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AN INTEGRATIVE MODEL OF CONFLICT AND CONFLICT MANAGEMENT IN ORGANIZATIONAL WORK TEAMS

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A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Psychology

AN INTEGRATIVE MODEL OF CONFLICT AND CONFLICT MANAGEMENT IN ORGANIZATIONAL WORK TEAMS

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Abstract

The major contribution of the current dissertation is the development of an integrative model involving two lines of research on intrateam conflict. The first line of research involves the theory of conflict types, which argues that there exists at least two types of team conflict: relationship conflict and task conflict. Relationship conflict is theorized to be a hindrance to team performance because it involves frictions, animosity, annoyances, and interpersonal clashes within the team. Task conflict, however, is theorized to facilitate team performance when the task is complex because task conflict involves the occurrence of disagreements that are focused on the task, which could lead to new ideas and critical analysis of the team's approach. The second line of research involves conflict management variables, such as cooperative conflict management, which occurs when team members perceive their goals to be mutually compatible.

I argue for the integration of the two theories described above. Specifically, the effects of conflict types on team effectiveness criteria are theorized to be contingent on the teams' approaches to conflict management. In Study 1, I employ factor analysis to show that the variables involved in both theories are distinctive. In Study 2, I advance a contingency model that integrates the theoretical perspectives by predicting that conflict types and conflict management variables interact in the prediction of team outcomes. Moreover, I employ the traditional measure of task conflict and I also report on a new, "contextualized" measure that is customized to the teams' task. The sample comprised 81 student engineering design teams, criteria for which were team task performance and team innovation.

The findings from Study 2 regarding the integrative model led to novel insights and highlighted the importance of considering the mutual implications of the two theories. The major finding was that, at high levels of contextual task conflict, conflict management did not appear to

overcome the damage caused by frequent task conflicts; at low levels of task conflict, however, cooperative conflict management appeared to have positive implications for team task performance. This suggests that conflict management matters, but only at low levels of task conflict. Similar findings occurred for a second conflict management variable: competitive conflict management.

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INTRODUCTION

One common way that organizations structure work is through the use of small groups or teams. Team-based work arrangements can provide a flexible and responsive approach for handling the ongoing dynamics of today's global business environment (Hitt, 2000; Hollenbeck, DeRue, Guzzo, 2004). Yet, assembling people into teams and delegating responsibility to the team, as a unit, leads to a special set of challenges. Many suggest that interdependent action naturally leads to intrateam conflict because individuals often have different perspectives and viewpoints that must somehow be reconciled for the team to function (Beersma, Conlon, & Hollenbeck, 2008; Jehn, Greer, & Rupert, 2008). On the other hand, it has been countered that bringing members with a broad range of capabilities together to handle work assignments will likely result in different, conflicting viewpoints that are needed in order for the to team reach better solutions (Marks, Mathieu, & Zaccaro, 2001). The difficulty is that there is a need to capitalize on team members' diverse array of knowledge and skill without igniting intrateam conflicts that hinder the team's ability to perform.

Researchers have considered how teams experience intrateam conflict with an eye toward whether conflict can be beneficial or harmful, and how a team can approach the management of conflicts. In this regard there are at least two major lines of research on team conflict that have, surprisingly, been advancing relatively independently. One line of research aims to understand conflict by separating it into types (e.g., interpersonal- versus task-related conflicts) and to uncover the antecedents and consequences of each conflict type (e.g., Jehn, 1995). Theory underlying this literature suggests that relationship conflict will usually harm team functioning whereas task conflict may be helpful in certain situations, such as high task complexity. Another line of research on conflict focuses on conflict management. The basic premise of this research is

that conflict is virtually unavoidable when people work interdependently, but what matters for team effectiveness is the management of that conflict. For example, Tjosvold (2008a) reviewed research suggesting that a cooperative approach to conflict management often is associated with higher team effectiveness than is a competitive approach to conflict management. In addition, Tjosvold (1998) suggested that when teams confront conflict using constructive controversy – a third type of conflict management characterized by the open-minded discussion of incompatible activities or desired courses of action – they will be able to harness conflict effectively in order to meet learning and performance goals (see also Tjosvold, 2008b). In sum, there is currently two distinct literatures: One based on types of team conflict and another based on the management of team conflict.

Surprisingly, given their conceptual and empirical bases, the two lines of research involving conflict types and conflict management have not been theoretically integrated. That is, the theories underlying these lines of research could provide a more complete perspective on conflict in teams if they were considered together. However, one issue with the variables in these theories is that their empirical distinctiveness has not received full consideration. Lacking evidence of distinctiveness, one cannot be certain that these fields truly study different and distinguishable variables. In light of this gap, one purpose of my dissertation is to examine the distictiveness of the conflict type and conflict management variables.

A second purpose of the current dissertation is to consider, theoretically and empirically, how the two fields of conflict research might be integrated. This is potentially important because the study of conflict types and its direct effects on team effectiveness recently lost considerable momentum when a meta-analysis reported that both relationship and task conflict related negatively to team performance and satisfaction (De Dreu & Weingart, 2003a). De Dreu and

Weingart's findings were problematic because conflict theory predicted that task conflict – the occurrence of disagreements about how to best accomplish work – could be beneficial for team performance (see Amason, 1996; Jehn, 1995). A contingency perspective has arisen, in hopes of resurrecting this line of research, that identifies possible moderators of the relations between task conflict and team effectiveness (e.g., De Dreu & Weingart, 2003b; Jehn & Bendersky, 2003). That contingency-based research has so far found that some variables, such as collaboration, do moderate the relation between task conflict and team effectiveness, but that task conflict tends not to be positively related to team effectiveness (e.g., Lovelace, Shapiro, & Weingart, 2001). Importantly, conflict management styles, as described by Deutsch (e.g., 1949, 1973) and Tjosvold (e.g., 1991), have a rich theoretical and empirical history but have not been integrated into the contingency perspective. This is remarkable not only because the effects of conflict types likely depend on conflict management, but also because Deutsch and Tjosvold's conflict management theory appears to have ignored the existing levels of various types of conflict in teams. In my view, there is strong potential for conflict management to moderate the effects of types of conflict on team effectiveness, yet this proposition has not been tested. Accordingly, I propose to marry the two fields of conflict by advancing theory supporting their integration, and then evaluating empirically how conflict types may interact with conflict management to explain team effectiveness criteria.

A third focus of my dissertation involves personality-based correlates of conflict. Identifying personality variables associated with conflict types may help to understand the nature of conflict types and the extent to which they may be realistically theorized to be destructive or constructive for team functioning. For example, if task conflict is destructive, as previous empirical investigation suggests (see De Dreu & Weingart, 2003a), then task conflict may

potentially be positively correlated with so-called “dark” personality traits. This would contrast, however, with earlier research arguing for the benefits of task conflict (e.g., Jehn, 1995). In order to consider “dark” personality traits, the Dark Triad (Paulhus & Williams, 2002) appears relevant. The Dark Triad comprises the traits of Machiavellianism (conceptualized as Manipulativeness in this research), Narcissism, and Psychopathy. By considering the relations of these traits with relationship and task conflict, theory can be advanced regarding the nomological net, in which conflict type variables are embedded, and, perhaps, refine theory regarding the relations involving task conflict, relationship conflict, and team functioning. Furthermore, investigating these traits fills a gap in the current research, which has not considered traits outside the “Big Five” framework of personality (the Dark Triad traits are relatively independent of the Big Five) as possible correlates of conflict variables.

This dissertation is organized as follows. I begin by reviewing theory and empirical findings involving the conflict types literature. Following that, I discuss the conflict management line of research. In Study 1 of this dissertation, I report on the distinctiveness of the variables specified by the conflict types and conflict management theories. Next I introduce the integrative model of team conflict proposed in this research, and its hypotheses, under Study 2. In that study I also propose and evaluate the Dark Triad personality traits as antecedents of task and relationship conflict. A general discussion summarizes my findings from Study 1 and Study 2, identifies the contributions of this research, reviews practical implications, and suggests directions for further research.

The Conflict Types Approach to Conflict Research

Intrateam conflict occurs when team members perceive discrepancies, or incompatibilities, in various domains such as one another’s ideas, perspectives, interpersonal

styles, or personalities (Weingart & Jehn, 2000). Historically, conflict has been considered to be a negative process to be managed with the goal of eliminating that conflict to render interactions smooth and harmonious (see reviews by De Dreu & Weingart, 2003b; Jehn & Bendersky, 2003). Seminal research by Pinkley (1990), Jehn (e.g., 1992, 1994, 1995), Amason (1996; Amason & Sapienza, 1997; Amason & Schweiger, 1994), Pelled (1996a, 1996b), and others, however, have in common a two-dimensional approach to conflict theory. Those researchers distinguished between interpersonal-related conflicts, referred to as relationship conflict, and task-related conflicts, referred to as task conflict. The distinction between these two conflict types is critical because it allows for theorizing about how dimensions of conflict may affect team effectiveness differentially.

The Theory of Relationship Conflict

Relationship conflict is defined as the occurrence of interpersonal tensions, friction, animosity, annoyance, and resentment among team members. Research findings have been clear regarding this form of conflict; relationship conflict appears to never be related positively to group or individual outcomes (see De Dreu, 2001; De Dreu & Weingart, 2003a). For example, in a longitudinal study by Jehn and Mannix (2001), relationship conflict was lower in effective groups than it was in ineffective groups across three time periods. The theory explaining why relationship conflict inhibits team effectiveness proposes that, in groups with relationship conflict, members (a) concentrate on mitigating interpersonal threats and coercive behavior in an effort to keep the team viable, (b) experience uncomfortable feelings such as anxiety or fear, and (c) are closed to other team members' ideas (Pelled, 1996a; Peterson & Behfar, 2003). As a result, the team has less time and cognitive resources to direct toward substantive task work, and

members can be dissatisfied, withhold effort, and distance themselves from the team and its mission.

The Theory of Task Conflict

Task conflict is different from relationship conflict in its substance, and, in some situations, the way it is theoretically related to team effectiveness. Task conflict is defined by the occurrence of disagreements, in the form of viewpoints, ideas, and opinions among group members, regarding the content of the task (Jehn, 1995). The proposed theoretical relation between task conflict and team effectiveness is apparently at odds with empirical findings. Many have proposed that task conflict can be beneficial for team effectiveness because it promotes discussion and exploration of different ideas and because it stimulates in-depth analysis of alternative courses of action (e.g., Amason, 1996; Jehn, 1997a; Pelled, Eisenhardt, & Xin, 1999; West, 2001). Indeed, to benefit from the diverse array of knowledge distributed among team members, it seems probable that exchanges of different, and often incongruent, viewpoints could be needed (Badke-Schaub, Goldschmidt, & Meijer, 2010). Task conflict could promote learning from others' perspectives and lead to a deeper understanding of the issues (Simons & Peterson, 2000). Moreover, task conflict could avert decisions that would otherwise lead to disastrous outcomes. For example, some have speculated that a lack of task conflict was implicated in the crash of space shuttle *Challenger*, because engineers felt pressure to not pursue the divergent viewpoint that launching the shuttle under the expected meteorological conditions could be disastrous (Turner & Pratkanis, 1997).

Despite arguments for the potential benefits of task conflict, some have suggested that it interferes with effective task work. For example, the cognitive processing perspective suggests that all forms of conflict require cognitive attention that distracts from the task. Carnevale and

Probst (1998) relied on this theory to posit that intensification of task conflict leads to physiological arousal and cognitive load increases at the expense of creative thinking and flexibility. Elsewhere, Jehn (1995) found that routine, mundane, and simple tasks that are straightforward to do are performed relatively poorly when teams experience task conflict. This is because routine tasks are familiar and have very predictable procedures for optimal performance. Discussing at length and debating the best way to approach such tasks, therefore, may hinder team effectiveness. For complex tasks, however, problem-solving and sharing discrepant viewpoints about the task (i.e., task conflict) could lead to higher team effectiveness than would avoiding those discussions (i.e., low task conflict; Amason, 1996; Jehn, 1994; Jehn, Northcraft, & Neale, 1999).

Empirical Research on Task and Relationship Conflict

In light of the above research and theory, a negative relation between relationship conflict and team effectiveness would not be surprising. The direction of the relation between task conflict and team effectiveness, however, may be contingent on the task. Performance on more complex tasks may benefit from task conflicts, but performance on simple tasks may be hindered by task conflicts (Jehn, 1995). In De Dreu and Weingart's (2003a) meta-analysis, the sample-weighted corrected correlation between relationship conflict and team performance was -.22, whereas the sample-weighted corrected correlation between task conflict and team performance was -.23. Thus, on average, task conflict is equally as harmful as is relationship conflict for team performance, which runs contrary to some theorizing regarding the benefits to task conflict (e.g., Jehn, 1995; Jehn, Chadwick, & Thatcher, 1997). Also contrary to prediction was De Dreu and Weingart's finding that *increases* in task complexity resulted in *greater negative* relations between types of conflict and team performance. For teams with the lowest task complexity (i.e.,

production teams), both types of conflict were unrelated to team performance. Recall that this finding is unexpected because the theory suggested that task conflict may be beneficial when tasks are complex (e.g., Jehn, 1997a), yet the evidence indicates that task conflict's negative relation with team effectiveness is strongest in complex tasks.[1] Given the findings of De Dreu and Weingart's (2003a) meta-analysis, the theory that task conflict has a direct, positive effect on team performance can largely be rejected at the current juncture. Moreover, the hypothesis that the relation between task conflict and team effectiveness becomes increasingly positive as task complexity increases has not been well supported. Nevertheless, this work gave rise to a more refined theory of conflict, referred to as the contingency perspective.

The Contingency Theory of Conflict in Organizations

Theory

In response to De Dreu and Weingart's (2003a) meta-analytic findings regarding the negative relation between conflict and team performance, a number of researchers have advocated for a contingency perspective. This was spearheaded by De Dreu and Weingart (2003b) and Jehn and Bendersky (2003), who published theoretical papers speculating about the conditions under which task conflict may be beneficial for team effectiveness. Their argument,

[1] In my view, the complexity of team tasks was not directly tested in that meta-analysis, and the finding must be interpreted with respect to the studies in the analysis. Studies on teams with complex tasks were coded as either "decision-making teams" or "project teams." The usual paradigm for studies coded as decision-making teams in that meta-analysis involved asking team members to recall a decision-making situation and self-report the level of task conflict and perceptions of decision-making effectiveness. It is possible that the presence of task conflicts led teams to self-report low decision-making effectiveness because members would have had different, conflicting viewpoints regarding the best solution, which could have led them to question the effectiveness of the decision. For project teams, an argument could be made that task conflict is largely unhelpful because of the time-pressures often associated with project work. Thus, it may not be task complexity, per se, that moderated effects, but either artifacts of study designs (i.e., the studies coded as decision making) or team types (e.g., project teams). In a study that did directly consider task type, a stronger negative relation between a variable similar to relationship conflict occurred in complex tasks (i.e., conceptual) than in simple tasks (i.e., task execution; Stewart & Barrick, 2000). The opposite was found by Jehn (1995) with regard to task conflict. Thus, despite the meta-analytic findings regarding "task complexity," it is likely that the "jury is still out" regarding its effects on the conflict-team performance relation.

consistent with earlier theory, was that relationship conflict is always undesirable (see also Guerra, Martinez, Munduate, & Medina, 2005). Task conflict, however, was offered as potentially functional under certain conditions. For example, task conflict could be helpful when the team has a set of norms that encourage people to express their doubts, opinions, and uncertainties without fear of retribution or dissatisfaction from other team members. Without these openness and safety norms, team members that express a divergent perspective may feel interpersonally threatened, may be made to feel incompetent, and might be accused of hindering the team's progress (see Edmondson, 1999).

Empirical Findings

As noted above, contingency theory argues that there may be moderators of the relation between task conflict and team effectiveness. Suggested moderators included task interdependence, task complexity, conflict management strategies, and team emotions (De Dreu & Weingart, 2003b; Jehn & Bendersky, 2003). Building on this initial theoretical groundwork, Guerra et al. (2005) considered an organizational culture variable they called support orientation, which comprised the facets of participation, mutual trust, team spirit, and individual growth. Guerra et al. tested support orientation as a moderator of the relation between perceived task conflict and individuals' job satisfaction. They found that job satisfaction was unaffected by differing levels of task conflict when individuals perceived their organizations to be high on support orientation, but that job satisfaction was negatively related to task conflict when the organizations were perceived to be low on support orientation. Guerra et al. concluded that organizational cultures characterized as collaborative, wherein members provide mutual assistance and experience personal growth, may be protected against the potentially harmful

effects of task conflict (e.g., interpreting conflicting perspectives as personal attacks). However, under no circumstance was task conflict found to be beneficial for job satisfaction.

Rispens, Greer, and Jehn (2007) reported on a contingency study that examined the moderating effect of cognitive connectedness on levels of team trust. Cognitive connectedness was defined as the extent to which team members felt able to gain access to knowledge they needed from other members. Trust was defined as an emergent team state comprising the intention to accept vulnerability because of positive expectations about others' behavior. In line with Guerra et al.'s (2005) findings above, Rispens et al. found that task conflict had a less negative effect on team trust when cognitive connectedness was high than when it was low. Thus, the contingency perspective was supported, but task conflict was never positively related to team trust at any level of the moderator variable of cognitive connectedness.

