, 179-194

Stumpf, S. A. & Freedman, R. D. (1981). The learning style inventory: still less than meets the eye. *Academy of Management Review, 6*(2), 297-299.

Sundstrom, E., DeMeuse, K. P., & Futrell, D. (1990). Work teams: Applications and effectiveness. *American Psychologist, 45,* 120-133.

Tepper, B. J., Tetrault, L. A., Braun, C. K., & Romero, J. E. (1993). Discriminant and convergent validity of the problem solving style questionnaire. *Educational and Psychological Measurement, 53*, 437-444.

Thompson, L. F., & Coovert, M. D. (2003). Team work online: The effects of computer conferencing on perceived confusion, satisfaction and post-discussion accuracy. *Group Dynamics, 7*, 135-151.

Thunholm, P. (2004). Decision-making style: habit, style or both? *Personality and Individual Differences, 32*, 931-944.

van Knippenberg, D. & Schippers, M. C. (2007). Work group diversity. *Annual Review of Psychology, 58*, 515-541.

Vance, C. M., Groves, K. S., Paik, Y., & Kindler, H. (2007). Understanding and measuring linear-nonlinear thinking style for enhanced management education and professional practice. *Academy of Management Learning & Education, 6*(2), 167-185.

Volkema, R. J. & Gorman, R. H. (1998). The influence of cognitive-based group composition on decision-making process and outcome. *Journal of Management Studies, 35*(1), 105-121.

Webber, S. S., & Donahue, L. M. (2001). Impact of highly and less job-related diversity on work group cohesion and performance: A meta-analysis. *Journal of Management. 27*(2), 141-162.

West, G. P. (2007). Collective cognition: When entrepreneurial teams, not individuals, make decisions. *Entrepreneurship Theory & Practice, 31*(1), 77-102.

Williams, K. Y., & O'Reilly, C. A. (1998). Demography and diversity in organizations. In B. M. Staw & R. M. Sutton (Eds.), *Research in Organizational Behavior: Vol. 20*, pp. 77-140. Stamford, CT: JAI.

Zellmer-Bruhn, M. E., Maloney, M. M., Dhappu, A. D., & Salvador, R. (2008). When and how do differences matter? An exploration of perceived similarity in teams. *Organizational Behavior and Human Decision Processes, 107*, 41-59.

Appendix A

Rational and Intuitive Styles: Construct Validation of Four Measures

Abby L. Mello, Nancy Scott, Lisa A. Delise, Melissa Staniewicz, and Joan R. Rentsch

The University of Tennessee

Rational and intuitive styles reflect differences in the way individuals gather and process information (Hayes & Allinson, 1994; Ridding & Cheema, 1991; Robey & Taggart, 1981; Sadler-Smith, 1998). Research suggests that these styles are differentially associated with decisiveness (Hough & ogilvie, 2005), leader-member exchange relationships (Allinson, Armstrong, & Hayes, 2001), team leader behavior (Armstrong & Priola, 2001), teaching style (Evans, Harkins, & Young, 2008), entrepreneurship characteristics (Kickul, Gundry, Barbosa, & Whitcanack, 2009), and risk assessment (Henderson & Nutt, 1980). To capitalize on rational/intuitive style differences in practice and research, reliable and valid measures must be used. Therefore, the purpose of present study was to compare the construct validity evidence for measures of rational and intuitive style because the literature is lacking this evaluation.

Rational and Intuitive Styles

Rational style, also referred to as analytic style and linear style, is characterized by a thorough search for facts and data, deliberate, logical information processing, and a focus on problem details when making decisions. Hough and ogilvie (2005) wrote, “analytical processes… [are] slow, rule-based, and depend on high-effort systematic reasoning” (p. 426). Allison and Hayes (1996) stated that rational thinking "…refers to judgment based on mental reasoning and a focus on detail" (p. 122). Vance, Groves, Paik, and Kindler (2007) defined “linear thinking style as a preference for attending to external data and facts, *and* processing this information through conscious logic and rational thinking…” (p. 170, italics in original).

Intuitive style, also referred to as holistic style and nonlinear style, has been described as being based on internal feelings, a big-picture approach, little external data gathering, and fast, intuition-based decision making. Hough and ogilvie (2005) wrote, “intuitive processes are fast, associative, and use low-effort heuristics” (p. 426). Allinson and Hayes (1996) stated that

intuitive "…refers to immediate judgment based on feelings and the adoption of a global perspective" (p. 122). Vance et al. (2007) noted, “holistic in nature, intuition is often the result of an automatic and unconscious assessment of the interrelated parts of a nonlinear system that scans the integrated “big picture” to point to appropriate decisions and new directions, rather than getting delayed and lost in the detailed analysis of a huge set of data” (p. 169).

Theory and empirical research support the notion that people have a consistent preference for either a rational or intuitive style, but not both (Robey & Taggart, 1981). Therefore, we expect positive relationships among rational style measures and positive relationships among intuitive style measures, but negative relationships between rational and intuitive measures. Rational measures evaluated in the present study were the Rational scale of the General Decision-Making Style instrument (GDMS, Scott & Bruce, 1995), the Linear and External scales of the Linear-NonLinear Thinking Styles Profile (LNTSP, Vance et al., 2007), and the Analytic and Directive scales of the Decision Style Inventory (DSI, Rowe & Mason, 1987; See Table 1). Intuitive measures evaluated were the Intuitive scale of the GDMS, the Nonlinear and Internal scales of the LNTSP, and the Conceptual and Behavioral scales of the DSI. The Cognitive Style Index (CSI, Allinson & Hayes, 1996), which is scored such that high scores reflect rational style and low scores reflect intuitive style, was also included.

Construct Validity Evidence

Construct validity evidence includes indications of convergent relationships and expected relationships with variables in the nomological net (Nunnally & Bernstein, 1994). In the present study, convergent validity evidence was obtained by evaluating the intercorrelations among the style measures (as described above).

Evidence of predicted relationships with variables in the nomological net was also evaluated. Specifically, rational style should be associated with conscientiousness and learning goal orientation. Conscientiousness is characterized by organization, planning, carefulness, and deliberation (Clark & Schroth, 2010; Perry, Witt, Penney, & Atwater, 2010). Learning goal orientation is characterized by a desire to develop one's competence through acquiring new skills and mastering new situations (Vandewalle, 1997). Rational style should be positively related to conscientiousness and learning goal orientation because rational style is characterized by a thorough search for data, detail-oriented problem solving, and careful, planned decision making, characteristics that highly conscientious and learning goal oriented individuals would exhibit.

Intuitive style should be related to extraversion and self-monitoring. Extraversion is described as engagement in one's surrounding environment (Bolton, Becker, & Barber, 2010). Self-monitoring refers to the degree to which people regulate, through self-observation, the way they present themselves to others (Gangestad & Snyder, 1985; Snyder, 1974). Intuitive style should be positively related to extraversion and self-monitoring because individuals with an intuitive style also use a big picture approach to problem solving, including an understanding of the external environment.

Rational and intuitive style should not be significantly related to agreeableness, openness to experience, emotional stability, perspective taking, self-esteem, social desirability, or psychological collectivism. Agreeableness reflects a desire for social harmony and cooperation with others (Bolton et al., 2010). Openness to experience is characterized by imagination, sensitivity, and a willingness to try new experiences (McCrae & Costa, 1983). Emotional stability relates to the tendency to experience emotional swings or negative emotions (Perry et al., 2010). Perspective taking is the inclination to "spontaneously adopt the point of view of

others" (Davis, 1980, p.114). Self-esteem is a conscious global self-evaluation of one's worth (Campbell, Eisner, & Riggs, 2010). Social desirability is a measure of an individuals' tendency to respond in a socially desirable manner (Crowne & Marlowe, 1960), a response bias that should not exist for a valid style measure. Psychological collectivism refers to the extent to which individuals emphasize relationships within and feel responsibility towards an in-group (Jackson, Colquitt, Wesson, & Zapata-Phelan, 2006). These variables should be unrelated to rational and intuitive style because they do not directly relate to information gathering, organization, or processing.

Method

Participants

Participants were 119 students from a large public university who received course credit for participation. Participants were 42% female, 83% Caucasian, 74% upperclassman, 56% currently employed, and had a mean age of 20.9 years.

Procedure

Participants were given two packets of measures that included informed consent information. They were instructed to complete both packets at different times to avoid fatigue and to return the completed measures within seven days. Participants were debriefed and awarded credit upon packet return. Measures were ordered within each packet to vary construct and response format.

Measures

Rational and intuitive style. Four measures were used to assess rational and intuitive style. The CSI contained 38 *true/uncertain/false* items that were scored 0 (intuitive), 1 (uncertain), or 2 (rational) points, yielding a possible 0-76 range. Internal consistency reliability

estimates have ranged from .84 to .92 (Allinson & Hayes, 1996). The LNTSP contained a 5-item Linear/Nonlinear scale and a 8-item External/Internal scale, each consisting of pairs of stimuli containing one Linear (or External) option and one Nonlinear (or Internal) option. Respondents distributed three points across each pair of items, which resulted in the Linear (External) and Nonlinear (Internal) responses being correlated -1.00. Therefore, scores for only the Linear and External scales were used in the analyses, with scores ranging from 0-15 and 0-24, respectively. Internal consistency reliability estimates have ranged from .70 to .78 for Linear and from .84 to .92 for External (Vance et al., 2007). GDMS contained a Rational scale (four items) and an Intuitive scale (five items) with a 1 (*strongly disagree*) to 5 (*strongly agree*) response scale. Internal consistency reliability estimates have ranged from .77 to .85 for Rational and from .78 to .84 for Intuitive (Scott & Bruce, 1995). DSI contained 20 questions, each with four responses, one response representing each style. Respondents allocated 1, 2, 4, or 8 points to each option to indicate their likelihood of acting according to the represented style (Analytic, Conceptual, Directive, or Behavioral). Split-half reliability estimates have ranged from .5 to .7 (Rowe & Mason, 1987). Internal consistency reliability estimates for these measures in the present study can be found in Table 2.

Nomological net variables. Learning goal orientation was assessed with five items using a 1 (*strongly disagree*) to 7 (*strongly agree*) response scale. Internal consistency reliability estimates have ranged from .88 to .91 (Vandewalle, 1997). The items were adapted to academic situations. Conscientiousness and extraversion were each assessed with eight items using 1 (*very inaccurate*) to 7 (*very accurate*) response scale. Internal consistency reliability estimates have ranged from .83 to .86 and .83 to .85, respectively (Saucier, 1994). Self-monitoring was assessed with the Self-Monitoring Scale using 18 *true/false* items with a reported internal consistency

reliability estimate of .70 (Gangestad & Snyder, 1985). Internal consistency reliability estimates for these measures in the present study can be found in Table 3.

Discriminant nomological net variables. Agreeableness, openness to experience, and emotional stability were each assessed with eight items using a 1 (*very inaccurate*) to 7 (*very accurate*) response scale. Internal consistency reliability estimates have ranged from .81 to .85, .78, and .76 to .78, respectively (Saucier, 1994). Perspective taking was assessed with seven items from the Interpersonal Reactivity Index using a 1 (*does not describe me well*) to 5 (*describes me very well*) response scale. Internal consistency reliability estimates have ranged from .71 to .77 (Davis, 1980). Self-esteem was assessed with the 10-item Rosenberg Self-Esteem Scale (Rosenberg, 1985) using a 1 (*doesn't describe me in the slightest*) to 9 (*describes me perfectly*) response scale. The reported internal consistency reliability estimate was .83 (Campbell, Eisner, & Riggs, 2010). Social desirability (Crowne & Marlowe, 1960) was assessed with 32 items using a *true/false* response scale. The reported internal consistency reliability estimate was .75 (Holden & Passey, 2010). Five dimensions of psychological collectivism regarding in-groups (preference, reliance, concern, acceptance of norms, and goal priority) were assessed with three items each using a 1 (*strongly disagree*) to 5 (*strongly agree*) response scale. Reported internal consistency reliability estimates were .86, .81, .90, .90, and .86, respectively for the subscales (Jackson et al., 2006). Internal consistency reliability estimates for these measures in the present study can be found in Table 4. Demographic information regarding age, gender, grade point average (GPA), class rank, and work experience was also assessed.

Results

Descriptive statistics are reported in Tables 2-4. Partial correlations were examined in cases where demographic variables correlated significantly with study variables. All correlations reported in parentheses below were significant at $p < .05$.

Convergent Validity Evidence

Evidence of convergent validity was obtained by examining the intercorrelations among the cognitive style assessments. See Table 2. We expected rational measures to correlate positively with one another, intuitive measures to correlate positively with one another, and rational measures to correlate negatively with intuitive measures.