Lovelace et al. (2001) examined the relations between team member disagreements and team innovation. Team member disagreements were operationalized as the extent to which members disagreed about decisions related to new product design (e.g., what functions to include in the new product given what functions existing products already had). This construct is similar to task conflict. Team innovation was operationalized as manager ratings of the team's ability to generate creative product designs. Three moderators of the relation between task conflict and team innovation were tested: collaborative communication styles, contentious communication styles, and feeling freedom to express doubts about ideas. Lovelace et al. found support for all three moderators such that task conflict was less negatively related to team innovation when collaborative communication styles and the freedom to express doubts about ideas were high, and when contentious communication styles were low, compared to when these moderator variables were in the opposite directions. This study supported the notion that the relation

between task conflict and team effectiveness (in this case, innovation) is contingent on other variables, but again task conflict was never positively related to team effectiveness.

Jehn, Greer, Levine, and Szulanksi (2008) considered four possible moderators of the relation between task conflict and emergent states. “Emergent states” were operationalized as the average of scores on the three scales of trust, cohesion, and respect. The moderators included reports of negative emotions (the extent to which members experienced jealousy, hatred, anger, and frustration), conflict resolution efficacy (the extent to which team members felt confident in their abilities to resolve task conflicts), the importance of the conflict episode (the size or intensity of the conflict), and conflict norms (the extent to which group members felt it was appropriate to openly discuss different opinions). In light of previous research on the contingency perspective, the authors hypothesized that task conflict should be less detrimental to team emergent states (but not beneficial), when negative emotions and importance of the conflict episode were low, and when conflict resolution efficacy and conflict norms were high. The interation terms involving task conflict and each of these four variables, however, were not significant. Thus, support was not found for the contingency perspective in this particular study.

Ayoko, Callan, and Härtel (2008) investigated the relation between task conflict and destructive reactions to conflict at high and low levels of conflict management norms. Conflict management norms involved teams that approached conflict, attempted to resolve conflict, and had procedures for working through conflict (see also Jehn, 1995). Destructive reactions to conflict, such as failing to learn from conflicts and inabilities to settle conflicts, were found to be more strongly related to task conflict when conflict management norms were high. This suggests that task conflict was more harmful when teams had norms that involved approaching conflict, which implies that task conflicts are better repressed than addressed.

At least four studies have found potential benefits of task conflict under the contingency perspective. First, Bendersky and Hays (in press) recently coined a new type of conflict they labeled status conflict. According to Bendersky and Hays, status conflicts involve attempts to defend, maintain, or elevate one's own relative status of prominence or respect in the group. Moreover, Bendersky and Hays found that task conflict appeared to be positively related to team performance when status conflicts were low (although simple slopes analyses were not reported; therefore, the significance of that slope cannot be ascertained). Second, Medina, Munduate, Dorado, Martinez, and Guerra (2005) found a negative relation between task conflict and propensity to leave the organization when relationship conflict was low. However, in this study it did not appear that individuals belonged to teams (i.e., the items referred to co-workers). Third, DeChurch and Marks (2001) reported an interaction between task conflict and active conflict management. Active conflict management, according to the authors, occurs when teams "openly discuss differences of opinion, exchange information to solve problems together, and firmly pursue their own sides of disagreements" (p. 7). Task conflict was found to be positively related to team performance at high levels of active conflict management, whereas task conflict was negatively related to team performance at low levels of active conflict management. One concern with this study, however, is that the theory of conflict management employed by the researchers was originally meant to reflect individual styles, although it was operationalized at the team level. Moreover, scores on that measure were computed on the basis of four distinct conflict management styles, as in the following: (Competing + Collaborating) – (Avoiding + Accommodating). Because adaptation to the team-level was not extensively theoretically justified, and because the construct validity of those measures, given their computation, is unclear, it is difficult to interpret the findings of that research. Fourth, Tekleab, Quigley, and

Tesluk (2009) found that task conflict was positively related to team cohesion when conflict management was high, whereas there was a zero relation when conflict management was low. One potential limitation of that study, however, is that the conflict management construct was defined largely in terms of open communication norms rather than on a long-standing theory of conflict management, such as Social Interdependence Theory (described below). Additionally, all measures were self-reported and it would be valuable to investigate whether those findings generalize to criteria involving the actual products of a team's work. Taken together, these four studies provide some cause for optimism regarding the possibility that task conflict could be positively related to team outcomes, although, in my view, compelling evidence is still needed.

Summary

There are at least nine studies that tested the contingency perspective on relations between task conflict and team effectiveness. Overall, the results generally support the moderation of task conflict's relation with team effectiveness, yet, only some of these studies found evidence of any positive relation between task conflict and team effectiveness. The other studies found either no significant effects or less negative relations between task conflict and team effectiveness at favorable levels of the moderators. Considering the traditional framework of conflict types (e.g., task conflict, relationship conflict), it would appear that both types of conflict are likely to be detrimental to team performance except under very specific circumstances. Although two studies did consider conflict management, the construct validity of those conflict management measure is uncertain and the underlying theory was relatively sparse compared to the theory of conflict management applied in the current research (explained below). Thus, the contingency perspective has not been overly successful in demonstrating a positive relation between task conflict and team effectiveness for a variety of moderators, but at

the minimum it does provide some hope as an avenue that may at least mitigate the effects of task conflict's potentially destructive effects. Still, the contingency perspective is nascent and further theory and empirical research is needed.

The Conflict Management Approach to Conflict Research

One major set of previously unconsidered variables that could be important moderators of the relation between both of task and relationship conflict and team effectiveness are conflict management variables. Conflict management variables investigated in this research were originally developed under Social Interdependence Theory (see reviews by Johnson, 2003; Johnson & Johnson, 1989). Social Interdependence Theory posits that conflict is of little interest when individuals are independent because their actions are unlikely to affect the goal pursuit of others. When individuals are interdependent, however, perceptions of cooperation and competition become relevant to how parties interact (see Deutsch, 1949; Tjosvold, 1985). More specifically, cooperative conflict management is an approach to conflict that occurs when individuals see their goals as being positively related (i.e., a positive interdependency), such that goal attainment of one individual enhances the perceived probability that goal attainment will occur for other individuals. Cooperative conflict has been associated with effective communication, friendliness and helpfulness, coordination of effort and division of labor, treatment of conflicting interests as a mutual problem to be solved through collaboration, and so forth (see Deutsch, 2006 for a review). Conversely, conflict occurring in a competitive environment that is characterized by a perceived negative association between individuals' goal attainment (i.e., a negative interdependency) is theorized to hinder the effective processes and behaviors just described. Because of their potential relevance for acting as contingencies of

conflict types and team effectiveness relations, a brief overview of cooperative and competitive management styles follows.

Cooperative and Competitive Conflict Management

Recall that intrateam conflict is the occurrence of team member perceptions of discrepancies, or incompatibilities, in various domains such as one another's ideas, perspectives, interpersonal styles, or personalities (Weingart & Jehn, 2000). Tjosvold (1998, 2008a) argued that this definition has often been used imprecisely because it confounds the occurrence of conflict and the team environment in which that conflict occurs. According to Tjosvold (1998), therefore, team members could simultaneously have incompatible ideas about the task (i.e., task conflict), but see their goals, such as achieving very high team performance, as compatible (i.e., cooperative conflict management). In this case, conflicting ideas may be interpreted constructively because of the cooperative conflict management environment in which the team resides. Thus, the problem with current theory and research on task and relationship conflict, suggested by Tjosvold (1998), is that the effects of conflict types on team outcomes is confounded because it ignores the occurrence of potentially very different team environments (e.g., cooperative, competitive).

Imagine that team members express disagreement about the ideal way to design a gas-powered engine. In this instance, conflict, in the generic form of incompatible ideas, is present by definition yet the way the team treats that conflict might depend on existing perceptions of goal compatibility (i.e., levels of cooperativeness and competitiveness). When team members see their goals as compatible, they may tend to interact and manage conflict cooperatively, but when they see their goals as incompatible, they may tend to interact and manage conflict competitively (Deutsch, 1980). Supportively, Behfar, Peterson, Mannix, and Trochim (2008) recently found

that although most teams reported discussing and debating the merits of different courses of action, high performing and satisfied teams did this using a non-emotional, fact-based approach whereas low performing and unsatisfied teams had members who felt they had to “give in” to the demands of others. The strategy of the former set of teams resembles cooperative conflict management, whereas the strategy of the latter set of teams resembles competitive conflict management. Thus, it appears that the interpretation of task conflicts (e.g., regarding the design specifics of an engine) could depend on levels of conflict management variables. Taken together, for a more complete understanding of team conflict there may be a need to disentangle the occurrence of conflict (e.g., disagreements) from the context that surrounds that conflict (i.e., a cooperative versus competitive atmosphere).

In light of the theorizing above, Tjosvold (2008a) suggested that studying conflict by considering antecedents and consequences of types, such as task and relationship conflict, is not the most productive approach to advancing knowledge on the study of conflict. Instead, it appears that he views the occurrence of these types of conflict as unavoidable and potentially treatable as constants (i.e., as ignorable). Not surprisingly, Tjosvold argued that Social Interdependence Theory, and cooperative and competitive conflict management in particular, should receive primary attention (see also Deutsch, 1973). This approach, according to Tjosvold, is theoretically sound because it does not assume that incompatible activities (i.e., conflict) necessarily imply incompatible goals, and vice versa. I will argue shortly, however, that following Tjosvold and limiting research to conflict management, at the expense of considerations of the occurrences of conflict types, provides an incomplete perspective of conflict because it implicitly treats high and low levels of conflict, and conflict types, as irrelevant. However, it seems that the effects of conflict management on team outcomes will be

of differential importance at different levels of task and relationship conflict. Before building that argument further, however, I first introduce a third related conflict management variable and review the empirical literature on this set of conflict management variables.

Constructive Controversy

A conflict management style that is theoretically related to cooperative and competitive conflict, and advocated by Tjosvold, is constructive controversy (Tjosvold, 1985; Tjosvold, Wedley, & Field, 1986). Tjosvold et al. (1986) introduced the concept of constructive controversy into the decision-making literature, and described it there as "the skilled discussion of opposing positions" (p. 126; see also Tjosvold, 1982, 1984; Tjosvold & Deemer, 1980; Tjosvold & Field, 1983). Constructive controversy involved discussing conflicting perspectives openly, reporting feelings of being in a cooperative context, clearly identifying one's own views before integrating the views of others, and experiencing personal competence in light of others' ideas. The theoretical proposition in Tjosvold et al.'s paper was that managers who engaged in constructive controversy when making decisions would make higher quality decisions than would those who did not engage in constructive controversy. Empirically, the theory was supported in that constructive controversy was positively related to decision quality, originality, effectiveness, acceptance, and satisfaction. Thus, Tjosvold et al. concluded that managers who were skilled in discussing opposing positions made more successful decisions.

Constructive controversy has also been described as the "open-minded discussion of diverse positions" (Tjosvold, 1998, p. 290), and the "open-minded discussion of opposing views for mutual benefit." (Tjosvold & Yu, 2007, p. 660). In groups scoring high on constructive controversy, there is an emphasis on intellectual disagreement regarding conflicts (Tjosvold, 1998). Tjosvold (1998, 2008b) offered four mutually-reinforcing dynamics of constructive

controversy: (a) individuals present their own viewpoints to the team, and, in so doing, engage in cognitive rehearsal that enhances their understanding of their own ideas; (b) once confronted with opposing views, uncertainty is created and epistemic curiosity is aroused, which causes a search for information about others' perspectives; (c) elements of other team members' viewpoints are integrated in each team member's understanding of the problem; and (d) new solutions, not unique to any one individual's original position, are developed. Although constructive controversy is considered to be a natural outgrowth of cooperative conflict management, it can be studied as an important third variable in explaining the way teams manage conflict (e.g., Tjosvold & Su, 2007; Tjosvold & Yu).

Empirical Studies Involving Cooperation, Competition, and Constructive Controversy

Alper, Tjosvold, and Law (1998) collected data on cooperative and competitive goal interdependence (described in similar terms as cooperative and competitive conflict management), constructive controversy, and other constructs from a sample of field teams. Confirmatory factor analyses (CFA) suggested the best fit was when these three constructs were considered uniquely (not as a single factor). Team levels of cooperative goal interdependence and constructive controversy were positively related to manager ratings of team effectiveness, whereas team levels of competitive goal interdependence were negatively related to manager ratings of team effectiveness.

Alper, Tjosvold, and Law (2000) conducted a study on cooperative and competitive conflict management in a sample of field teams. Cooperative and competitive conflict management scales correlated at -.55, suggesting a strong relation between constructs but not complete overlap. Competitive conflict was significantly and negatively related to manager ratings of team effectiveness, whereas cooperative conflict, despite its relation in the predicted

direction (i.e., positive), did not significantly relate to team effectiveness. Using the same items as Alper et al. (2000) except translated into Chinese, an exploratory factor analysis (EFA) from a sample of teams from China supported the distinctiveness of cooperative and competitive conflict (i.e., a two-factor solution was supported; Tjosvold, Poon, and Yu, 2005). Moreover, in that study, cooperative conflict was positively related to manager ratings of team performance, whereas competitive conflict was not. Chen, Liu, and Tjosvold (2005) found support for the distinctiveness of cooperative and competitive conflict management scales using CFA, and cooperative and competitive conflict management were related positively and negatively, respectively, to manager ratings of team innovation.

Tjosvold, Wong, Nibler, and Pounder (2002) investigated the relations involving cooperative conflict management, competitive conflict management, constructive controversy, and team performance. Team performance scores were the grades on team projects completed by strategic management students. The authors found that cooperative conflict management and competitive conflict management were predictive of constructive controversy, and that constructive controversy related to team performance in the positive direction (although the relation was only marginally significant). Constructive controversy did, however, predict team members' self-ratings of team performance. Chen and Tjosvold (2002) also investigated the relations involving cooperative conflict management, competitive conflict management, constructive controversy, and team effectiveness. The team effectiveness criterion was the self-rated team innovation of MBA student project teams. Innovation correlated significantly and positively with constructive controversy, but innovation was unrelated to cooperative and competitive conflict management styles. Limitations to these studies, however, were the use of student teams doing relatively independent work and the use of self-reported criteria. In an

arguably stronger research design, Tjosvold and Yu (2007) reported that constructive controversy correlated positively with manager ratings of team innovation in various types of work teams in industry. Moreover, structural equation modeling suggested that this effect was mediated by the teams' willingness to take risks, which involved adopting calculated strategies that may help the team reach its goals but that have clear potential for setbacks. The authors interpreted this finding as suggesting that teams higher in constructive controversy may have more confidence in taking risks because they have more closely and rigorously considered their options and the advantages and disadvantages of each. Risk taking, in turn, was helpful in spawning innovations.

There were two studies I could uncover that incorporated cooperative, competitive, task, and relationship conflict variables (i.e., Somech, Desivilya, & Lidogoster, 2009; Tjosvold et al., 2006). Using a Chinese sample, Tjosvold et al. reported CFA analyses supporting the distinctiveness of the four conflict measures with observed scale intercorrelations ranging from -.20 (task conflict, cooperative conflict) to .64 (task conflict, relationship conflict). Regarding criterion validities, whereas task and relationship conflict were unrelated to managerial ratings of team effectiveness, cooperative and competitive conflict were positively and negatively related to team effectiveness, respectively. Tjosvold et al. interpreted this finding as suggesting that conflict management variables may be more important for team effectiveness than are conflict type variables. Somech et al. found relations ranging from -.06 (task conflict – competitive conflict management) to .75 (task conflict – relationship conflict), thereby providing additional support for the distinctiveness of the conflict variables (although, evidently, the correlation between task and relationship conflict was not small – this has historically been an issue with

Jehn's scales). Futher, Somech et al. found that the positive relation between team task interdependence and team performance was mediated by cooperative conflict management.

Janssen, Van De Vliert, and Veenstra (1999) asked managers who were part of management teams to rate their teams' task, relationship, and cooperative conflict levels. In the same survey Janssen et al. asked respondents to rate the perceived decision quality and the affective acceptance of the team's decisions. One important finding from that study is that task and relationship conflict only correlated at -.21 and -.45 with cooperative conflict management, respectively. This suggests the scales measure separate constructs. Additionally, Janssen et al. found support for three-way interactions, which led them to conclude that the relationship between cooperative conflict management and decision making outcomes is stronger when both task and relationship conflict are high. The reasoning behind that conclusion was that when high relationship conflict coincides with high task conflict, cooperative conflict management allows the team to benefit from task conflict, although it is unclear exactly how that would happen. One would expect that cooperative conflict management would be most helpful for team effectiveness when relationship conflict is low. The potential limitations to this study, however, are that only one team member from each team was surveyed (thus, additional team member perspectives were ignored), all study variables were collected in a single-source survey and measurement occasion, and the dependent variables were limited to member perceptions and not measures of team output. The important contribution of this study to the present research is the finding that task, relationship, and cooperative conflict appeared to be distinct constructs (because of the magnitude of their intercorrelations).

Summary

Tjosvold (2008a) has argued that, when individuals are brought together to work as a team, conflict is inevitable. Accordingly, it appears that he sees no need to theoretically consider, or empirically model, levels of conflict types. Tjosvold (1991, 1998) proposed that it is how teams manage conflict – using cooperative conflict, competitive conflict, and constructive controversy – that affects team effectiveness criteria. Indeed, the empirical research he and his colleagues have published overwhelmingly supports the claim that these conflict management styles have implications for team effectiveness.