Results for CSI, Linear, External, Rational, and Intuitive were strong. CSI correlated positively with Linear (.45), External (.49), and Rational (.55), and negatively with Intuitive (-.46). Similarly, Linear correlated positively with External (.55) and Rational (.41), and negatively with Intuitive (-.60). External correlated positively with Rational (.49) and negatively with Intuitive (-.55). Rational and Intuitive were negatively correlated (-.38).

The DSI scales (Analytic, Conceptual, Directive, and Behavioral) were expected to correlate significantly with one another and with the other five scales. Analytic correlated negatively with Conceptual and Behavioral (-.34 and -.58, respectively), but not positively with Directive. Conceptual correlated negatively with Directive (-.34), but not positively with Behavioral. Directive and Behavioral were negatively correlated (-.41). Results for the Analytic scale were strong. Analytic correlated positively with CSI (.40), Linear (.43), External (.41), and Rational (.45), and negatively with Intuitive (-.33). Results for the Conceptual and Behavioral scales were mixed. Conceptual correlated negatively with CSI (-.24) and Rational (-.20), but not negatively with Linear or External or positively with Intuitive. Behavioral correlated negatively

with External (-.21) and Rational (-.21), but not positively with Intuitive or negatively with CSI and Linear. Results for the Directive scale were poor. We hypothesized that Directive would correlate positively with CSI, Linear, External, and Rational and negatively with Intuitive. However, it correlated positively with Intuitive (.33).

Nomological Net Evidence

We hypothesized that rational style would be positively related to conscientiousness and learning goal orientation and negatively related to extraversion and self-monitoring, with relationships in the opposite direction for intuitive style. See Table 3.

Evidence for Linear was strong. It correlated positively with conscientiousness (.31) and learning orientation (.30) and negatively with extraversion (-.21) and self-monitoring (-.34).

Evidence for the CSI, External, Rational, and Analytic scales was moderate. CSI, External, Rational, and Analytic correlated positively with conscientiousness (.49, .29, .33, and .30, respectively) and negatively with self-monitoring (-.52, -.46, -.36, and -.30, respectively). Rational and Analytic were positively correlated with learning orientation (.22 and .24, respectively). CSI and External were negatively correlated with extraversion (-.35 and -.28. respectively).

Evidence for Intuitive was modest. It correlated positively with extraversion (.41) and self-monitoring (.38) but was not correlated with conscientiousness and learning orientation. Evidence for Conceptual, Directive, and Behavioral was poor. There were no significant correlations for Conceptual and Behavioral, and Directive was unexpectedly positively correlated with self-monitoring (.31).

Discriminant Nomological Net Evidence

It was hypothesized that style would be unrelated to agreeableness, openness to experience, emotional stability, perspective taking, self-esteem, social desirability, and the five dimensions of in-group collectivism (preference, reliance, concern, norm acceptance, and goal priority). See Table 4.

Evidence for CSI and Analytic was strong. Both were unrelated to agreeableness, openness to experience, emotional stability, perspective taking, self-esteem, social desirability, and the collectivism dimensions.

Evidence for Linear, External, Rational, and Directive was moderately strong. All four scales were unrelated to agreeableness, openness to experience, emotional stability, perspective taking, self-esteem, and three collectivism dimensions (reliance, concern, and norm acceptance). However, Linear and Directive were correlated with social desirability (.27 and -.33, respectively). External and Rational each correlated with one of the collectivism scales – External with preference (-.29) and Rational with goal priority (-.30).

Evidence for Intuitive and Conceptual was moderate. Both were unrelated to agreeableness, openness to experience, perspective taking, self-esteem, and three of the collectivism dimensions (reliance, norm acceptance, and goal priority). However, Intuitive was correlated with social desirability (-.25) and the collectivism dimension preference (.27) and Conceptual was correlated with emotional stability (.35) and the collectivism dimension concern (-.22).

Evidence for Behavioral was modest. It was unrelated to agreeableness, emotional stability, self-esteem, and four collectivism dimensions (preference, concern, norm acceptance,

and goal priority). However, it was correlated with openness to experience (-.22), perspective taking (.22), social desirability (.30), and the collectivism dimension reliance (.25).

Discussion

Evaluation of Each Measure

Useful measures of rational and intuitive styles should be reliable, correlated with predicted nomological net variables, uncorrelated with discriminant variables, free of social desirability bias, uncorrelated with demographics variables, and should have a reasonable length, response format, and an identifiable context for use. Below, we offer recommendations for each measure based on these characteristics. A summary is also presented in Table 5. All measures except the DSI had acceptable internal consistency reliability estimates.

The validity evidence for the CSI was strong. It demonstrated expected relationships with nomological net variables and discriminant variables, and was not significantly correlated with social desirability. With respect to demographics, in the present sample it was positively correlated with GPA, possibly because typical academic assessments may favor the careful and deliberate nature of rational style, leading to higher grades. The CSI is moderate in length. The minimal missing data may be attributable to the response format. Rows of identical answer bubbles may have led respondents to overlook some items. Minor format changes (e.g., lines, increased spaces between items) may alleviate this problem. CSI items are situated within a broad context with many work-related items. The CSI would be useful for assessing rational and intuitive style in general circumstances and managerial contexts.

The validity evidence for the LNTSP was also strong. It demonstrated expected relationships with nomological net and discriminant variables, although the External scale was negatively correlated with social desirability. The Linear and External scales were correlated

with GPA but not with other demographic variables. The LNTSP has only 13-items. However, approximately 10% percent of cases were missing because respondents' ratings violated the instructions (pair ratings did not sum to 3), indicating possible problems with the response format or the instructions. The LNTSP is the only measure evaluated in the present study that differentiated information gathering (External/Internal) from processing (Linear/Nonlinear). Therefore, the LNTSP would be appropriate for use in instances when both facets of style are of interest.

The validity evidence for the GDMS was fairly strong. The Rational and Intuitive scales generally correlated as expected with nomological net and discriminant variables. However, fewer predicted relationships were confirmed with the Intuitive scale and it was correlated with social desirability. Additionally, the Rational scale unexpectedly correlated negatively with class rank but, was unrelated to other demographic variables. The GDMS has relatively few items and had the least missing data (1% or fewer missing items and cases). The GDMS items were couched in the context of "important" decisions. The GDMS might be considered to assess style when a lengthier measure is impractical, but it would require controlling for social desirability.

The empirical evidence related to the DSI is relatively weak. All scales except Analytic showed poor construct validity evidence, Directive and Behavioral correlated with social desirability, and Behavioral correlated with gender. With an average scale reliability of less than .42 in the present study, the internal consistency reliability estimates were unacceptable. The DSI is lengthy because using any scale requires responses to 80 stimuli. Additionally, 17% of the cases were unusable because respondents' ratings violated the instructions (did not use 1, 2, 4, and 8 for their responses to each item). The items were work-related and were designed for

use with managers. Although the content of the DSI is commendable, given the empirical results, the DSI requires additional development before its use could be recommended.

Limitations and Future Research

The use of students in the present study may limit the generalizability of the results. However, 56% of participants held a job at the time of the study and 70% of those with jobs worked 20 hours per week or more. Thus, participants had substantial job experience and were representative of some employed populations. However, future research should evaluate these measures using samples from different populations (e.g., draw from various professions, experience levels, work contexts), which may reveal how the measures vary in their interpretation or applicability. Evaluation of style in various populations might also reveal relationships between style and other organizationally-relevant outcomes. Perhaps rational and intuitive styles lend themselves differently to various tasks. Researchers have found that turnover, for example, was higher when a misfit between style and job demands existed (Chan, 1996). Other outcomes such as job satisfaction and performance might also be influenced by the interaction of style and work contexts. Cross-sectional and longitudinal studies could provide insight into the stability or malleability of style. For example, if experience with problem-solving and decision making scenarios leads managers to feel more comfortable relying on global, intuition-based information processing, then intuitive style may be related to managerial experience. These are but a few possible fruitful paths for future style research.

The variables in this present study were measured using self-reports. Self-report data is often criticized as being fakeable, lacking reliability, and as producing invalid estimates of relationships with other variables (Chan, 2009). However, several aspects of the present study mitigate these concerns. The anonymity of the data and non-evaluative nature of the study

should have encouraged truthful responses (Chan, 2009). The various response formats of the measures required participants' attention and may have reduced the likelihood of such response biases as central tendency. Furthermore, the constructs in the present study do not lend themselves well to objective measures. They are most appropriately assessed using self-report methods, because they would not likely be more reliably captured using another measurement technique (Chan, 2009). Additional criterion variables such as peer ratings, time-to-decision, or schema structure could serve as alternative assessment approaches in future research.

With respect to the style measures, self-report is the preferred method of assessing them due to the nature of the constructs and the inherent difficulties associated with the other methods. For example, it is cumbersome and expensive to assess the brain waves of many individuals with an EEG (Robey & Taggart, 1981). Similarly, timed assessments or measures that must be sent for proprietary scoring are cumbersome to administer (Robey & Taggart, 1981). The contribution of the present study was to evaluate several measures commonly used in I-O and related literature. However, future research should extend measurement of rational and intuitive styles to behaviorally-oriented assessments.

Conclusion

The present study provides an evaluation of the construct validity evidence of measures of rational and intuitive styles. Convergent, nomological net, and discriminant validity results showed the most support for the CSI, followed by the LNTSP and GDMS, and poor support for the DSI. Reliability evidence, relationships with social desirability, and respondent difficulties with response format followed a similar pattern. Future research should continue to examine measures of rational and intuitive styles and their influences on organizationally-relevant variables.

References

Allinson, C. W., & Hayes, J. (1996). The cognitive style index: A measure of intuition-analysis for organizational research. *Journal of Management Studies, 33*(1), 119-135.

Allinson, C. W., Armstrong, S. J., & Hayes, J. (2001). The effects of cognitive style on leader-member exchange: A study of manager-subordinate dyads. *Journal of Occupational and Organizational Psychology, 74*, 201-220.

Armstrong, S. J., & Priola, V. (2001). Individual differences in cognitive style and their effects on task and social orientations of self-managed work teams. *Small Group Research, 32*(3), 283-312.

Bolton, L. R., Becker, L. K., & Barber, L. K. (2010). Big Five trait predictors of differential counterproductive work behavior dimensions. *Personality and Individual Differences, 49*(5), 537-541.

Campbell, R. L., Eisner, S., & Riggs, N. (2010). Sources of self-esteem: From theory to measurement and back again. *New Ideas in Psychology, 28*(3), 338-349.

Chan, D. (1996). Cognitive misfit of problem-solving style at work: A facet of person-organization fit. *Organizational Behavior and Human Decision Processes, 68*(3), 194-207.

Chan, D. (2009). So why ask me? Are self-report data really that bad? In C. E. Lance, & R. J. Vandenberg (Eds.), *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences* (pp. 309-336). New York: Routledge/Taylor & Francis Group.

Clark, M. H., & Schroth, C. A. (2010). Examining relationships between academic motivation and personality among college students. *Learning and Individual Differences, 20*(1), 19-24.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*(4). 349-354.

Evans, C., Harkins, M. J., & Young, J. D. (2008). Exploring teaching styles and cognitive styles: Evidence from school teachers in Canada. *North American Journal of Psychology, 10*(3), 567-582.

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 44*(1), 113-126.

Gangestad, S., & Snyder, M. (1985). “To carve nature at its joints": On the existence of discrete classes in personality. *Psychological Review, 92*(3), 317-349.

Hayes, J., & Allinson, C. W. (1994). Cognitive style and its relevance for management practice. *British Journal of Management, 5*, 53-71.

Henderson, J. C., & Nutt, P. C. (1980). The influence of decision style on decision making behavior. *Management Science, 26*(4), 371-386.

Hough, J. R., & ogilvie, d. (2005). An empirical test of cognitive style and strategic decision outcomes. *Journal of Management Studies, 42*(2), 417-448.

Holden, R. R., & Passey, J. (2010). Socially desirable responding in personality assessment: Not necessarily faking and not necessarily substance. *Personality and Individual Differences, 49*(5), 446-450.

Jackson, C. L., Colquitt, J. A., Wesson, M. J., & Zapata-Phelan, C. P. (2006). Psychological collectivism: A measurement validation and linkage to group member performance. *Journal of Applied Psychology, 91*(4), 884-899.

Kickul, J., Gundry, L. K., Barbosa, S. D., & Whitcanack, L. (2009). Intuitition versus analysis? Testing differential models of cognitive style on entrepreneurial self-efficacy and new venture creation process. *Entrepreneurship: Theory and Practice*, *33*(2), 439-453.