In my view, the glaring drawback to the research reviewed above, and Tjosvold and colleagues' perspective on Social Interdependence Theory, is that there is no linkage connecting the theory of conflict types to the theory of conflict management. As mentioned earlier, the conflict management approach, when studied independently of conflict types, treats the occurrence of different types, and their intensity, as uncontrolled and extraneous variables. It could be argued, however, that Tjosvold's treatment of conflict types as irrelevant is deficient. Would it not be theoretically appealing to consider the impact of conflict management on the relation between task and relationship conflict and team effectiveness? Would task conflict potentially be helpful when, say, cooperative conflict is high? I aim to address these and other apparently overlooked research questions by offering an integrative model of conflict types and conflict management variables. The model posits that Tjosvold's conflict management variables will act as contingencies of the relation between conflict types and team effectiveness. It suggests that negative effects of both task and relationship conflict will be mitigated by cooperative conflict management, competitive conflict management, and constructive controversy. Such a model would be an important advancement of the contingency perspective,

described earlier, because it integrates the well-theorized and well-researched conflict management variables with recent research on conflict types.

Before describing the specific hypotheses of my integrative model, evidence regarding the distinctiveness of the conflict variables under both theories of conflict types and conflict management is needed. Recall that the literature search conducted for this dissertation revealed no study that empirically investigated the distictiveness (i.e., uniqueness) of conflict types (i.e., task and relationship) and all three conflict management variables (i.e., cooperative conflict, competitive conflict, and constructive controversy). Only two studies correlated task, relationship, cooperative, and competitive conflict, and one of those studies used Chinese measures that might not yield identical results in English speaking cultures. Accordingly, there is a pressing need for research that evaluates the uniqueness of the different conflict constructs in order to show that these are indeed distinguishable variables. Evidence of distinctiveness would include factor-analytic results that support a five-factor solution (task conflict, relationship conflict, constructive controversy, cooperative conflict, competitive conflict). In Study 1, I investigated the factor structure of the five conflict variables using a series of CFAs. In Study 2, I offer specific hypotheses regarding the integrative model and present empirical tests of those hypotheses.

Overview of Research Context

A brief description of the team context is presented here to facilitate the explanation of the studies that follow. Over the past several years the TeamWork Lab, headed by Dr. Natalie Allen in the department of psychology at the University of Western Ontario (UWO), has been collecting data on engineering student project teams at UWO (described in Allen, 2009). These teams are formed during the first week of university classes in September and remain intact until

early April. During this time, the following events relevant to the two studies in this thesis unfold:

Study 1

- Week 1 (middle of September): Measurement of personality variables followed by team formation.
- Week 3 (late September): Introduce Team Project 1
- Week 7 (late October): Deadline for Team Project 1 (written report)
- Week 8 (early November): Data collection for Study 1 (conflict variables)

Study 2

- Week 8 (early November): Introduce Team Project 2
- Month 6 (late March): Data collection (conflict variables)
- Month 7 (early April): Deadline for Team Project 2 (written report and criterion variable data collection) and design showcase.

The engineering student teams are project teams responsible for, among other things, completing two reports over the course of their seven-month lifespan. Project 1 was due at the end of Week 7 and was known as the *Creativity Vignette*. This project required that students identify a design problem (e.g., a poorly constructed computer mouse) and write a report detailing a new design that would address that problem. Project 1 was consequential for the students given that 15% of their grade depended on the quality of the team reports. This presented an opportunity for conducting Study 1, where the distinctiveness of the five conflict variables could be investigated through factor-analytic methods. Data were collected one week after teams submitted their Project 1 report, but before team members were aware of their performance on that project.

Although Project 1 was important to students, it was smaller and less complex than was Project 2 for at least three reasons. First, the goal of Project 2 in previous years has been to design and report comprehensively on a prototype that is an innovative way to demonstrate existing technologies that conserve energy or other resources in the spirit of protecting the environment. In contrast, Project 1 involved a far simpler design that was typically restricted to a minor alteration of an existing device. Second, Project 1 required only a sketched prototype and its description whereas Project 2 required a physical and functional prototype. Third, Project 2 was presented at a session similar to a "science fair" wherein all student teams, many engineering faculty, members of the media, the engineering faculty dean, and the city mayor were in attendance. Project 1 was only submitted to instructors at the deadline and was only presented in small studio design sessions. Thus, Project 1 was a useful time point at which to assess the empirical distinctiveness of the conflict variables (i.e., Study 1), but, insofar as the consequences and importance of the team effectiveness criteria are concerned, the context of Study 2 offered a more compelling opportunity to study predictors of team effectiveness.

STUDY 1

Method

Participants and Procedure

A total of 348 students enrolled in Engineering Science 1050 at the UWO during the 2009-2010 academic year were involved in this research (Appendices A-C contain ethics approval forms). The sample was composed of teams that worked interdependently over the course of seven months during which their main goals are to complete two major engineering design projects. Teams were formed at the beginning of September by researchers from the TeamWork Lab. The first design project comprised a written report documenting a design solution identified by the team as a way of increasing the usability of an object. Teams drew schematics of their prototypes for inclusion in their reports and provided detailed descriptions of the materials needed to construct the prototypes, their capabilities (e.g., purpose), and their limitations (e.g., maximum load capacity). The project was worth 15% of students' grade and was due approximately seven weeks after the teams are formed.

Data collection for Study 1 occurred after teams completed their first project but before they were aware of project grades (i.e., Week 8). Data were collected using a paper/pencil survey while participants were attending the regularly-scheduled laboratory component of their course wherein they worked on team-related projects.

Measures

Task and relationship conflict. Measures developed by Jehn (1995, 1999) were used to measure task and relationship conflict (see Appendix D; see also Pearson, Ensley, & Amason, 2002). Pearson et al. found support for a two-factor structure of Jehn's measures, as have numerous other studies (e.g., Janssen et al., 1999; Jehn, 1995; Jehn & Mannix, 2001; Peterson &

Behfar, 2003; Vodosek, 2007)[2]. A sample task conflict item is "How much disagreement was there among the members of your group over their opinions?" A sample relationship conflict item is "How much emotional conflict was there among the members of your group?" Participants reported the frequency in which they perceived conflicts on a five-point scale ranging from 1 (a very small amount) to 5 (a great deal).

Cooperative and competitive conflict. Also administered were Alper et al.'s (2000) measures of cooperative and competitive conflict, based on Tjosvold (1985) and Barker, Tjosvold, and Andrews (1988) (items reported in Tjosvold et al., 2005 and Appendix E of this thesis). Five items assessed cooperative conflict management and four items assessed competitive conflict management. The factor structure of those scales has been supported in factor-analytic research (e.g., Alper et al., 1998; Tjosvold et al.). A sample cooperative conflict management item is "Team members seek a solution that will be good for all of us." A sample competitive conflict item is "Team members demand that others agree to their position." Participants responded to each item on a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Constructive controversy. Constructive controversy was measured with eight items from Tjosvold et al. (1986), used also by Chen and Tjosvold (2002) and Alper et al. (1998) (see Appendix F). Alper et al. demonstrated the distinctiveness of constructive controversy from cooperative and competitive conflict using CFA. A sample item is "Team members express their own views direction to each other." Participants responded to each item on a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree).

[2] Two data sets obtained from the TeamWork Lab on earlier samples of teams enrolled in the current course also provided clear support for two-factor solutions using CFA.

Analytic Strategy

Recall that the purpose of Study 1 was to examine the empirical distinctiveness of several related constructs central to the integrative model tested in this research: task conflict, relationship conflict, cooperative conflict, competitive conflict, and constructive controversy. In sum, a series of nested models were tested using CFA in the order listed below. Each nested model was compared to the simpler models in which the nested models were embedded. It should be noted that the hypothesized model was Model 4, which assigns the items from each scale to their own individual factors.

Model 1: One-factor model that loads all items on a single factor.

Model 2: Two-factor model that splits items into desirable (constructive controversy, cooperative conflict) and undesirable (competitive conflict, task conflict, relationship conflict) constructs (referred to as the "Valence" Model).

Model 3: Two-factor model that splits items into conflict types (i.e., task conflict, relationship conflict) and conflict management (i.e., cooperative conflict, competitive conflict, constructive controversy) (referred to as "Types versus Management" Model).

Model 4: Five-factor model that loads items onto their associated factors (task conflict, relationship conflict, cooperative conflict, competitive conflict, and constructive controversy).

Results

Of the 348 participants in this research, there were 21 individuals that did not respond to the survey (94% response rate). There were three additional cases missing full data on the cooperation scale and three other cases missing full data on the relationship conflict scale. These cases were deleted from the factor analysis. Remaining individuals were missing data

sporadically. Specifically, of the 8988-cell data matrix (321 individuals x 28 items) 23 data points were missing (.003%), and no participant missed more than a single item. In these cases, person-mean imputation was applied, such that the individual's scale mean on the remaining scale-relevant items was imputed in the place of his or her missing data.

Table 1 presents the scale means, standard deviations, and coefficient alphas for the five conflict variables. The covariance matrix associated with the items for the five scales in Table 1 was subjected to CFA in order to investigate the factor structure of the data, as proposed above. The results, in Table 2, clearly suggested that the hypothesized five-factor model was the best-fitting model. Thus, the distinctiveness of the five conflict variables was supported. Table 3 displays the factor correlations, which are moderate to large. However, those correlations are not sufficiently large to suggest complete dependence among constructs.

Discussion

The current findings provide support for the distinctiveness of the five conflict variables. This is an important contribution given that the variables have not been studied simultaneously in previous research. Moreover, it was needed before hypothesizing and testing substantive models that assume that these five variables are empirically distinguishable. Having supported a five-factor solution, I will now describe the integrative model and hypotheses involved in Study 2.

Table 1

Scale Means, Standard Deviations, and Reliabilities for Study 1 Variables

	M	SD	α
1. Cooperative	5.72	.91	.89
2. Competitive	2.81	1.26	.87
3. Constructive Controversy	5.79	.68	.87
4. Task Conflict	2.24	.79	.88
5. Relationship Conflict	1.56	.73	.90

Note. $n = 321$.

Table 2

CFA Model Fit Statistics for Study 1

Model	Number of parameters[a]	df[b]	χ^{2c}	CFI[d]	RMSEA[e]	SRMR[f]	$\chi^2 \Delta$ (reference model)[g]
1. One-factor	56	350	2533.57	.64	.14	.11	--
2. Two-factor ("valence")	57	349	1713.20	.70	.11	.08	820.37 (Model 1)
3. Two-factor ("type versus management")	57	349	1863.54	.71	.12	.10	670.03 (Model 1)
4. Five-factor model	66	340	642.54	.94	.05	.04	1891.03 (Model 1) 1070.66 (Model 2) 1220.46 (Model 3)

Note. n = 321. [a]The number of parameters free to vary in the model. [b]The degrees of freedom of the model, found by subtracting the number of model parameters from the number of unique terms in the variance/covariance matrix. [c]The chi-square statistic is a "badness of fit" statistic, meaning that higher values are associated with poorer fit. All chi-square values were significant, although this significance test has been shown to have critical flaws (but less so when comparing the fit of two models, see below); accordingly, the significance of the chi-square is not considered further (see Goffin, 2007). [d]The comparative fit index (CFI) compares the hypothesized model to a completely independent model; values in the range of .95 and greater are generally acceptable. [e]The root mean square error of approximation (RMSEA) is a parsimony-corrected index that incorporates consideration of degrees of freedom and favors simple models. Generally acceptable fit is in the range of .06 and lower. [f]The standardized root mean square residual (SRMR) is the average squared residual correlation. Models with values around .08 and below are often considered to have acceptable fit. [g]The chi-square difference test assesses the significance of the difference between the chi-square values of two models. All of the differences shown are significant at $p < .001$, indicating that Model 4, which has the lowest overall chi-square, fits the data significantly better than any of the other three models (see Brown, 2006; Byrne, 2006; Hu & Bentler, 1999; Kline, 2005).

Table 3

Inter-factor Correlations

	1.	2.	3.	4.
Cooperative Conflict Management Factor				
Competitive Conflict Management Factor	-.49			
Constructive Controversy Factor	.77	-.50		
Task Conflict Factor	-.37	.50	-.35	
Relationship Conflict Factor	-.57	.62	-.54	.58

Note. $n = 321$. Significance tests based on the factor covariances suggested that all correlations were significant at $p < .05$.

STUDY 2

I begin Study 2 by outlining the team outcomes used as criterion variables in the present study as well as an alternative approach to measuring task conflict. Regarding the latter, I will identify some potential limitations to Jehn's (1995) classic measure of task conflict, used in virtually all research, and my approach to addressing some of those issues. Following that, I detail my integrative model and its predictions involving conflict types and conflict management. Finally, I offer predictions regarding the relations between the personality traits of the Dark Triad and conflict types.

Measurement of Criterion Variables and Task Conflict

The relevant criteria for judging team effectiveness in the engineering student project teams used in this research are the (a) grades received on the final written report for Project 2 (i.e., team task performance) and (b) ratings of team prototype innovation provided by expert judges (i.e., team innovation). Team task performance is one of the most frequently theorized outcomes of task and relationship conflict (Amason & Schweiger, 1997; Jehn, 1997b), and team innovation was recently identified as one of the few criterion variables for which task conflict may be beneficial (De Dreu, 2006, 2008; see also Carnevale, 2006; Deutsch, 1973; West, 2002; West & Anderson, 1996). Team innovation involves developing a creative or novel solution that is also practical and feasible for development and application (Amabile, 1983; West & Anderson, 1996). Including two criteria that are highly relevant to the theory developed here and to the participants in the current research context is consistent with De Dreu's (2008) recent call for a simultaneous examination of conflict's effects on multiple team criteria instead of focusing on only a single criterion.

Regarding the measurement of task conflict, it is notable that Jehn's (1995) measure has been used extensively, and almost exclusively, in previous research involving task conflict (De Dreu & Weingart, 2003a). However, there are at least two potential disadvantages associated with her measure. One potential issue is that the items appear to have negative connotations or overtones. For example, several items refer to *conflicts* and *disagreements*. In my view, these words may be interpreted as suggesting negative team interactions. If Jehn's task conflict items are interpreted in a negative light, they may not be likely to be endorsed by members of high performing teams, all else being equal equal. Accordingly, one possible explanation for previous research that has found primarily negative associations between task conflict and team effectiveness is the items' potentially negative "valences." A second potential limitation of Jehn's items is that they appear to be "decontextualized." The items target conflict at a very general level by referring to ideas and opinions about the team's "task," but team tasks are often multidimensional and complex. Thus, it is possible that items targeted to specific task foci could lead to improved prediction and construct validity. A final issue with Jehn's measure of task conflict is that it does not indicate the extent to which task conflicts were *resolved*. A team that is unable to resolve task conflicts may be expected to perform worse than does a team that successfully resolves task conflicts. Whereas the integrative model involving Tjosvold's (1991) constructs of cooperative conflict management, competitive conflict management, and constructive controversy attempts to address the issue of conflict management, none of these constructs appear to measure conflict resolution.

Given the potential issues with Jehn's (1995) measure of task conflict, I developed alternative measures of both task conflict and its resolution. In order to develop these measures, I observed teams receiving task instructions, interacting, and presenting their work over the 6.5

months of their lifespan. I also communicated regularly with team members, teaching assistants, and course instructors. I conducted this observational research for at least four hours per week and recorded my notes in a diary. Based on my knowledge of the context, I developed alternative measures of team conflict and conflict resolution. I refer to these alternative measures as "contextual task conflict" and "contextual task conflict resolution," respectively (see Appendix G). In my view, the piloted items are potentially advantageous because they appear to have less negative overtones, they have specific, relevant, and meaningful task foci, and they address the resolution of conflict for each foci.

The new measures were expected to be distinct from existing conflict variables measured in the present research. Accordingly, I will report results of CFA and EFA supporting their distinctiveness. Moreover, the contextualized measure of task conflict will be used, along with Jehn's existing measure, to operationalize team task conflict and to further test my integrative model. Further, the new measure of conflict resolution will be investigated as an additional contingency of the relationships involving task conflict, relationship conflict, and team effectiveness variables. I present my predictions associated with these variables next.[3]

Integrative Model and Study Hypotheses

The hypotheses are listed in the following order: First presented are the hypotheses regarding the interaction between conflict types (i.e., task and relationship conflict), and conflict management (cooperative and competitive conflict, and constructive controversy) and contextual task conflict resolution, in the prediction of team effectiveness criteria. Following the interaction hypotheses are direct effect hypotheses regarding the relations between task and relationship

[3] I do not advance *a priori* predictions regarding differential relations involving the contextual task conflict and traditional task conflict scales with other variables in this research. Hypotheses described below that refer to task conflict are later tested using both scales (see Study 2, *Results*).

conflict and team effectiveness criteria. Finally, the predicted relation between each "dark" personality trait of the Dark Triad and both task and relationship conflict is explained. Figure 1 visually describes the hypotheses of the present study. It should be noted that all variables were operationalized at the team level. Personality and conflict variables were computed by calculating team means of individual's self-reported scale scores. Aggregation issues are further discussed below. Team task performance and team innovation were scored at the level of the team (i.e., one stimulus each, per team); accordingly, no aggregation was required.