McCrae, R. R., & Costa, P. T. (1983). Joint factors in self-reports and ratings: Neuroticism, extraversion and openness to experience. *Personality and Individual Differences, 4*(3), 245-255.

Perry, S. J., Witt, L. A., Penney, L. M., & Atwater, L. (2010). The downside of goal-focused leadership: The role of personality in subordinate exhaustion. *Journal of Applied Psychology, 95*(6), 1145-1153.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd edition). New York: McGraw-Hill.

Riding, R., & Cheema, I. (1991). Cognitive styles – an overview and integration. *Educational Psychology, 11*(3/4), 193- 226.

Robey, D., & Taggart, W. (1981). Measuring managers' minds: The assessment of style in human information processing. *Academy of Management Review, 6*(3), 375-383.

Rosenberg, M. (1985). Self-concept and psychological well-being in adolescence. In R. L. Leahy (Ed.), *The development of the self* (pp. 205-246). Orlando, FL: Academic Press.

Rowe, A. J., & Mason, R. (1987). *Managing with style: A guide to understanding, assessing, and improving decision making*. San Francisco: Jossey-Bass.

Sacier, G. (1994). Mini-markers: A brief version of Goldberg's unipolar Big-Five markers. *Journal of Personality Assessment, 63*(3), 506-516.

Sadler-Smith, E. (1998). Cognitive style: Some human resource implications for managers. *International Journal of Human Resource Management, 9*(1), 185-202.

Scott, S. G., & Bruce, R. A. (1995). Decision-making style: The development of a new measure. *Educational and Psychological Measurement, 55*(5), 818-831.

Snyder, M. (1974). Self-monitoring of expressive behavior. *Journal of Personality and Social Psychology, 30*(4), 526-537.

Vandewalle, D. (1997). Development and validation of a work domain goal orientation instrument. *Educational and Psychological Measurement, 57*, 995-1015.

Vance, C. M., Groves, K. S., Paik, Y., & Kindler, H. (2007). Understanding and measuring linear-nonlinear thinking style for enhanced management education and professional practice. *Academy of Management Learning & Education, 6*(2), 167-185.

Table 1

Cognitive Style Measures Categorization and Scoring.

Measure	Higher Scores Indicate	Lower Scores Indicate
Rational Style		
LNTSP: Linear Scale		
LNTSP: External scale	More rational processing style	Less rational processing style
GDMS: Rational scale		
DSI: Analytic scale		
DSI: Directive scale		
Intuitive Style		
LNTSP: Nonlinear scale		
LNTSP: Internal scale	More intuitive processing style	Less intuitive processing style
GDMS: Intuitive scale		
DSI: Conceptual scale		
DSI: Behavioral scale		
Rational and Intuitive Style		
CSI	More rational processing style	More intuitive processing style

Table 2

Correlations Among Cognitive Style Measures

Variables	M	SD	r_{xx}	1	2	3	4	5	6	7	8	9
1. CSI	43.46	11.59	.82	-								
2. LNTSP: linear	7.67	2.65	.67	.45**[a]	-							
3. LNTSP: external	15.28	3.35	.76	.49**	.55**[a]	-						
4. GDMS: rational	15.35	2.45	.80	.55**	.41**[a]	.49**	-					
5. GDMS: intuitive	17.32	3.20	.82	-.46**[a]	-.60**[a]	-.55**[a]	-.38**[a]	-				
6. DSI: analytic	79.71	15.89	.50	.40**	.43**[a]	.41**	.45**	-.33**[a]	-			
7. DSI: conceptual	76.53	12.72	.24	-.24*	-.20[a]	-.10	-.20*	.15[a]	-.34**	-		
8. DSI: directive	73.97	13.49	.32	-.14[b]	-.20[c]	-.08[b]	-.01[b]	.33**[c]	-.10[b]	-.34**[b]	-	
9. DSI: behavioral	69.80	16.54	.61	.02	-.08[a]	-.21*	-.21*	-.10[a]	-.58**	-.14	-.41**[b]	-

Note. *n* ranges from 94-121

[a]Controlled for GPA

[b]Controlled for Age and Class

[c]Controlled for Age, Class, and GPA

* $p < .05$, ** $p < .01$; two-tailed tests.

Table 3

Nomological Net Correlations

Variables	Conscientious	Learning Orientation	Extraversion	Self-Monitoring
CSI	.49**[b]	.06[d]	-.35**	-.52**[e]
LNTSP: linear	.31**[b]	.30**[d]	-.21*[a]	-.34**[f]
LNTSP: external	.29**[b]	.16[d]	-.28**	-.46**[e]
GDMS: rational	.33**[b]	.22*[d]	-.11	-.36**[e]
GDMS: intuitive	-.06[b]	-.18[d]	.41**[a]	.38**[f]
DSI: analytic	.30**[b]	.24**[d]	-.14	-.30**[e]
DSI: conceptual	-.10[b]	.02[d]	-.01	-.02[e]
DSI: directive	-.12[d]	-.09[d]	.07[c]	.31**[g]
DSI: behavioral	-.13[b]	-.15[d]	.01	-.10[e]
r_{xx}	.82	.80	.82	.72
M	41.87	26.34	39.23	10.50
SD	7.59	5.81	8.33	3.54

Note. *n* ranges from 97-120

[a] Controlled for GPA

[b] Controlled for GPA and Age

[c] Controlled for Age and Class

[d] Controlled for Age, Class, and GPA

[e] Controlled for Gender

[f] Controlled for GPA and Gender

[g] Controlled for Age, Class, and Gender

* $p < .05$, ** $p < .01$; one-tailed tests.

Table 4

Discriminant Nomological Net Correlations

Variables	Agreeable	Openness	Emotional Stability	Perspective Taking	Self-Esteem	Social Desire
CSI	.07	.18	-.20[e]	.12	-.17	.15
LNTSP: linear	.09[a]	-.03[a]	.17[f]	.18[a]	.23[a]	.27*[a]
LNTSP: external	-.16	.06	-.11[e]	.01	.03	.16
GDMS: rational	.03	.18	-.18[e]	.10	.03	.12
GDMS: intuitive	-.04[a]	-.00[a]	.05[f]	-.23[a]	-.02[a]	-.25*[a]
DSI: analytic	.06	.20	-.10[e]	-.00	-.10	.05
DSI: conceptual	.00	.12	.35**[e]	.07	.14	-.05
DSI: directive	-.17[c]	-.01[c]	-.22[g]	-.16[c]	.17[c]	-.33**[c]
DSI: behavioral	.14	-.22*	.05[e]	.22*	-.03	.30**
r_{xx}	.83	.73	.81	.77	.83	.82
M	44.63	42.20	37.27	17.53	32.22	15.29
SD	7.15	6.21	8.17	4.98	4.55	5.64

Note. *n* ranges from 96-121.

[a]Controlled for GPA
[b]Controlled for GPA and Age
[c]Controlled for Age and Class
[d]Controlled for Age, Class, and GPA
[e]Controlled for Gender
[f]Controlled for GPA and Gender
[g]Controlled for Age, Class, and Gender

* $p < .05$, ** $p < .01$; two-tailed tests.

Table 4

Discriminant Nomological Net Correlations (Continued)

Variables	Collectivism				
	Prefer	Reliance	Concern	Norms	Goals
CSI	-.12	-.22[f]	.05	-.04	-.18[e]
LNTSP: linear	.10[a]	-.14[f]	-.00[a]	.10[a]	.16[f]
LNTSP: external	-.29**	-.24[f]	-.09	-.08	.02[e]
GDMS: rational	-.06	-.22[f]	.06	-.04	-.30*[e]
GDMS: intuitive	.27*[a]	.23[f]	.13[a]	.00[a]	-.04[f]
DSI: analytic	-.07	-.22[f]	.17	-.05	.04[e]
DSI: conceptual	-.07	.13[f]	-.22*	-.13	-.02[e]
DSI: directive	-.01[c]	-.17[g]	-.02[c]	.03[c]	.09[g]
DSI: behavioral	.13	.25*[f]	.03	.16	-.02[e]
r_{xx}	.81	.95	.85	.86	.68
M	8.87	8.64	12.09	10.79	9.36
SD	3.08	2.80	1.95	1.76	2.47

Note. *n* ranges from 96-121.

[a]Controlled for GPA
[b]Controlled for GPA and Age
[c]Controlled for Age and Class
[d]Controlled for Age, Class, and GPA
[e]Controlled for Gender
[f]Controlled for GPA and Gender
[g]Controlled for Age, Class, and Gender

* $p < .05$, ** $p < .01$; two-tailed tests.

Table 5
Summary of Results

Scale	Number of Items	Percent Missing		Percent of Expected Relationships Confirmed	
		Items	Cases[1]	Nomological Net	Discriminant
CSI	38	<1	6	75	100
LNTSP: linear	5	7	8	100	91
LNTSP: external	8	5	9	75	91
GDMS: rational	4	<1	1	75	91
GDMS: intuitive	5	<1	1	50	82
DSI: analytic	20	4	17	75	100
DSI: conceptual	20	4	17	0	82
DSI: directive	20	4	17	0	91
DSI: behavioral	20	4	17	0	64

[1] Because no missing data were replaced and scale scores were sums of item scores, a missing item in a scale resulted in a missing case for that scale

Appendix B

People differ in the way they think about problems. Below are 38 statements designed to identify your own approach. If you believe that a statement is *true* about you, answer **T**. If you believe that it is *false* about you, answer **F**. If you are *uncertain* whether it is true or false, answer **?**. This is not a test of your ability, and there are no right or wrong answers. Simply choose the one response which comes closest to your own opinion. Work quickly, giving your first reaction in each case, and make sure that you respond to every statement.

Indicate your answer by completely filling in the appropriate oval opposite the statement:

T True **?** Uncertain **F** False

		T	**?**	**F**
1.	In my experience, rational thought is the only realistic basis for making decisions.	0	0	0
2.	To solve a problem, I have to study each part of it in detail.	0	0	0
3.	I am most effective when my work involves a clear sequence of tasks to be performed.	0	0	0
4.	I have difficulty working with people who 'dive in at the deep end' without considering the finer aspects of the problem.	0	0	0
5.	I am careful to follow rules and regulations at work.	0	0	0
6.	I avoid taking a course of action if the odds are against its success.	0	0	0
7.	I am inclined to scan through reports rather than read them in detail.	0	0	0
8.	My understanding of a problem tends to come more from thorough analysis than flashes of insight.	0	0	0
9.	I try to keep to a regular routine in my work.	0	0	0
10.	The kind of work I like best is that which requires a logical, step-by-step approach.	0	0	0
11.	I rarely make 'off the top of the head' decisions.	0	0	0
12.	I prefer chaotic action to orderly inaction.	0	0	0
13.	Given enough time, I would consider every situation from all angles.	0	0	0

14.	To be successful in my work, I find that it is important to avoid hurting other people's feelings.	0	0	0
15.	The best way for me to understand a problem is to break it down into its constituent parts.	0	0	0
16.	I find that to adopt a careful, analytical approach to making decisions takes too long.	0	0	0
17.	I make most progress when I take calculated risks.	0	0	0
18.	I find that it is possible to be too organised when performing certain kinds of task.	0	0	0
19.	I always pay attention to detail before I reach a conclusion.	0	0	0
20.	I make many of my decisions on the basis of intuition.	0	0	0
21.	My philosophy is that it is better to be safe than risk being sorry.	0	0	0
22.	When making a decision, I take my time and thoroughly consider all relevant factors.	0	0	0
23.	I get on best with quiet, thoughtful people.	0	0	0
24.	I would rather that my life was unpredictable than that it followed a regular pattern.	0	0	0
25.	Most people regard me as a logical thinker.	0	0	0
26.	To fully understand the facts I need a good theory.	0	0	0
27.	I work best with people who are spontaneous.	0	0	0
28.	I find detailed, methodical work satisfying.	0	0	0
29.	My approach to solving a problem is to focus on one part at a time.	0	0	0
30.	I am constantly on the lookout for new experiences.	0	0	0
31.	In meetings, I have more to say than most.	0	0	0
32.	My 'gut feeling' is just as good a basis for decision making as careful analysis.	0	0	0
33.	I am the kind of person who casts caution to the wind.	0	0	0

34.	I make decisions and get on with things rather than analyse every last detail.	0	0	0
35.	I am always prepared to take a gamble.	0	0	0
36.	Formal plans are more of a hindrance than a help in my work.	0	0	0
37.	I am more at home with ideas rather than facts and figures.	0	0	0
38.	I find that 'too much analysis results in paralysis'.	0	0	0

(Citation: Allinson, C. W., & Hayes, J. (1996). The cognitive style index: A measure of intuition-analysis for organizational research. *Journal of Management Studies, 33*(1), 119-135; Higher scores represent more rational style; the following items are reverse scored: 7, 12, 16, 17, 18, 20, 24, 27, 30, 31, 32, 33, 34, 35, 36, 37, and 38).