Interaction Between Task Conflict and Conflict Management/Resolution

One class of potentially important moderators of the relation between conflict types and team criteria are the conflict management variables referred to above (cf. De Dreu, 1997; De Dreu & Weingart, 2003b). Tjosvold (1998) argued that conflict will always occur when people work together and are mutually interdependent (see also Deutsch, 1973; Johnson, 2003; Johnson & Johnson, 1989). What matters, from the perspective of these theorists, is how the team manages this conflict. Effective conflict management could help the team use conflict to its advantage, or at least reduce its harmful effects (De Dreu, 2008). Thus, Tjosvold's theory is a contingency theory although it has not been empirically tested in that way with regard to task and relationship conflict types.

Conflict management under Tjosvold's (e.g., 1998) theory can be measured by considering the team's levels of cooperative conflict, competitive conflict, and constructive controversy. Recall that competitive conflict occurs when team members perceive their individual goals as incompatible, cooperative conflict occurs when team members perceive their individual goals as congruent, and constructive controversy occurs when group members engage in open-minded discussion of disagreements regarding incompatible activities. Whereas task and

Figure 1. Study 2 hypotheses.

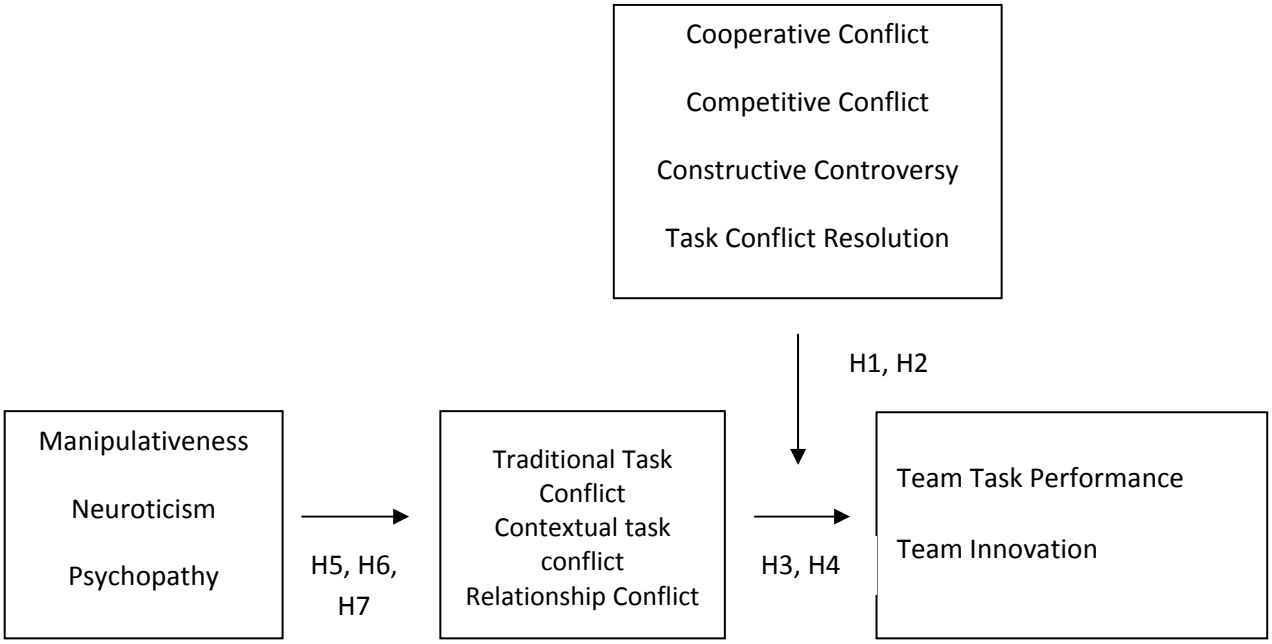

Figure caption. The figure provides a summary of the hypotheses tested in the current research. Note that all variables were operationalized at the team-level; therefore, there were no multilevel or crosslevel analyses involved.

relationship conflict attempt to measure the absolute amount of each type of conflict that exists in the team, Tjosvold's constructs attempt to measure how the team manages that conflict.

In the meta-analysis conducted by De Dreu and Weingart (2003a), it was found that both types of conflict, task and relationship, are negatively related to team performance. In the present study, it is expected that task and relationship conflict will be negatively related to team task performance and team innovation, but that the extent to which they will be negatively related to team effectiveness will depend on levels of cooperative conflict, competitive conflict, and constructive controversy. When team members experience divergent viewpoints, opinions, and beliefs about their task (i.e., task conflict), this occurrence should be less damaging to team task performance and team innovation when cooperative conflict is high because team members still see their individual goals as compatible. That is, team members may disagree about the best project idea or how a certain portion of their prototype should be designed, but as long as the motivation for these disagreements is seen as beneficial for others' goal attainment such conflicts may not be harmful (Deutsch, 2006). Stated formally, the following hypothesis is proposed:

> *Hypothesis 1a*: The relationship between task conflict and team effectiveness criteria (task performance and innovation) will be less negative when cooperative conflict is high compared to when it is low.

If team members are in task conflict and they see their individual goals as incompatible, as they would in competitive conflict (i.e., as one member approaches his or her goals, other members are forced away from their goals), task performance and innovation will be hindered relative to those teams who are low on competitive conflict (see Deutsch, 2006). This is because the negative experience of task conflict is likely to be exacerbated when team members perceive the situation as a competitive, zero-sum scenario where members' goal achievement is

contingent on other members not achieving their goals (Weingart & Jehn, 2000). Accordingly, the following hypothesis is proposed:

> *Hypothesis 1b*: The relation between task conflict and team effectiveness criteria (task performance and innovation) will be less negative when competitive conflict is low compared to when it is high.

The theory of constructive controversy is that teams scoring high on this construct have open-minded discussions about divergent viewpoints, which Tjosvold (2008b) has argued to be critical for team member learning, team creativity, and team task performance (see also Johnson, Johnson, & Tjosvold, 2006; Tjosvold, 1991, 1998). When members' perspectives and biases are challenged by others (as they would be when task conflict and constructive controversy are high) they are forced to seek out rationales to support their own positions. To the extent that members cannot find as much evidence supporting their own idea as that of another, they will not be able to defend that course of action and new, more effective ideas presented by others could be adopted (see Putnam, 1997). Note, however, that this process would be unlikely if task conflict was high but constructive controversy was low. In such a case, there would be conflicts of opinion and disagreement about the task, but these conflicts would not be resolved through open discussion and therefore the task conflicts could damage both team task performance and innovation. These arguments can be summarized by the following proposed hypothesis:

> *Hypothesis 1c*: The relation between task conflict and team effectiveness criteria (task performance and innovation) will be less negative when constructive controversy is high compared to when it is low.

Task conflict resolution, as measured by the contextual task conflict resolution scale developed in the current research, may be a fourth potential moderator of the task conflict-team

effectiveness relationship. One could argue that the occurrence of task conflicts may be beneficial to the extent that the conflicts are resolved. When task conflicts occur, but the team is unable to find common ground in the form of an action plan for moving forward, the team may be interrupted from completing their task. Although previous research has consistently found a negative association between task conflict and team effectiveness, I suggest that the contextualized task conflict resolution scale has the potential to reduce the magnitude of this negative association because it allows the team to overcome task conflicts. Nevertheless, resolution of task conflicts is not expected to be so impactful that at high levels it leads to a positive relation between task conflict and team effectiveness – it might simply mitigate the historically negative effects of task conflict. Accordingly, I predicted the following:

> *Hypothesis 1d*: The relation between task conflict and team effectiveness criteria (task performance and innovation) will be less negative when scores on the contextualized task conflict resolution scale are high compared to when they are low.

Interaction Between Relationship Conflict and Conflict Management/Resolution

The contingency approach has not been applied to relationship conflict, likely because relationship conflict is theorized to never be helpful for team effectiveness (see Weingart & Jehn, 2000). However, team processes such as conflict management could be expected to mitigate the harmful effects of relationship conflict on team effectiveness criteria. In theory, teams could occasionally experience relationship conflict while also managing conflict cooperatively, non-competitively, and with constructive controversy. This would be the case when a team has interpersonal frictions and personality clashes yet they still see their goals as positively intertwined (high cooperative conflict), not negatively intertwined (low competitive conflict), and have conversations about the task where group members express and analyze one another's

perspectives (high constructive controversy). Whereas scoring high on relationship conflict and simultaneously scoring high on cooperative conflict, constructive controversy, and low on competitive conflict may be unlikely in many teams, it is possible that teams high in relationship conflict will experience a range of levels of the three conflict management variables. To the extent that the latter argument is empirically supported, there exists a theoretical (and statistical) potential for an interaction between relationship conflict and conflict management on team effectiveness criteria.

Consider a team that has high relationship conflict. Team members would be aware of interpersonal frictions and tensions among each other, but these conditions do not imply with complete certainty that cooperative conflict, for example, is low. A team may be composed of group members who do not like one another, but it is possible that they are able to put those differences aside in recognition of their mutually supportive and compatible goals (e.g., to produce a top-quality report). Similarly, being in relationship conflict does not imply definitively that team members' goal structure is such that one person reaching his or her goal interferes with other members reaching their goals, as would be the case in high competitive conflict. Finally, this logic can be applied also to constructive controversy: teams in relationship conflict may be able to constructively debate the merits of one another's ideas to develop a novel and effective design solution. Accordingly, there could be interactions between relationship conflict and each conflict management approach, as in the following:

> *Hypothesis 2a*: The relation between relationship conflict and team effectiveness criteria (task performance and innovation) will be less negative when cooperative conflict is high compared to when it is low.

Hypothesis 2b: The relation between relationship conflict and team effectiveness criteria (task performance and innovation) will be less negative when competitive conflict is low compared to when it is high.

Hypothesis 2c: The relation between relationship conflict and team effectiveness criteria (task performance and innovation) will be less negative when constructive controversy is high compared to when it is low.

Although the contextualized task conflict resolution scale was designed to address whether contextual task conflicts were resolved, this scale may have implications for the relation between relationship conflict and team effectiveness. To the extent that task conflicts are resolved, interpersonal tensions and frustrations (i.e., relationship conflicts) may not be as harmful for team effectiveness compared to when task conflicts are still rampant. My reasoning is that relationship conflicts could be compounded when there are also unresolved task conflicts. This supports the prediction that relationship conflicts will be more detrimental to team effectiveness when contextualized task conflicts are unresolved compared to when they are resolved, as in the following:

Hypothesis 2d: The relation between relationship conflict and team effectiveness criteria (task performance and innovation) will be less negative when contextualized task conflict resolution scale scores are high compared to when they are low.

Direct Effects of Task and Relationship Conflict on Team Effectiveness Criteria

Task conflict, although theorized to be positively related to team performance when the task is complex and requires some degree of innovation or creativity (Jehn, 1995; Schulz-Hardt, Mojzisch, & Vogelgesang, 2008; West, 2002), has been negatively related to team performance in the majority of previous research (for a review, see De Dreu, 2008). Task conflict could be

detrimental to team performance because teams with members that experience conflicting viewpoints likely have difficulties choosing an approach to the task that all members can agree and commit to (De Dreu). High task conflict indicates that there are differences in opinions, viewpoints, and approaches to the task among members, and the existence of these differences, all else equal, probably hinders members' motivation, teams' abilities to create high levels of task performance, and the creative potential of the team (see Jehn et al., 2008; Ross, 1989). Moreover, from an information processing perspective, task conflicts may interfere with effective performance because team members could experience increasing cognitive loads and closed-mindedness as a result of the arousal caused by trying to maintain a challenged position (Carnevale & Probst, 1998; De Dreu & Weingart, 2008). When cognitive load and closed-mindedness increase, the ability to critically analyze the merits of various team member positions appears to decrease (Carnevale & Probst). In sum, negative relations are expected between task conflict and team effectiveness criteria in this study:

Hypothesis 3a: Task conflict will be negatively related to team task performance.

Hypothesis 3b: Task conflict will be negatively related to team innovation.

Teams that experience relationship conflict could be hindered because members focus on team viability and cohesiveness issues to the neglect of the team's task, they may experience anxiety or fear, and they may be unreceptive to each other's ideas (Peterson & Behfar, 2003). Each of these occurrences may interfere with the team members' abilities to process information, which limits the team's capacity to function effectively as a task-performing unit (Pelled, 1996a; Peterson & Behfar). Moreover, Varela et al. (2008) found that relationship conflict was negatively associated with helping behaviors and other team-related contextual functions like exceeding expectations. Stated simply, most previous research has found that relationship

conflict is uniformly deleterious for team effectiveness regardless of the criterion (De Dreu & Van Vianen, 2001). Thus, the following hypotheses are proposed:

Hypothesis 4a: Relationship conflict will be negatively related to team task performance.

Hypothesis 4b: Relationship conflict will be negatively related to team innovation.

Antecedents of Task and Relationship Conflict: The Dark Triad

The Dark Triad is composed of Machiavellianism, Narcissism, and Psychopathy. Machiavellianism, however, is a reasonably broad trait that describes people who tend to be manipulative, insincere, callous, and who use deception, flattery, and charm to achieve their own ends without feeling remorse for others who they may have harmed along the way (Christie & Geiss, 1970; Jakobwitz & Egan, 2006; Lee & Ashton, 2005). Moreover, the content of the Machiavellianism construct overlaps considerably with that of Psychopathy; McHoskey, Worzel, and Szyarto (1998) argued, with support, that Machiavellianism and the scale used to measure that construct is essentially the same as Psychopathy and its scale. Thus, a traditional Machiavellianism scale was not used in the present research. Instead, one dimension of Machiavellianism that is much more conceptually aligned with team conflict was used: Manipulativeness (see Paunonen, 2002).

There are several important advantages of considering the Dark Triad traits as antecedents of task and relationship conflict. First, at the team level, one compelling operationalization of the Dark Triad for the purposes of this research involved the mean operationalization (as opposed to the standard deviation, minimum, or maximum). A second potential compelling alternative was the maximum value, because perhaps only one individual high on Dark Triad traits is needed in order to hinder the entire team. My decision to adopt only

the mean operationalization was, in large part, because it is arguably most "commensurate with how traits operate at the individual level" (see Judge & LePine, 2007, p. 341). More specifically, the mean implies additivity across group members (see LePine, Hollenbeck, Ilgen, & Hedlund, 1997). Additivity implies that the trait is expected to accumulate across individuals such that, overall, the more team members are characterized by a given trait, the greater the likelihood that the team-level trait operationalization will be associated with increases or decreases in the criterion (in this study, team conflict types; see O'Neill & Allen, 2011). To the extent that individuals tend to be higher on Dark Triad variables, as evidenced by the team means, there should be more potential for both types of conflict (further described in the preamble to the specific hypotheses that follow). Having only one individual high on the a Dark Triad trait (i.e., the maximum operationalization) may not be as relevant because group members may learn to accommodate this individual, he or she may be routinely absent thereby reducing the likelihood of influencing conflict, or he or she may be a highly intelligent individual that can push the group to adopt valuable ideas. But having many team members high on a Dark Triad trait would likely make conflict very difficult to avoid. Moreover, Barrick, Neubert, Stewart, and Mount (1998) reported that different team-level personality operationalizations are highly correlated; accordingly this reduces any non-redundant information gleaned from reporting more than one operationalization. In sum, an important advantage of the Dark Triad traits is that they are well suited for aggregation using the mean because it is this operationalization that could, potentially, be most related to team conflict and, importantly, the mean interpretation tends to be more readily interpretable given it is relatively commensurate with individual-level personality (see Judge & LePine, 2007).

Second, the Dark Triad traits fall mostly outside the space of the Big Five, and the literature reviewed earlier did not uncover a single study that considered the relation between team-level personality and conflict with personality variables largely peripheral to the boundaries of the Big Five. Thus, it does not appear that traits similar to the Dark Triad have ever been considered in previous research on conflict in teams.

Third, the Dark Triad, being dark traits, have natural linkages to teams characterized by interpersonal tensions and frictions, anger, and personality clashes (relationship conflict) as well as the expression of differences in opinions, viewpoints, and ideas (task conflict). Thus, they warrant consideration as possible dispositional antecedents of team conflict. What follows are the rationales linking each Dark Triad trait (Manipulativeness, Narcissism, and Psychopathy) to relationship and task conflict.

Manipulativeness. Manipulativeness is the extent to which team members attempt to reach their own personal goals using impression management techniques such as flattery, ingratiation, and, even, deception (Paunonen, Haddock, Forsterling, & Keinonen, 2003). The team's mean on Manipulativeness could be positively associated with both task and relationship conflict. To the extent that team members engage in insincere behaviors and these are seen by other team members as disingenuous (which is probable given the intensity of interactions and lengthy time frame of the teams' lifespan), greater levels of both types of conflict would likely ensue. Relationship conflict will be increased when the team is higher on Manipulativeness because team members will likely observe or be the recipients of manipulative acts (or even coercion). These could be interpreted as personal threats and responses would likely be defensive, anxiety-ridden, and avoidant. If this is true, more interpersonal friction and anger is likely. People who are manipulative would also be likely to direct the team's task discussions

toward their own goals in a way that could be argumentative and certainly confrontational. They will be inclined to steer the conversation toward their own interests, and when several members try to do this simultaneously, conflicting opinions and viewpoints will characterize the team's interactions. This should result in increased task conflict. Taken together, the following hyphotheses are proposed:

> *Hypothesis 5a*: Mean team levels of Manipulativeness will be positively related to relationship conflict.
>
> *Hypothesis 5b*: Mean team levels of Manipulativeness will be positively related to task conflict.