Appendix C

The following statements inquire about your thoughts and feelings in a variety of situations. For each item, indicate how well it describes you by choosing the appropriate letter on the scale: A, B, C, D, E, (where A = Does not describe me well and E = Describes me very well). When you have decided on your answer, select the appropriate letter. READ EACH ITEM CAREFULLY BEFORE RESPONDING. Answer as honestly as you can.

Answer Scale:

A	B	C	D	E
does not describe me well				describes me very well

1. ____ I sometimes find it difficult to see things from the "other guy's" point of view.
2. ____ I try to look at everybody's side of a disagreement before I make a decision.
3. ____ I sometimes try to understand my friends better by imagining how things look from their perspective.
4. ____ If I'm sure I'm right about something, I don't waste much time listening to other people's arguments.
5. ____ I believe that there are two sides to every question and try to look at them both.
6. ____ When I'm upset at someone, I usually try to "put myself in his shoes" for a while.
7. ____ Before criticizing somebody, I try to imagine how *I* would feel if I were in their place.

(Citation: Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 44*(1), 113-126; Higher scores indicate more perspective taking; the following items are reverse scored: 1 and 4).

Appendix D

Please answer the following questions about the extent to which differences in opinion and disagreements occur within the team.

1 – Not at all
2 –
3 –
4 –
5 – Very much

1. How frequently are there conflicts about ideas in the team?
2. How much are personality conflicts evident in the team?
3. How much tension is there among members in the team?
4. How often do people in the team disagree about opinions regarding the work being done?
5. How much friction is there among members in the team?
6. How much emotional conflict is there among members in the team?
7. To what extent are there differences of opinion in the team?
8. How much conflict about the work you do is there in the team?
9. To what extent do people take the arguments in the team personally?
10. How much jealousy or rivalry is there among the members in the team?

(Citation: Hinds, P. J., & Mortensen, M. (2005). Understanding conflict in geographically distributed teams: The moderating effects of shared identity, shared context, and spontaneous communication. *Organization Science, 16*(3), 290-307; Task conflict is represented by the following items: 1, 4, 7, and 8 where higher score equal more conflict; Affective conflict is represented by the following items: 2, 3, 5, 6, 9, and 10 where higher scores equal more conflict

Table 1. *Variable inter-correlations*

	$\bar{x}$	s.d.	1	2	3	4	5	6	7	8	9
1. CS Diversity[a]	11.04	6.79	-								
2. CS Mean[a, c]	43.58	7.14	-.14	-							
3. Affective Conflict	7.93	2.12	-.04	-.05	-						
4. Task Conflict	9.17	1.87	-.07	-.36*	.59*	-					
5. Schema Congruence[b]	.79	.13	.02	-.13	.08	-.04	-				
6. Perspective Taking[a]	17.44	3.24	.07	.18	-.08	-.13	-.24	-			
7. Performance: Percent Good	73.75	11.53	.08	.05	-.23	-.39*	.16	-.25	-		
8. Performance: Optimal	4.71	4.76	.11	-.14	-.15	-.18	.29*	-.40*	.76*	-	
9. Performance: Completeness	11.10	2.18	.14	-.02	-.32*	-.37*	.13	-.04	.74*	.36*	-

$n = 41$
[a] $n = 42$
[b] $n = 40$
[c] Higher scores are more rational

Table 2. *Hierarchical regression of cognitive style diversity on task conflict controlling for the mean effect of cognitive style*

	Predictors	B	SE B	β	t	*r*	R^2	ΔR^2	Sig.
Step 1						.36	.13	.13	.02
	Mean Cognitive Style	-.09	.04	-.36	-2.41				
Step 2						.38	.14	.01	.45
	Mean Cognitive Style	-.10	.04	-.37	-2.47				.02
	Cognitive Style Diversity	-.03	.04	-.12	-.76				.45

Table 3. *Moderated hierarchical regression of cognitive style diversity and perspective taking on task conflict*

	Predictors	B	SE B	β	t	*r*	R^2	ΔR^2	Sig.
Step 1						.14	.02	.02	.69
	Cognitive Style Diversity	-.02	.04	-.06	-.37				.71
	Perspective Taking	-.07	.09	-.12	-.75				.46
Step 2						.22	.05	.03	.28
	Cognitive Style Diversity	-.02	.04	-.08	-.47				.64
	Perspective Taking	-.27	.21	-.47	-1.31				.20
	CSD x PT	.02	.02	.39	1.01				.28

Table 4. *Moderated hierarchical regression of cognitive style diversity and perspective taking on affective conflict*

	Predictors	B	SE B	β	t	*r*	R^2	ΔR^2	Sig.
Step 1						.09	.01	.01	.87
	Cognitive Style Diversity	-.01	.05	-.03	-.17				.87
	Perspective Taking	-.05	.11	-.08	-.48				
Step 2						.40	.16	.16	.01
	Cognitive Style Diversity	-.02	.05	-.07	-.43				.67
	Perspective Taking	-.57	.22	-.87	-2.63				.01
	CSD x PT	.05	.02	.89	2.6				.01

Table 5. *Moderated hierarchical regression of cognitive style diversity and perspective taking on schema congruence*

	Predictors	B	SE B	β	t	*r*	R^2	ΔR^2	Sig.
Step 1						.24	.06	.06	.33
	Cognitive Style Diversity	.00	.00	.04	.22				.83
	Perspective Taking	-.01	.01	-.24	-.15				.14
Step 2						.32	.10	.05	.18
	Cognitive Style Diversity	.00	.00	.05	.32				.75
	Perspective Taking	.01	.01	.19	.54				.59
	CSD x PT	.00	.00	-.46	-1.36				.18