Narcissism. Narcissism is a personality variable that describes people who tend to be domineering and exploitative, as well as those who maintain feelings of superiority and entitlement (Raskin & Terry, 1988). Teams that are composed of people high on Narcissism (i.e., have a high team mean on Narcissism) are likely to experience high levels of both relationship and task conflict. Narcissistic behaviors such as exploiting others to achieve personal gain and projecting a sense of supremacy are not behaviors that normally come to mind when thinking about effective team players. When the team is composed of members who are concerned with using others to meet personal ends and who behave as though they are personally deserving of credit for the team's accomplishments, it is likely that interpersonal frictions, angry interactions, and a state of constant tension will result (i.e., high relationship conflict). Moreover, teams that are high on Narcissism could be likely to experience disagreements about task-related issues such as how to best get work done or what project idea to adopt. This is because teams with several or more members high on Narcissism will have interactions focused on advancing individual agendas. Team members will not likely be flexible in their viewpoints because they

see their own ideas as the most valuable, appropriate, and likely to result in an effective team project. In sum, the following hypotheses are proposed:

Hypothesis 6a: Mean team levels of Narcissism will be positively related to relationship conflict.

Hypothesis 6b: Mean team levels of Narcissism will be positively related to task conflict.

Psychopathy. Psychopathy refers to people who behave in antisocial ways. People high on Psychopathy are anxious, avoid close relationships, fail to commit to mid- to long-term goals or objectives, are prone to emotional outbursts such as yelling or cursing at others, and prefer impulsivity to careful planning. Teams with members high on Psychopathy are likely to report high levels of personal friction, tension, and anger because their members are prone to demonstrating behaviors that are hurtful to others. For example, teams with members high on Psychopathy could be likely to experience emotional arguments because of their inability to control their reactions or show empathy. In addition, teams high on Psychopathy would be expected to often be in conflict about the task. Different opinions and perspectives about the way the task might be best accomplished ought to be more common when the team is composed of members who do not stick to decisions or goals and are willing to break agreed upon plans of action simply because they are impulsive and willing to transgress. To sum up these arguments, two hypotheses are proposed:

Hypothesis 7a: Mean team levels of Psychopathy will be positively related to relationship conflict.

Hypothesis 7b: Mean team levels of Psychopathy will be positively related to task conflict.

Method

Participants and procedure

The same pool of 348 participants in Study 1 was targeted again for sampling in Study 2. Study 2 considered personality variables, measured on the first day of class in September, and conflict variables, measured approximately six months into the teams' lifespan. Surveys were distributed during tutorial sessions (i.e., design workshops). The team project, Project 2, formed the basis of the performance criteria and was submitted after about 6.5 months of the teams' tenure. Teams worked interdependently on Project 2, in the same groups as in the initial project, beginning in November. They met once per week in two-hour laboratory sessions where they were introduced to the project goals and given project oversight by instructors and teaching assistants over the course of the semesters. Team members also worked extensively outside of these laboratory sessions. This team project was a sizeable and important one in that a functional design prototype had to be constructed and its specifications documented. In addition, design projects accounted for 20% of students' final course grades and were displayed publicly at a "science fair" design showcase that was attended by the city mayor, media, engineering faculty, teacher assistants, and the public.

Measures

Personality. Manipulativeness was measured using Paunonen's (2002) Manipulativeness scale from the Supernumerary Personality Inventory (SPI; see Appendix H). That scale comprises 15 items that use a five-point Likert scale. A sample item is "By flattering someone I can make him or her more apt to agree with me." Cronbach's alpha has been in the range of .65 to .77 and independence from the Big Five factors of personality has been supported (e.g., O'Neill & Hastings, 2010; Paunonen et al., 2006). Narcissism was measured using the short form

of the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979; Raskin & Terry, 1988). The full NPI is a 40-item forced-choice questionnaire, but a shorter 16-item forced-choice form was recently developed by Ames, Rose, and Anderson (2006), who found concurrent correlations with the full NPI of .90 in two studies. Moreover, correlations with other scales were highly similar between the full and short NPI scales. Accordingly, the 16-item measure was suitable for the current study (see Appendix I). Secondary Psychopathy was measured using the Levenson Self-Report Psychopathy Scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995). That scale uses a four-point response format and 10 items (see Appendix J). The LSRP Secondary Psychopathy scale has been supported by a factor analyses and has shown acceptable reliability and validity (see Jacobwitz & Egan, 2006; Levenson et al.). A sample item is "I have been in a lot of shouting matches with other people."

Conflict measures. The measurement of task conflict, relationship conflict, cooperative conflict, competitive conflict, and constructive conflict was the same as it was in Study 1 (see Appendices D, E, and F). The distinctiveness of these scales was supported in Study 1. Contextual task conflict and contextual task conflict resolution were measured using the scales described earlier (see Appendices G and K) and constructed specifically for this research. A sample contextual task conflict item is "When working on your team's problem definition, to what extent did team members *express* different opinions, viewpoints, and perspectives?" A sample contextual task conflict resolution item is "To what extent were these different opinions, viewpoints, and perspectives *resolved* before settling on the team's final problem definition?" These scales used the same response scale as did the task and relationship conflict scales (i.e., a five-point frequency scale). Evidence regarding the distinctiveness of the conflict variables in this research will be further reported on in the Results section.

Criterion Measures. Team task performance ratings were provided by experienced course instructors and teaching assistants. The quality of the report was scored on dimensions such as Problem Definition, Design Methodology, Engineering Validation (i.e., appropriate application of engineering design principles), Design Documentation, and Technical Writing (see Appendix L for the rating form). Note that raters did not rate the same teams; therefore, interrater reliability was not calculable. In order to control for the possibility that raters used different performance distributions (i.e., mean and variance of distributions), team performance scores were *Z*-standardized within raters (see also DeChurch & Marks, 2001; O'Neill & Allen, 2011; Wageman & Gordon, 2005).

Team innovation was assessed by having five expert judges rate the innovation of each design prototype. The expert judges were recruited from the faculty of engineering at the UWO, and they were all graduate-level students that were familiar with the course (i.e., they were course teaching assistants). Numerous complexities are involved in the measurement of innovation (West & Anderson, 2001). At least four issues are relevant to the current study: the general approach used to measure innovation, the prototype stimuli, the rating scale format, and the criterion definition and content domain. A fifth issue that was unique to the current research was that judges had to make the ratings on three consecutive days due to the large number of stimuli. I elaborate on each of these issues below.

Amabile (1983) recommended the consensual assessment technique for the measurement of innovation. That technique involves collecting innovation judgments from domain-relevant experts, and this appears to be a highly defensible approach for the current study (see also Amabile, Conti, Coon, Lazenby, & Herron, 1996; Shalley, 1991; 1995; Shalley & Perry-Smith, 2001; West & Anderson, 1996). Experts may be positioned to judge innovation because of their

specialized technical knowledge, expertise, and experience; those unfamiliar with engineering may not be capable of determining the extent to which a device represents a novel and practical concept. Thus, it was deemed appropriate to use expert judges as a conduit for the measurement of team innovation in this research.

The targets of experts' ratings were short, written descriptions and color 4 x 6 photographs of the team prototypes. I developed the written descriptions when I attended laboratory sessions in which projects were presented by group members. Each group was given 10 minutes to present their project. During each presentation I recorded the problem definition (one sentence), prototype purpose (one sentence), and a description of the prototype (four sentences). I then edited the project descriptions immediately after each laboratory session, and then again after all descriptions were collected. Every possible effort was made to ensure evaluative statements were not included in the descriptions and that each conformed to the standardized format. I took photos during the design showcase at the end of the term (i.e., April, 2009). See Appendix M for examples of stimuli used in the current research.

The Relative Percentile Method (RPM) formed the basis for the rating scale employed to assess team innovation (see Goffin, Gellatly, Paunonen, Jackson, & Meyer, 1996). The current application of the RPM required that judges rate each team's level of innovation on a scale ranging from zero to 100 (see Appendix N). Specifically, raters indicated, in percentile units, the level of each team's innovation relative to the average team innovation performance of all teams in this course. A growing body of research has supported the accuracy and validity of the RPM as an approach to performance assessment and the measurement of other psychological variables (e.g., Goffin et al., 1996; Goffin, Jelley, Powell, & Johnston, 2009; Goffin & Olson, 2011;

Olson, Goffin, & Haynes, 2007; Wagner & Goffin, 1997). Team innovation was scored as the average of each judge's rating of each team.

Team innovation was defined, for the judges, as "the demonstration of a green technology that (a) clearly illustrates how the technology works, and (b) is novel, unique, and original (see Appendix N). Experts were then asked to come to the research laboratory on three consecutive days, each day rating a third of the prototypes. Pilot testing indicated that it would likely have been too cognitively demanding to rate accurately all team prototypes in one session. Accordingly, each expert rated the same three sets of prototypes, but the order of the three prototype sets was counterbalanced. I developed the three sets by first rank ordering and scoring all the projects on team innovation, and then assigning to each of the three sets an equal number of each project type (e.g., hydro, solar, wind) with equal distributions of innovation levels across groupings. That is, I attempted to ensure that the variance in types of prototypes was the same and that the distribution of levels of innovation was the same in each grouping. After finishing all their ratings, experts were provided with an honorarium of $100 (see Appendix O for the ethics approval form).

Results

Data Preparation for Factor Analyses

Variables submitted to factor analyses included the five conflict scales from Study 1 plus four items measuring "contextual task conflict" and four items measuring "contextual task conflict resolution." Of the 348 participants in this research, there were 31 individuals who did not respond to the survey. There was one additional case missing full data on the cooperative conflict management scale, and there were six cases that only responded to small portions of the survey. These seven cases were deleted from the factor analysis, leaving 89% of the data usable

for factor analysis. Remaining individuals were missing data very sporadically. Specifically, of the 10540-cell data matrix (310 individuals x 34 items) involving all possible responses to conflict items, 16 data points were missing (.002%), and no individual participant missed more than a single item. In these cases where a single item was missing, person-mean imputation was applied.

Factor Analyses

Table 4 contains the scale means, standard deviations and reliabilities for Study 2 conflict variables. The factor structure of the variance/covariance matrix associated with the items for the five conflict variables investigated in Study 1 was reconfirmed in this study. Table 5 contains the CFA results comparing the hypothesized five-factor model to a one-factor model, two-factor

Table 4

Scale Means, Standard Deviations, and Reliabilities for Study 2 Variables

	M	SD	α
1. Manipulativeness	2.91	.41	.70
2. Narcissism	4.94	2.90	.67
3. Psychopathy	2.34	.49	.63
4. Cooperative	5.88	.84	.91
5. Competitive	2.65	1.23	.89
6. Constructive Controversy	5.85	.77	.91
7. Task Conflict	2.12	.76	.89
8. Relationship Conflict	1.61	.78	.92
9. Contextual Task Conflict	2.66	.86	.80
10. Contextual Task Conflict	3.94	.90	.89

	Resolution

Note. n = 340 for personality variables and n = 310 for conflict variables.

"valence" model, and two-factor "types versus management" model (see Study 1 for model specifics). The hypothesized five-factor model, involving a separate factor for each set of scale items, was the best fit to the data. For the hypothesized model, all fit statistics were within the typically acceptable ranges (Hu and Bentler, 1999; Kline, 2005).

Because I administered the new contextual measures of conflict and its resolution in the current study, I conducted additional factor-analytic investigations. First, I conducted CFA that considered Jehn's (1995) measure of task conflict, the new contextual conflict measure, and relationship conflict (see Table 6). A hypothesized three-factor model with items loading on their respective factors fit the model significantly better than did one- and two-factor models. The one-factor model assigned all items to a single factor. The two-factor model involved a "task conflict" factor, which assigned task conflict items from Jehn's scale and the contextual scale to the same factor and the relationship conflict items to a separate factor. Second, I conducted CFA wherein the items from Jehn's traditional task conflict measure were considered along with items from the contextual task conflict and contextual task conflict resolution scales. Using these three scales' items, I compared the fit of a three-factor model with items loading only on their hypothesized scales to the fit of a one-factor model (see Table 7). The hypothesized three-factor model provided a better fit to the data than did a one-factor model, thereby lending support to the distinctiveness of the new scales relative to Jehn's existing measure.

Because there was a total of seven conflict-related scales (i.e., task conflict, relationship conflict, cooperative conflict management, competitive conflict management, constructive controversy, contextual task conflict, contextual conflict resolution), there were too many items for all of these scales to be considered in a single CFA. Accordingly, I employed EFA, which can handle a relatively lower sample size (see Brown, 2006; Nunnally, 1978). Specifically, I

Table 5

CFA Model Fit Statistics for Items Belonging to the Scales of Jehn's Task Conflict and Relationship Conflict, and the Scales of Cooperative Conflict Management, Competitive Conflict Management, and Constructive Controversy

Model	Number of parameters[a]	df[b]	χ^{2}[c]	CFI[d]	RMSEA[e]	SRMR[f]	$\chi^{2}\,\Delta$ (reference model)[g]
1. One-factor	56	350	2555.57	.55	.15	.16	--
2. Two-factor ("valence")	57	349	1836.35	.76	.12	.08	719.22 (Model 1)
3. Two-factor ("types versus management")	57	349	1887.66	.75	.11	.09	667.91 (Model 1)
4. Five-factor model	66	340	740.67	.94	.06	.05	1814.90 (Model 1) 1095.68 (Model 2) 1147.00 (Model 3)

Note. n = 310. [a]The number of parameters free to vary in the model. [b]The degrees of freedom of the model, found by subtracting the number of model parameters from the number of unique terms in the variance/covariance matrix. [c]The chi-square statistic is a "badness of fit" statistic, meaning that higher values are associated with poorer fit. All chi-square values were significant, although this significance test has been shown to have critical flaws (but less so when comparing the fit of two models, see below); accordingly, the significance of the chi-square is not considered further (see Goffin, 2007). [d]The comparative fit index (CFI) compares the hypothesized model to a completely independent model; values in the range of .95 and greater are generally acceptable. [e]The root mean square error of approximation (RMSEA) is a parsimony-corrected index that incorporates consideration of degrees of freedom and favors simple models. Generally acceptable fit is in the range of .06 and lower. [f]The standardized root mean square residual (SRMR) is the average squared residual correlation. Models with values around .08 and below are often considered to have acceptable fit. [g]The chi-square difference test assesses the significance of the difference between the chi-square values of two models. All of the differences shown are significant at $p <$ .001, indicating that Model 4, which has the lowest overall chi-square, fits the data significantly better than any of the other three models (see Brown, 2006; Byrne, 2006; Hu & Bentler, 1999; Kline, 2005).

Table 6

CFA Model Fit Statistics for Items Belonging to the Scales of Jehn's Task Conflict, Contextual Task Conflict, and Relationship Conflict

Model	Number of parameters[a]	df[b]	χ^{2c}	CFI[d]	RMSEA[e]	SRMR[f]	$\chi^2 \Delta$ (reference model)[g]
1. One-factor	30	90	927.49	.68	.18	.13	--
2. Two-factor	31	89	454.55	.86	.11	.10	472.94 (Model 1)
3. Three-factor	33	87	163.41	.97	.05	.03	764.08 (Model 1) 219.14 (Model 2)

Note. n = 310. [a]The number of parameters free to vary in the model. [b]The degrees of freedom of the model, found by subtracting the number of model parameters from the number of unique terms in the variance/covariance matrix. [c]The chi-square statistic is a "badness of fit" statistic, meaning that higher values are associated with poorer fit. All chi-square values were significant, although this significance test has been shown to have critical flaws (but less so when comparing the fit of two models, see below); accordingly, the significance of the chi-square is not considered further (see Goffin, 2007). [d]The comparative fit index (CFI) compares the hypothesized model to a completely independent model; values in the range of .95 and greater are generally acceptable. [e]The root mean square error of approximation (RMSEA) is a parsimony-corrected index that incorporates consideration of degrees of freedom and favors simple models. Generally acceptable fit is in the range of .06 and lower. [f]The standardized root mean square residual (SRMR) is the average squared residual correlation. Models with values around .08 and below are often considered to have acceptable fit. [g]The chi-square difference test assesses the significance of the difference between the chi-square values of two models. All of the differences shown are significant at $p < .001$, indicating that Model 3, which has the lowest overall chi-square, fits the data significantly better than any of the other two models (see Brown, 2006; Byrne, 2006; Hu & Bentler, 1999; Kline, 2005).