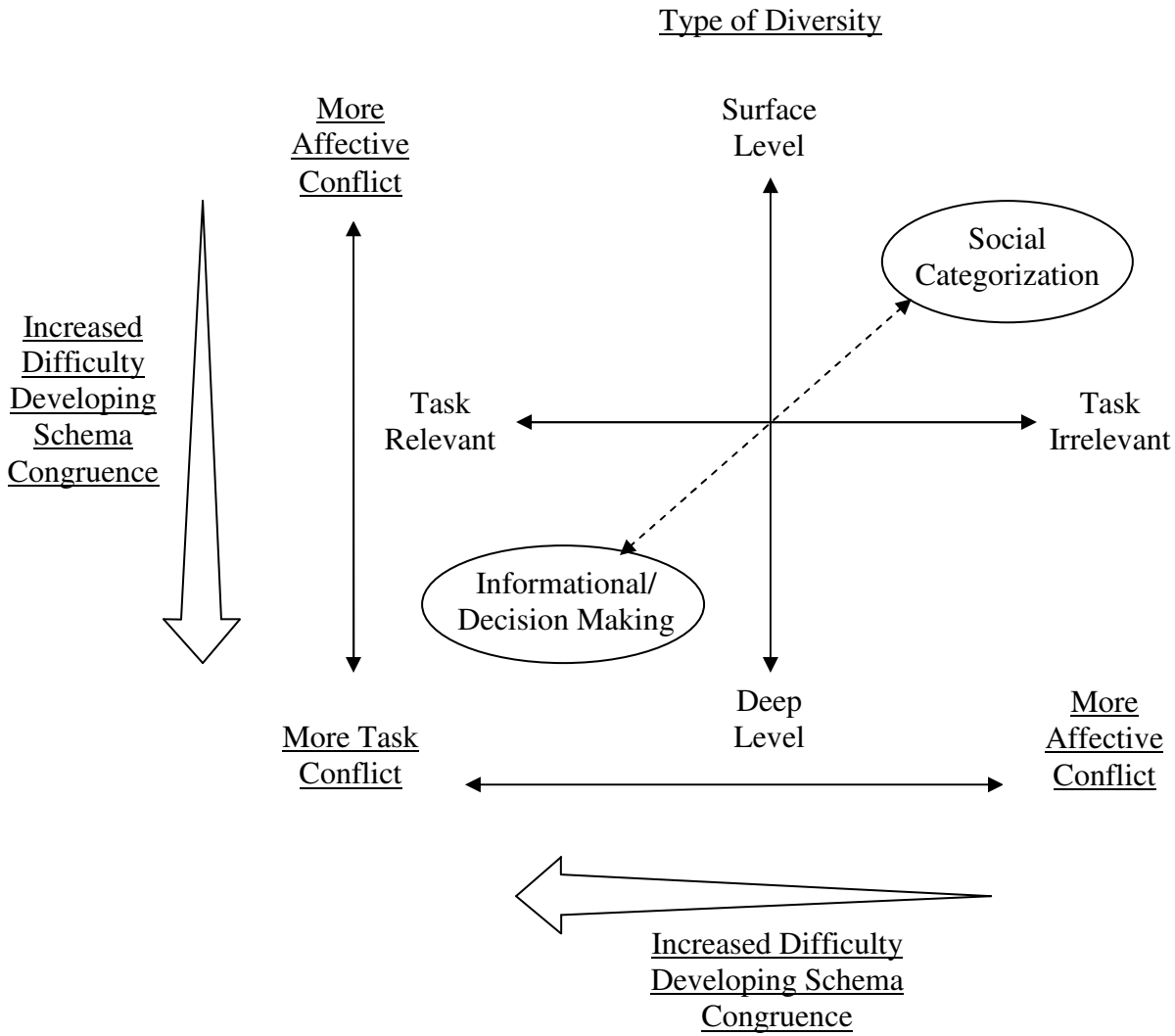

Figure 1. *The relationship between types of diversity, conflict, and the development of schema congruence*

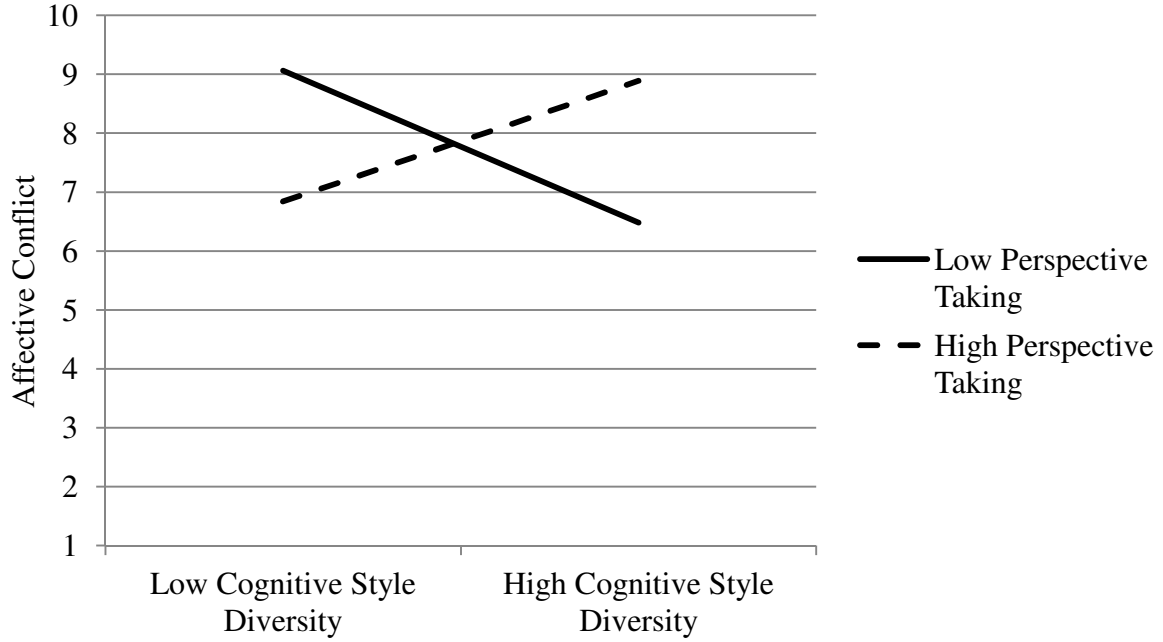

Figure 2. *Interaction of cognitive style diversity and perspective taking on affective conflict*

Vita

Abby Mello was born in New Haven, CT. She attended Caesar Rodney Senior High School in Dover, DE and graduated in 2001. From there she attended Wesley College in Dover, DE. She graduated Summa Cum Laude with a B.A. in Psychology and minor in Political Science in 2004. She successfully defended this dissertation to complete her Ph.D. from the University of Tennessee's Industrial-Organizational Psychology program on April 11, 2012.