Table 7

CFA Model Fit Statistics for Items Belonging to Jehn's Task Conflict Scale, Contextual Task Conflict, and Contextual Task Conflict Resolution

Model	Number of parameters[a]	df[b]	χ^{2c}	CFI[d]	RMSEA[e]	SRMR[f]	$\chi^2 \Delta$ (reference model)[g]
1. One-factor	28	77	1083.19	.53	.19	.17	--
2. Three-factor	31	74	166.53	.96	.04	.04	916.66 (Model 1)

Note. n = 310. [a]The number of parameters free to vary in the model. [b]The degrees of freedom of the model, found by subtracting the number of model parameters from the number of unique terms in the variance/covariance matrix. [c]The chi-square statistic is a "badness of fit" statistic, meaning that higher values are associated with poorer fit. All chi-square values were significant, although this significance test has been shown to have critical flaws (but less so when comparing the fit of two models, see below); accordingly, the significance of the chi-square is not considered further (see Goffin, 2007). [d]The comparative fit index (CFI) compares the hypothesized model to a completely independent model; values in the range of .95 and greater are generally acceptable. [e]The root mean square error of approximation (RMSEA) is a parsimony-corrected index that incorporates consideration of degrees of freedom and favors simple models. Generally acceptable fit is in the range of .06 and lower. [f]The standardized root mean square residual (SRMR) is the average squared residual correlation. Models with values around .08 and below are often considered to have acceptable fit. [g]The chi-square difference test assesses the significance of the difference between the chi-square values of two models. All of the differences shown are significant at $p < .001$, indicating that Model 2, which has the lowest overall chi-square, fits the data significantly better than the other model (see Brown, 2006; Byrne, 2006; Hu & Bentler, 1999; Kline, 2005).

used principal axis factor analysis (PAF) [although PAF tends to provide highly similar results to principal components analysis (PCA) for determining the number of factors underlying a data set (Velicer & Jackson, 1990)]. PAF has been recommended when latent constructs are under investigation, which was the focus here. Moreover, Russell's (2002) review concluded that PAF tends to be at least as accurate, and sometimes more accurate, than is PCA in reproducing the population factor loadings (see also Widaman, 1993). The scree plot, in Figure 2, provided some support for the hypothesized seven-factor solution, which was also supported by the parallel analysis procedure. The logic and accuracy of parallel analysis for determining the number of factors underlying a data set has been supported in numerous studies (e.g., Velicer, 1976; Velicer, Eaton, & Fava, 2000; Zwick & Velicer, 1986; see also a review by Conway & Huffcutt, 2003). I used O'Connor's (2000) program to compute 1000 random data sets with the same number of items and cases as are in the current data set. For each data set, the size of factors are computed, and the upper 95th percentile of the simulated distribution of factor sizes, for each factor, is identified. Normally parallel analysis involves retaining the number of observed factors (i.e., from the raw data set) with eigenvalues that exceed the 95th percentile of the distribution of simulated eigenvalues. Figure 2 plots the observed and simulated eigenvalues. Although eight factors could have been retained (observed 8th eigenvalue = .48, 95th percentile = .47), it was more convincing to adopt the proposed seven-factor solution. First, the margin of .01 suggests that retaining seven factors might be preferable. Second, each item's factor loadings in the seven-factor solution was greatest for the hypothesized factor, whereas the eight-factor solution had no interpretable eighth factor (not a single factor loading reached .30). That is, the eighth factor was not defined by any marker item. Third, there was a clear drop in eigenvalues after the 7th factor

Figure 1. Scree plot of seven-factor exploratory factor analysis with parallel analysis.

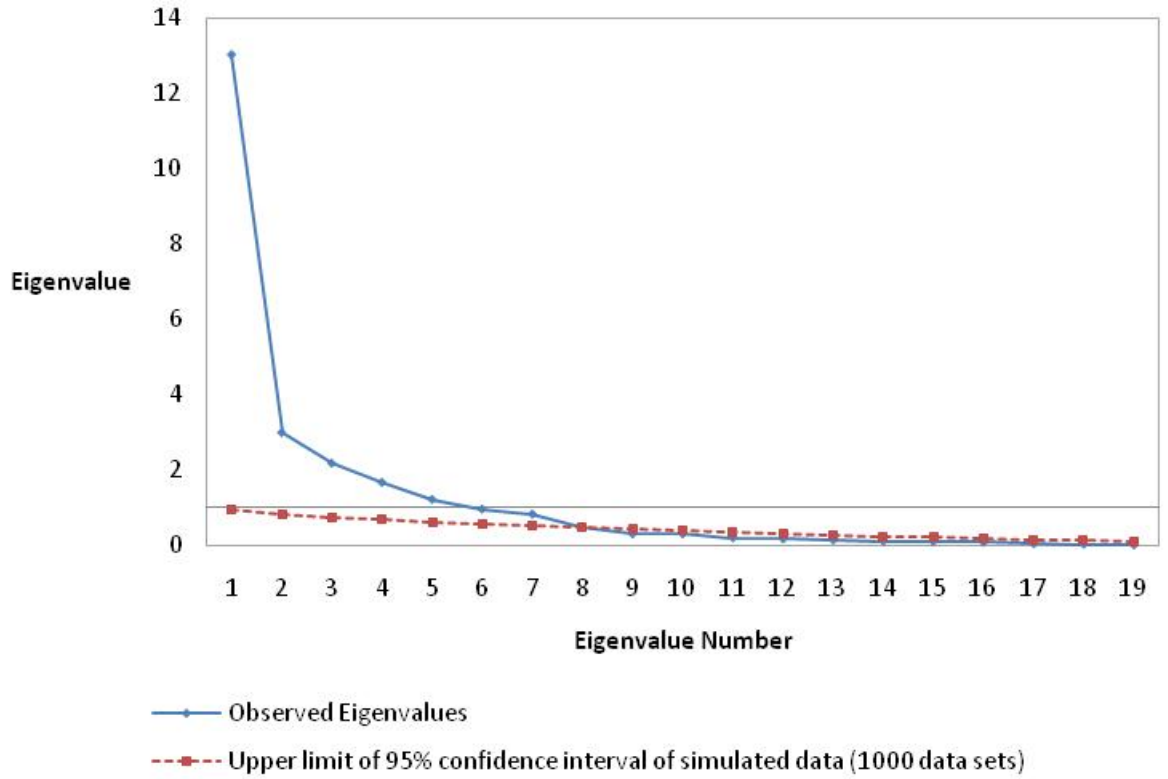

Figure caption. *n* = 310. EFA (principal axis factor analysis) was conducted using items belonging to the following seven scales: cooperative conflict management, competitive conflict management, constructive controversy, relationship conflict, Jehn's (1995) task conflict measure, contextual task conflict, and contextual task conflict resolution.

(eigenvalue VII = .88, eigenvalue VIII = .48), below which each factor was of very similar magnitude.

Taken together, I interpreted the above factor-analytic results as supporting the proposed factor structure of the conflict scales. Accordingly, the following section is concerned with examining how the new contextual conflict scales performed relative to the traditional measure of task conflict, and presents tests of the formal study hypotheses. First, however, I describe the team-level sample and issues related to the aggregation of individual-level self-report data to the team level.

Data Preparation for Hypothesis Testing

Of the original 82 teams, one was deleted because it was a two-person group. My observations of that group suggested that one group member carried the majority of the workload. For example, he was the sole presenter during class presentations and during the design showcase, and typically attended design laboratory sessions without his team mate. The remaining 81 teams were of size 4 (n = 61), and 5 (n = 20).[4] Cronbach's alpha reliabilities were in the acceptable range for the conflict and personality variables (see Table 4). The interrater reliability of team innovation, according to an intraclass correlation coefficient (ICC) based on a one-way random effects model was .71.

Because all hypotheses involved team-level variables, I aggregated self-report data (i.e., conflict variables, personality variables) to the team-level by computing the team means. For the conflict variables, previous literature treated these variables as "shared-unit" constructs (Jehn, 1995; Simons & Peterson, 2000). As suggested in the seminal work on group-level constructs by

[4] Results of hypothesis tests were unaffected by team size.

Kozlowski and Klein (2000), the construct validity of shared-unit variables assumes within-team agreement and between-team differences. The rationale is that measures of such variables are assumed to reflect shared perspectives of team members. Accordingly, shared-unit properties typically require non-zero ICCs in order to support aggregation. The conventional reliability coefficients, reported in this literature in order to reflect convergence of ratings within teams and differences across teams, are ICC(1) and ICC(2). These ICCs are essentially ratios of between-group variance to within-group variance (Bliese, 2000). I computed ICC coefficients for comparison to previous research; however, there are compelling theoretical reasons to suggest that relationship conflict, and particularly task conflict, are not shared-unit properties (O'Neill, 2009). Rather, each team member's experience of conflict is likely somewhat unique from other team members' experiences (Jehn, Rispens, & Thatcher, 2010). Thus, conflicts are unlikely to be "shared" in the sense that each team member interprets conflicts similarly. As Kozlowski and Klein argued, the appropriate conceptualization of team conflict is as a "configural" construct because discrepancies in perceptions of conflict are theoretically expected. Consistent with that notion, the team means on relationship and task conflict appear to correspond well to what Chan (1998) coined the "additive" conceptualization, which asserts that the mean captures the absolute level of the construct in the group, and variation in scores underlying that mean can be theoretically expected but the mean can still be a predictor of other team variables. Thus, in this research I conceptualized relationship and task conflict as configural and additive constructs, which, in line with recent conflict theory (e.g., Jehn et al., 2010), effectively removes a need to demonstrate homogeneity of group member perceptions.

Table 8 contains the descriptive statistics, ICCs, and zero-order correlations for the

Table 8

Means, Standard Deviations, Reliabilities, and Correlations for Study 2 Variables (Team Level)

	M	SD	ICC(1)	ICC(2)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Manipulativeness	2.91	.21													
2. Narcissism	4.95	1.38			.40										
3. Psychopathy	2.34	.23			.17	.29									
4. Cooperative	5.85	.57	.25	.57	-.10	-.21	-.41								
5. Competitive	2.66	.78	.20	.48	.21	.23	.43	-.75							
6. Constructive controversy	5.84	.52	.26	.57	-.11	-.24	-.41	.85	-.75						
7. Task conflict	2.13	.51	.24	.54	.17	.21	.26	-.54	.60	-.60					
8. Relationship conflict	1.63	.53	.24	.56	.22	.27	.28	-.74	.74	-.76	.73				
9. Contextual task conflict	2.65	.50	.05	.17	.01	.06	.18	-.15	.27	-.14	.42	.19			
10. Contextual task conflict resolution	3.91	.55	.14	.40	-.02	-.11	-.30	.55	-.59	.50	-.39	-.45	-.09		
11. Team innovation	53.96	17.38			.05	-.06	-.21	.09	-.10	.05	-.11	.04	-.23	.14	
12. Team performance	.00	.95			-.06	.08	-.30	.16	-.24	.17	-.18	-.09	-.17	.30	.37

Note. $n = 81$. Correlations exceeding absolute values of .21 are significant at $p < .05$.

team-level variables. A mentioned above, I reported ICCs for task and relationship conflict for comparison to previous research even though these are not theoretically expected to be large given the nature of configural constructs. ICCs were all significantly different from zero except for the contextual conflict variable, although I pressed on with interpretation of correlations and with hypothesis tests involving this variable because I believe there are compelling arguments, detailed above, for not expecting self-reported conflict measures to be shared among team members. Moreover, it should be noted that the current ICCs, even those for the contextual task conflict measure, are at levels consistent with some previous research (e.g., Jehn et al., 2008).

Correlations Involving Contextual Conflict

Aggregated to the team-level, contextual task conflict and contextual task conflict resolution appeared to show favorable convergent and discriminant correlations with other variables (see Table 8). In support of convergent validity, the contextual task conflict measure was related to Jehn's task conflict scale, $r = .42$, $p < .05$. That correlation, however, is likely not sufficiently large to suggest completely overlapping constructs. Moreover, contextual task conflict demonstrated relatively low correlations, compared to those involving Jehn's task conflict measure, with cooperative conflict management (contextual measure, $r = -.15$; Jehn's measure, $r = -.54$), competitive conflict management (contexutal measure, $r = .27$; Jehn's measure: $r = .60$), constructive controversy (contextual measure, $r = -.14$; Jehn's measure, $r = -.60$). Other validity evidence for the new scales is reflected in the weak correlation between contextual task conflict and contextual task conflict resolution ($r = -.09$), suggesting that teams could experience disagreements independently from achieving resolution of those disagreements. In addition, contextual task conflict resolution correlated at -.39 with Jehn's task conflict, suggesting Jehn's measure may be tapping, to some extent, unresolved task conflicts in addition

to the amount of conflict a team experiences. In other words, this suggests Jehn's measure could potentially confound the amount of task conflict in a group with its resolution, and this is a possible weakness that does not appear to be shared by the contextual task conflict measures (because of the low correlation between the two contextual scales). Finally, contextual task conflict resolution correlated with conflict management variables at levels falling within the range of .50 to .60, which is not unexpected given the similarity, but not complete redundancy, of the measures.

In terms of criterion validity, the contextual task conflict measure was significantly related to team innovation, although the relation was negative, r = -.23 (see Table 8). This suggests that the negative connotations associated with Jehn's measure may not have been alleviated by the new contextual measure. Another possibility is that the "true" construct-level relation between task conflict and team effectiveness is negative (see De Dreu & Weingart, 2003a). Turning to the criterion validity of contextual task conflict resolution, there was a significant and positive relation with team performance, r = .30. This is consistent with Tjosvold's (2008a) claims, which is that conflict management, and not necessarily the magnitude of the type of conflict, may be important for team effectiveness.

Hypothesis Testing

Moving into hypothesis testing, Hypothesis 1a, 1b, 1c, and 1d posited that task conflict would interact with cooperative conflict management, competitive conflict management, constructive controversy, and contextualized task conflict resolution in the prediction of team effectiveness criteria (i.e., team innovation, team performance). I used moderated multiple regression to test these hypotheses, and all variable scores were centered prior to computing the multiplicative term. I first conducted these hypothesis tests using Jehn's measure of task conflict.

The results, shown in Table 9, were all non-significant. However, when I employed the contextualized task conflict scale developed in this research as the measure of task conflict, there were two significant interactions (see Table 10). More specifically, Table 10 contains coefficients supportive of significant moderation for both cooperative conflict management, $b = -.76$, $p < .05$, and competitive conflict management, $b = .56$, $p < .05$. I plotted the shape of these interactions in Figure 3 and Figure 4, respectively.

Using O'Connor's (1998) SIMPLE program, I conducted simple slopes analysis by computing slopes between contextual task conflict and team performance at one standard deviation above and below the mean of the moderator (i.e., cooperative conflict management, competitive conflict management). Simple slopes analyses revealed that task conflict was negatively related to team performance at high levels of cooperative conflict management (simple $b = -.73$, $p < .05$), whereas task conflict was unrelated to team performance at low levels of cooperative conflict management (simple $b = .14$, *ns*). Moreover, task conflict was negatively related to team performance at low levels of competitive conflict management (simple $b = -.70$, $p < .05$), whereas task conflict was unrelated to team performance when competitive conflict management was high (simple $b = .19$, *ns*). Interestingly, the shapes of the interactions, in Figure 3 and Figure 4, were opposite to prediction. I expected a less negative relation between task conflict and team performance when cooperative and competitive conflict management were high and low, respectively. Thus, the prediction that task conflict's harmful effects may be mitigated by conflict management was not supported. However, interpretation of the current findings may be facilitated if the reader considers the same findings plotted with the "predictors" (conflict types) and "moderators" (conflict management) reversed (see Figure 5 and Figure 6).

Table 9

Moderated Multiple Regression Involving Jehn's Task Conflict and Conflict Management/Resolution Variables

Variable	Team Innovation		Team Performance	
	Model 1	Model 2	Model 1	Model 2
Task conflict	-2.75 (4.56)	19.30 (41.35)	-.25 (.25)	1.36 (2.24)
Cooperative conflict management	1.55 (4.04)	9.67 (15.68)	.14 (.21)	.73 (.85)
Interaction		-3.75 (7.00)		-.27 (.38)
Adjusted ΔR^2	.00	.00	.01	.00
Task conflict	-2.63 (4.80)	-11.35 (14.07)	-.11 (.26)	-.23 (.76)
Competitive conflict management	-1.15 (3.12)	-8.17 (11.10)	-.25 (.17)	-.34 (.60)
Interaction		3.24 (4.91)		.04 (.26)
Adjusted ΔR^2	.00	.00	.03	.00
Task conflict	-4.21 (4.80)	15.95 (42.19)	-.52 (.26)	.20 (2.29)
Constructive controversy	-.88 (4.73)	6.58 (16.22)	.17 (.26)	.33 (.88)
Interaction		-3.46 (7.20)		-.07 (.39)
Adjusted ΔR^2	.00	.00	.01	.00
Task conflict	-2.13 (4.16)	25.92 (29.71)	-.15 (.22)	1.18 (3.47)
Contextual task conflict resolution	3.67 (3.82)	18.65 (16.16)	.46 (.20)	1.17 (.86)
Interaction		-7.17 (7.52)		-.34 (.40)
Adjusted ΔR^2	.00	.00	.07*	.00

Note. $n = 81$. Values are unstandardized regression coefficients and, in parentheses, their standard errors.
*$p < .05$

Table 10

Moderated Multiple Regression Involving Contextual Task Conflict and Conflict Management/Resolution Variables

Variable	Team Innovation		Team Performance	
	Model 1	Model 2	Model 1	Model 2
Contextual task conflict	-7.70 (3.88)	6.92 (39.67)	-.29 (.21)	4.18 (2.13)
Cooperative conflict management	1.88 (3.37)	8.54 (18.30)	.23 (.19)	2.26* (.98)
Interaction		-2.5 (6.75)		-.76* (.36)
Adjusted ΔR^2	.03	.00	.02	.04*
Contextual task conflict	-7.65 (3.99)	-20.15 (13.82)	-.22 (.22)	-1.76* (.74)
Competitive conflict management	-.87 (2.54)	-12.94 (13.03)	-.25 (.14)	-1.73* (.69)
Interaction		4.59 (4.86)		.56* (.26)
Adjusted ΔR^2	.03	.00	.06	.03*
Contextual task conflict	-7.94* (3.88)	-1.81 (40.68)	-.29 (.21)	3.17 (2.20)
Constructive controversy	.57 (3.75)	3.33 (18.62)	.27 (.21)	1.83 (1.01)
Interaction		-1.04 (6.88)		-.59 (.37)
Adjusted ΔR^2	.03	.00	.03	.01
Contextual task conflict	-7.77* (3.83)	15.00 (26.56)	-.28 (.21)	1.89 (1.41)
Contextual task conflict resolution	3.83 (1.11)	18.44 (17.31)	.49 (.19)*	1.89* (.92)
Interaction		-5.85 (6.79)		-.56 (.36)
Adjusted ΔR^2	.04	.00	.09*	.01

Note. $n = 81$. Values are unstandardized regression coefficients and, in parentheses, their standard errors.
*$p < .05$

Figure 3. Interaction between contextual task conflict and cooperative conflict management in the prediction of team performance.

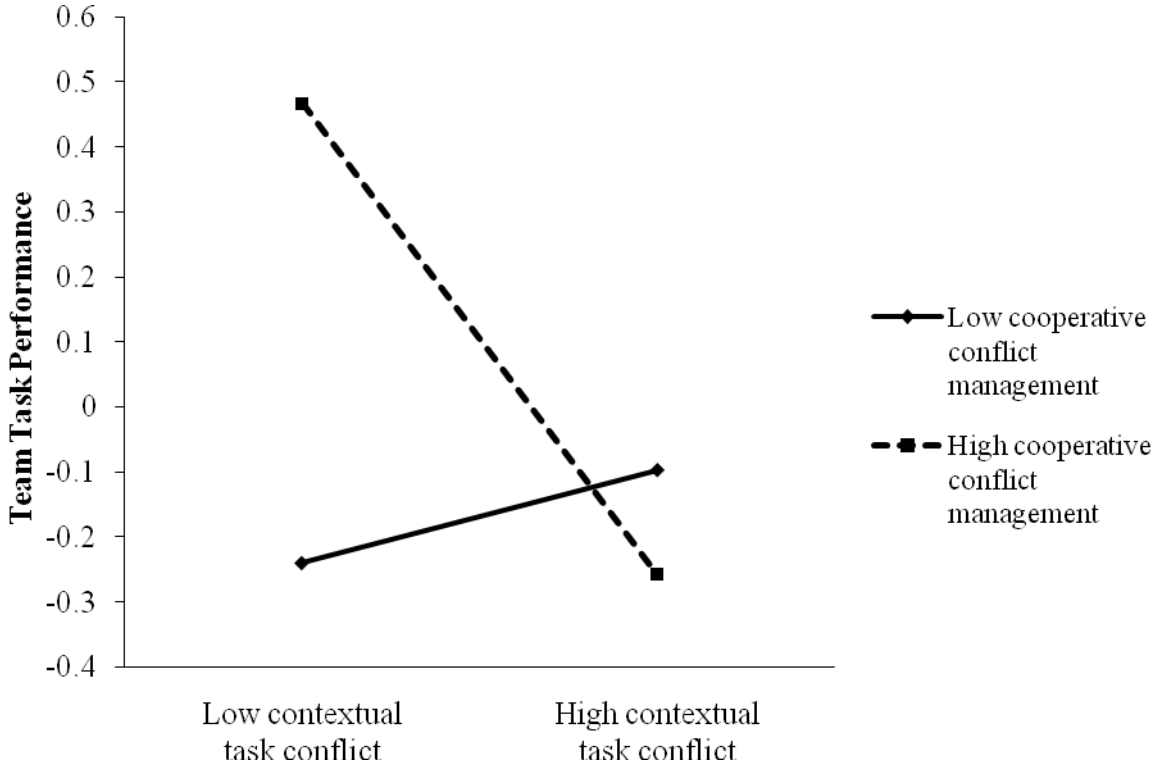

Figure caption. The relation between contextual task conflict and team performance is in the negative direction when cooperative conflict management is high, whereas the relation is non-significant when cooperative conflict management is low. Values are plotted at +/-1 standard deviation above and below the mean for contextual task conflict and cooperative conflict management.

Figure 4. Interaction between contextual task conflict and competitive conflict management in the prediction of team performance.

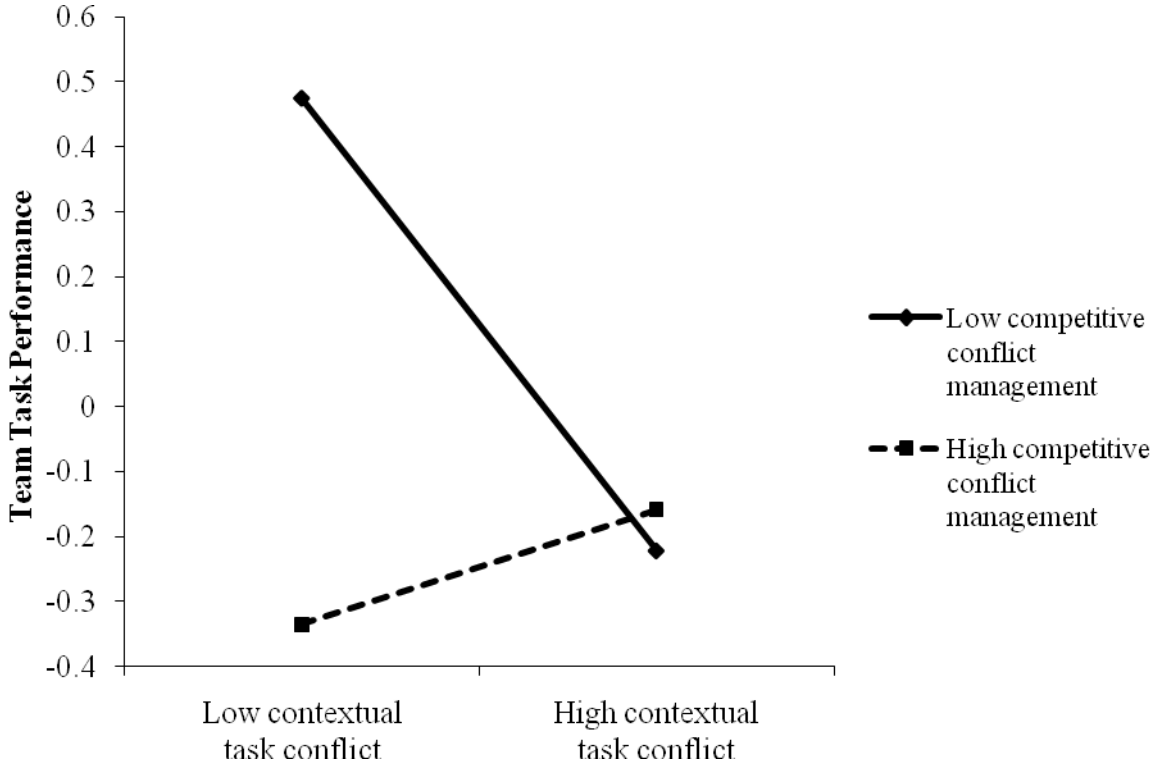

Figure caption. The relation between contextual task conflict and team performance is in the negative direction when competitive conflict management is low, whereas the relation is non-significant when competitive conflict management is high. Values are plotted at +/-1 standard deviation above and below the mean for contextual task conflict and competitive conflict management.

Figure 5. Interaction between contextual task conflict and cooperative conflict management using contextual task conflict as the moderator.

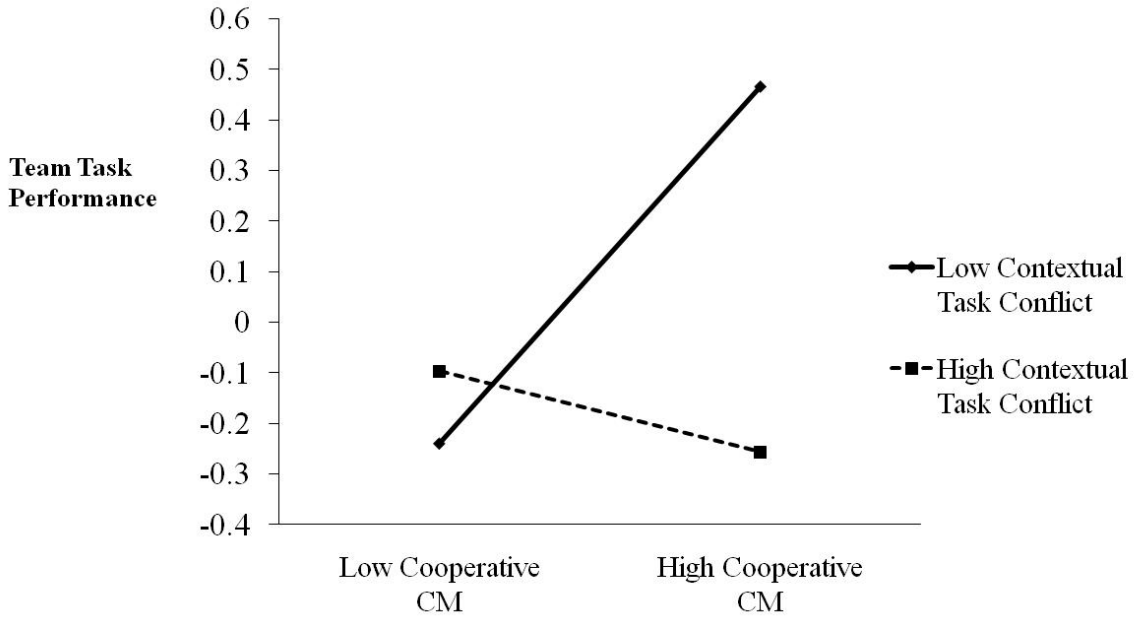

Figure caption. The relation between cooperative conflict management and team performance is in the positive direction when contextual task conflict is low, whereas the relation is non-significant when contextual task conflict is high. Values are plotted at +/-1 standard deviation above and below the mean for contextual task conflict and cooperative conflict management.

Figure 6. Interaction between contextual task conflict and competitive conflict management using contextual task conflict as the moderator.

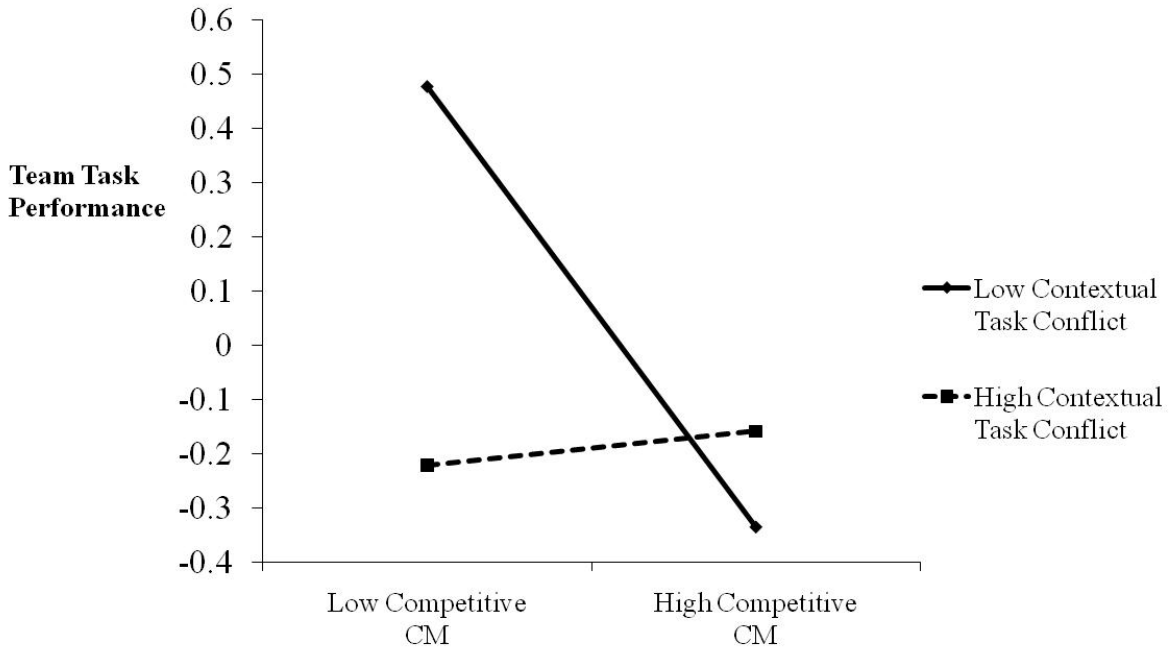

Figure caption. The relation between competitive conflict management and team performance is in the negative direction when contextual task conflict is low, whereas the relation is non-significant when contextual task conflict is high. Values are plotted at +/-1 standard deviation above and below the mean for contextual task conflict and competitive conflict management.

Of course, it is an arbitrary decision regarding the assignment to variables as “predictors” or “moderators;” statistically both variables are treated as predictors by regression and therefore no difference in the significance testing or slope coefficients occurs as a result of this reversing procedure. Importantly, inspection of the reversed figures reveals a potentially very meaningful set of findings. Cooperative conflict management was positively related to team task performance at low levels of task conflict, whereas cooperative conflict management was unrelated to team task performance at high levels of task conflict (see Figure 5). Similarly, competitive conflict management was negatively related to team task performance at low levels of task conflict, whereas competitive conflict management was unrelated to team task performance at high levels of task conflict (see Figure 6). These contingencies imply that conflict management only had effects on team task performance when teams were not overloaded with contextual task conflict. When contextual task conflicts were high, it appears that conflict management strategies did not matter. This highlights the inherent potential dependencies of these sets of variables and their associated theories despite the fact that the results were not consistent with prediction.

Hypothesis 2a, 2b, 2c, and 2d suggested that relationship conflict would interact with cooperative conflict management, competitive conflict management, constructive controversy, and contextual conflict resolution in the prediction of team effectiveness. Moderated multiple regression revealed no significant interactions (see Table 11); thus, Hypotheses 2a through 2d were not supported.

Hypothesis 3a and 3b predicted that task conflict would be negatively related to team task performance and team innovation, respectively. Zero-order correlations (see Table 8) between

Table 11

Moderated Multiple Regression Involving Relationship Conflict and Conflict Management/Resolution Variables

Variable	Team Innovation		Team Performance	
	Model 1	Model 2	Model 1	Model 2
Relationship conflict	7.96 (5.41)	27.32 (34.63)	.11 (.30)	1.69 (1.91)
Cooperative conflict management	8.24 (4.98)	13.75 (10.94)	.34 (.27)	.79 (.60)
Interaction		-3.54 (6.26)		-.29 (.34)
Adjusted ΔR^2	.01	.00	.00	.00
Relationship conflict	8.34 (5.45)	1.95 (18.77)	.35 (.29)	.02 (1.01)
Competitive conflict management	-6.34 (3.68)	-9.38 (9.31)	-.46* (.20)	-.62 (.50)
Interaction		1.99 (5.59)		.10 (.30)
Adjusted ΔR^2	.01	.00	.05	.00
Relationship conflict	5.95 (5.65)	30.67 (41.44)	.16 (.31)	1.22 (2.26)
Constructive controversy	6.2 (5.78)	13.28 (13.11)	.43 (.32)	.74 (.72)
Interaction		-4.48 (7.43)		-.19 (.41)
Adjusted ΔR^2	.00	.00	.01	.00
Relationship conflict	4.28 (4.09)	8.89 (45.18)	.09 (.22)	.83 (1.45)
Contextual task conflict resolution	6.25 (4.09)	8.14 (27.15)	.55 (.21)*	.85 (.62)
Interaction		1.27 (7.37)		-.20 (.39)
Adjusted ΔR^2	.01	.00	.07*	.00

Note. $n = 81$. Values are unstandardized regression coefficients and, in parentheses, their standard errors.
*$p < .05$

Jehn's traditional measure of task conflict and team effectiveness criteria were not significant. Although the contextual task conflict scale was unrelated to team task performance, it was negatively related to team innovation, $r = -.23$, $p < .05$. Thus, no support was found for Hypothesis 3a, but some support was found for Hypothesis 3b. Hypotheses 4a and 4b argued that relationship conflict would be negatively related to team performance and team innovation, respectively. Table 8, however, reveals that the correlations were not significant. Accordingly, Hypotheses 4a and 4b were not supported.

Turning to the group-level personality variables (see Table 8), Hypothesis 5a and 5b predicted that group means on Manipulativeness would be positively related to relationship conflict and task conflict, respectively. Manipulativeness was positively related to Relationship conflict, $r = .22$, $p < .05$, supporting Hypothesis 5a. Manipulativeness was not, however, significantly related to either task conflict scale, thereby not lending support to Hypothesis 5b. Hypothesis 6a and 6b argued that group means on Narcissism would be positively related to relationship and task conflict, respectively. Narcissism was positively associated with relationship conflict, $r = .27$, $p < .05$, and Narcissism's relation with Jehn's measure of task conflict was in the expected direction and approached significance, $r = .21$, $p = .06$. Narcissism was not significantly related to the contextual task conflict scale. Accordingly, Hypothesis 6a was supported and Hypothesis 6b could be interpreted as having been partially supported. Finally, Hypothesis 7a and 7b suggested that group-level Psychopathy would be positively related to relationship conflict and task conflict, respectively. Both of these relations received some support. Psychopathy was positively related to both relationship conflict, $r = .28$, $p < .05$, Jehn's measure of task conflict, $r = .26$, $p < .05$, but Psychopathy was not significantly related to

the contextual measure of task conflict. Thus, Hypothesis 7a and 7b were generally, but not fully, supported.[5]

Discussion

Moderation analyses involving conflict types and conflict management variables, a major impetus of this research, received some support. Significant moderation involved the contextual task conflict measure, cooperative conflict management, and competitive conflict management. First, task conflict was negatively related to team task performance when cooperative conflict management was high, whereas task conflict was unrelated to team task performance when cooperative conflict was low. My interpretation of this contingency is that cooperative conflict management appeared to have a positive influence on team task performance when task conflict was relatively low, but as task conflict increased there was a diminishing potential for cooperative conflict to mitigate the negative effects of task conflict. Similarly, task conflict was negatively related to team task performance when competitive conflict management was low. I see this finding as suggesting that low competitive conflict was only helpful for team task performance when task conflicts were low. It would appear that when task conflict was high, neither high levels of cooperative conflict management nor low levels of competitive conflict management could overcome the detrimental effects of task conflict.

Moderation analyses not receiving support involved Jehn's (1995) measures of conflict types, constructive controversy, conflict resolution, and team innovation. The limitations associated with Jehn's measures of task conflict may explain why its effects were not moderated

[5] I conducted the analyses controlling for team task performance at Time 1. None of the hypotheses were affected except for the interaction term involving cooperative conflict management and contextual task conflict, for which significance changed to $p = .08$. I also conducted the analyses controlling for the proportion of females in each team (i.e., gender) and the variance of gender in each team (i.e., standard deviation). None of the findings were affected by gender controls.

by conflict management or resolution, but it is not clear why the remaining variable were not involved. One possibility is that the contingency model needs further development. There could be other contingencies, not tested here, that can reduce the potentially negative effects of relationship and task conflict on team outcomes. Many moderators have been suggested, such as trust, open communication and conflict norms, task complexity, timing of the team's lifecycle, organizational support for divergent ideas, and so forth (see Jehn & Bendersky, 2003; De Dreu & Weingart, 2003b). Although the theory of cooperation and competition, as well as constructive controversy, have very extensive theoretical underpinnings, future research may benefit by considering a wider array of moderators. Another issue could be related to power to detect the moderator. Power of moderation analyses is known to be low in most applied research (Aguinis, Boik, & Pierce, 2001; Aguinis, Culpepper, & Pierce, in press; Aguinis & Gottfredson, 2010; Rogers, 2002) and it may have resulted in undetected moderator coefficients here.

Despite the fact that task and relationship conflict, measured with Jehn's (1995) original scales, were not significantly related to team outcomes, there were some interesting findings regarding the new contextual measures. The contextual measure of task conflict was associated with team innovation, albeit negatively. It should be noted that the relation between task conflict and team innovation was found to be slightly negative in a recent meta-analysis (ρ = -.14; Hulsheger, Anderson, & Salgado, 2009); thus, a negative relationship uncovered here is consistent with previous research. The fact that the contextual task conflict scale, which arguably has less negative valence than does Jehn's measure, still correlated negatively with team innovation suggests that large amounts of different ideas, perspectives, and viewpoints interfered with the development of engineering prototypes that were both novel and practical. I also found that the task conflict resolution measure was positively related to team task performance, which

suggests that teams with members who felt that their contextual task conflicts were more settled performed better. The new conflict resolution scale could be beneficial for future research. Specifically, an argument could be made that unresolved conflicts paralyze a team because it is unable to commit to an agreed-upon strategy and to move forward. Taken together, the contextual task conflict and contextual task conflict resolution appeared to have criterion correlations not revealed by the traditional instrument used to investigate task conflict. From my standpoint this is noteworthy because it involved a considerable departure from previous research that has relied almost exclusively on Jehn's measures of conflict despite the potential problems identified in the current research.

Turning to the Dark Triad of personality traits, it may not be surprising that these traits, Manipulativeness, Narcissism, and Psychopathy, were all negatively related to relationship conflict. This supports my earlier arguments that relationship conflict should be associated with traits that are theoretically likely to be unhelpful for effective interpersonal interactions. What may be somewhat surprising is that the three traits were also correlated in the negative direction with Jehn's measure of task conflict, although only Psychopathy reached conventional levels of significance. Thus, task conflict, as measured with Jehn's scale, appears to be associated with conflicts that occur among members who are high on Psychopathy, such as individuals who tend not to make plans or pursue goals, and who become frustrated with others and manage that frustration by yelling and losing emotional control. This is a valuable finding because Psychopathy is not typically the sort variable that one would expect to correlate positively with task conflict given that task conflict is often described as consisting of disagreements that have the potential to result in superior products or solutions (Jansen et al., 1999; Jehn, 1995; Kotlyar & Karakowsky, 2006). The crux of the issue is that teams with members high on Psychopathy

appear to also experience task conflict, and theoretically these teams with “psychopathic” members should not tend to perform well. Indeed, the correlation between team-level Psychopathy and team performance was -.30. Interestingly, however, the findings regarding the new contextual measure of task conflict included relatively lower correlations with the traits of the Dark Triad, suggesting that the new scale may not have comprised variance associated with the negative behaviors and intentions reflective of individuals scoring high on those traits. I consider this to be additional support for the contextual measure of task conflict relative to Jehn’s traditional measure, which appears, potentially, to tap a more negative shade of task conflict.

GENERAL DISCUSSION

The major contributions of the current research are at least three-fold. First, I developed a contingency model involving conflict types and conflict management variables. Second, I constructed an alternative measure of task conflict that avoids some of the issues associated with Jehn's (1995) traditional measure. Third, I found that personality traits of the Dark Triad correlated positively with relationship conflict and, to a lesser extent, task conflict. I will begin by reviewing the importance of these contributions. Following that, I will explore theoretical issues related to the measurement of conflict, report on limitations and strengths of the current research, offer suggestions for future research, and identify practical implications.

Contributions

Integrative Model

Perhaps one of the most important contributions of this research involved marrying the literatures of conflict types and conflict management. Jehn's (1995) dichotomy of conflict types, task and relationship conflict, is a relatively new theory of conflict that proposes differential criterion relations. These differential predictions – specifically, that relationship conflict is harmful but that task conflict can be beneficial – have not been well supported empirically. Task and relationship conflict have been shown to each relate negatively to team performance in a meta-analysis (De Dreu & Weingart, 2003a), and contingency models been inconsistent in supporting a positive effect of task conflict (see DeChurch & Marks, 2001; Guerra et al., 2005; Lovelace et al., 2001; Rispens et al., 2007). Notably, prior to the current work there was no extensive consideration of conflict management variables (but see DeChurch & Marks), although the conflict management environment in which task and relationship conflicts occur could likely affect how members interpret those conflicts. Particularly in regard to task conflict, it was

suggested earlier that effective conflict management could result in at least the mitigation of the historically negative relations between task conflict and team outcomes. One may even argue that task conflict could be beneficial given the current team task, which is likely high in complexity, assuming that conflict occurs within an effective conflict management atmosphere. The development of the integrative model presented here provides a vehicle for such theorizing.

Before investigating the contingencies proposed by the integrative model there was a need to investigate the empirical distinctiveness of the conflict variables. Accordingly, Study 1 presented evidence of the distinctiveness of task conflict, relationship conflict, cooperative conflict management, competitive conflict management, and constructive controversy using a series of CFAs. Study 2 reconfirmed the hypothesized factor structure supported in Study 1, and also presented EFA evidence that supported a larger factor structure that included the new contextual measures of task conflict and its resolution. The finding that these conflict variables appear distinct is important because the scales had not been studied together in earlier research identified in my literature review, yet their distinctiveness is assumed by the model posited and tested in Study 2.

Upon finding support for the empirical distinctiveness among the conflict variables, Study 2 presented theoretical arguments in order to develop the integrative model. The central tenet of the integrative model is that, theoretically, conflict types and conflict management theories are conceptually insufficient when considered in isolation. As mentioned above, the effect of conflict types on team performance may depend on the environment within which that conflict occurs, but previous research on conflict types has only recently began to consider contingencies (but see for example Rispens et al., 2007). It is interesting to also note that Tjosvold's (1985, 1991, 1998) conflict management variables are likely insufficient without

consideration of the magnitudes of conflict types. Although Tjosvold (2008a) appears to maintain that the amount of conflict is not a concern, one might expect that conflict management can be more or less helpful depending on how much conflict and of what type of conflict occurs. Surprisingly, the levels of conflict experienced (e.g., the score on a task conflict scale) have not been considered previously in work involving Tjosvold's conflict management variables. Thus, the current research makes an important theoretical contribution by integrating two previously distinct literatures that are both, in my view, incomplete when considered separately.

Regarding the findings associated with tests of the integrative model, there were interactions that involved the contextual measure of task conflict, cooperative conflict management, and competitive conflict management. Together, these contingencies offer an important potential limitation of Tjosvold's earlier work in which he suggested that a team's approach to conflict is more critical than is the actual level of conflict experienced. It also offers a limitation of the conflict types literature that ignore the contingency of conflict management. The present research demonstrates that conflict management variables may be most relevant when there is a relatively small amount of task conflict to manage. Apparently, too much task conflict can be debilitating regardless of how that conflict is managed. Thus, the development of the integrative model and its empirical investigation revealed potentially novel insights, and this model and the associated empirical findings are major contributions of this dissertation.

Measurement of Task Conflict

In addition to the integrative model and the distinctiveness of its variables, I contributed to previous literature by identifying potential issues with Jehn's (1995) measure of task conflict and by proposing a new measure that was designed to alleviate those issues. Jehn's measure, used almost exclusively in research involving task conflict, appears to have limitations involving

valence and "decontextualization." That the items refer to "conflict" and "disagreements" could, arguably, lead high performing team members to not endorse such statements if the statements are interpreted as descriptive of poorly functioning teams. This could lead to an artificial negative relation between task conflict and team performance. Moreover, that the items are decontextualized suggests that responses may be less meaningful and accurate than when specific foci of the team's work are clearly specified. In order to improve upon these possible limitations, I developed a measure that improves upon the earlier measures in two ways. First it avoids terms with negative connotations. Second, it targets specific task foci that, based on my extensive observations, were highly relevant to the teams in question. Moreover, for each of the foci I asked members to report the extent to which those task conflicts were resolved. This allowed me to measure "contextual" task conflict resolution, and to determine if that scale moderated the effects of conflict on team outcomes and to investigate its zero-order correlations with other variables.

The findings involving the new, contextual measures of task conflict and conflict resolution shed new light on earlier findings involving conflict in teams. First, these scales were distinctive from other conflict variables, as shown in Study 2 CFA and EFA results. Second, the pattern of zero-order correlations involving the contextual measure of task conflict compared favorably to the pattern of zero-order correlations involving Jehn's measure of task conflict. Whereas Jehn's measure was highly related to relationship conflict and conflict management variables, the contextual measure was not. Moreover, Jehn's measure was moderately and negatively related to the contextual measure of task conflict resolution, yet the contextual scales of task conflict and its resolution were independent. Finally, the contextual measures were

involved in criterion-related validity and interactions whereas the measures developed by Jehn were not. Thus, the new scales appear relatively promising.

It is becoming clear that the pioneering researchers of task conflict view the current measurement scale as unsatisfactory. Recently, work has been presented by experts in the field, such as Bendersky, Weingart, and Jehn, that enumerates facets of an elaborated model of conflict (e.g., Bendersky et al., 2010). Those authors argued for separation of each of task and relationship conflict into three dimensions. Self-report measures for these scales are currently in development. Elsewhere, Hjerto and Kuvaas (2009) suggested that each of task conflict and relationship conflict be separated into two facets based on whether the conflict is person- or cognition-based. However, my reading of those papers is that the issue of valence has not been addressed. The issue of identifying various foci may be partly addressed through refinement of the scales, but not so much so that the new scales are likely to be clearly adapted to the team's task. The proposed scales are meant to be applicable to all teams, which leads to questions about the extent to which they are decontextualized. Thus, whereas new developments are underway by the leaders of the field, it would appear that the current work presented in this dissertation is a unique and an important contribution.

Conflict Antecedents

As a third major contribution of the present research, I proposed and tested personality traits of the Dark Triad as correlates of task and relationship conflict using Jehn's (1995) measures and the contextual conflict scale. The pattern of findings suggested that the potentially harmful "dark" personality traits are related to both of Jehn's measures of task and relationship conflict. This is not surprising for relationship conflict, but it may be unexpected to some that Psychopathy was significantly related to task conflict in the positive direction. This means that

teams comprised of individuals who are generally not commited to goals, and who routinely treat others with hostility are also likely to be in task conflict. The fact that task conflict, theorized by some researchers to be beneficial, was positively related to the team's level of Psychopathy is somewhat paradoxical. If task conflict is expected to be helpful one would expect it to relate negatively to traits expected to hinder team effectiveness. Thus, Jehn's measure of task conflict might be manifesting destructive tendencies of the team, not productive exchanges of ideas. This proposition, however, still awaits further research.

It is worth noting briefly that the relations involving dark personality traits and the contextual task conflict measure were generally lower than those involving Jehn's traditional task conflict measure, and none were significant. This suggests that the new measure of task conflict is likely to be less impacted by individuals' standing on potentially unhelpful personality traits, and it further supports its potential to not impact all team outcomes negatively. Moreover, this is supportive of my attempt to reduce the potentially negative connotations of Jehn's traditional measure. In sum, the current research provides preliminary evidence that Jehn's measure of task conflict is related to potentially destructive personality variables, and it would be interesting if future research examined more personality traits and other potential "inputs" of conflict to better understand its nomological net, and how it compares to contextual measures of task conflict.

Conceptualization of Task Conflict

Shared-unit properties, as mentioned earlier, are properties belonging to the entire team and, accordingly, include constructs that should be observable by all team members (Kozlowski & Klein, 2000). Although previous research has conceptualized task and relationship conflict as a shared-unit property (Jehn, 1995; Jehn & Mannix, 2001), there appears to be a shift, even by

Jehn, toward considering conflict as something that is not completely shared or experienced equally by all team members (Jehn et al., 2010; Korsgaard, Jeong, Mahony, & Pitariu, 2008; Kozlowski & Klein, 2000). Theoretically, team members are expected to interpret conflicts differently, and there may be conflicts between factions of the team or conflicts at the dyadic level, but often these conflicts may not involve the team as a whole or each team member equally. For these reasons, conflict perceptions may be theorized to be distributed configurally, not similarly, across team members; consequently high within-team agreement and within-team correlations (suggested by ICCs) would not be expected. I reported those values from Study 2 for comparison to previous research, but I did not interpret them at face value.

As opposed to conceptualizing conflict as a shared unit property, there is compelling reason to consider it a configural property. Using terminology advanced in Kozlowski and Klein's (2000) seminal work, a configural property refers to a way to operationalize group-level constructs that relaxes the assumption of "sharedness" in the form of convergence of team member ratings. Configural properties recognize that coalescence around some average is not necessarily expected. I suggest future research consider the treatment of conflict as configural and, specifically, as an "additive" characteristic of the group (see Chan, 1998). In reference to group-level constructs, Chan's pioneering taxonomy defines additive constructs as those that capture each group member's level or perception of a group-level construct as a contribution to the team's overall level, which is captured by the team mean but does not assume interchangeability of team members as judges of the construct. An additive construct is one potential manifestation of many types of configural constructs (other examples of configural constructs include the team's variance of the individual members' scale scores).

Limitations and Strengths

Sample Considerations

One design characteristic of the current study that may be construed as a limitation is that the sample was composed of students. Use of students is potentially an issue because the students are not perfect replications of employees who are in a context that involves compensation, multi-year relationship considerations, and client demands. With that limitation acknowledged, there is a need to emphasize the tradeoffs.

At a practical level, it would be very difficult, if not impossible, to obtain data from a large number of teams completing tasks of similar type, duration, and consequentiality within a single organizational context. One could collect cross-sectional data, but that confounds tasks, organizational cultures, team lifecycles and tenure, team purposes, team status, and so forth. Statistical control of such variables is not a desirable or rectifying option (see Becker, 2005). The current sample, on the other hand, allowed for the context to be highly controlled despite allowing the teams to exist in their natural environment. This had the added advantage of allowing for very high response rates (approximately 90%), which is a critical issue in teams research because response rates can vary within teams and it is undesirable to have only one or two members reporting on behalf of an entire team (although perhaps better than removing these teams from the analysis completely; see Maloney, Johnson, & Zellmer-Bruhn, 2010). My preference for opting for more control, possibly at the expense of some generalizability, was also needed in order to develop and test the contextualized task conflict scale, which requires an assessment of the teams' tasks. Taken together, whereas some concerns regarding the generalizability of these findings are understandable, the current sample had many advantages for the current study that I believe can be viewed as strengths (see also O'Neill & Allen, 2011;

for similar arguments, see Behfar et al., 2008; Ilies, Wagner, & Morgeson, 2007; Tasa,Taggar, & Seijts, 2007). Future research may consider the extent to which the present findings generalize to teams in organizational contexts involving compensation, long-term teamwork and relationships, and tenured employees.

Measurement of Task Conflict

The contextual measure of task conflict developed in this research, although arguably an improvement in the measurement of task conflict, has its limitations. First, it would be difficult to apply such an instrument in a sample of teams doing disparate tasks because it requires some understanding of the teams' tasks in order to customize the item content. A counterargument to that limitation is that knowledge of the teams' tasks is needed in order to make an informed judgment about the potential relevance of task conflict, and other variables, to a teams' effectiveness. There is, fortunately, team task analysis methodology available that would lend itself well to developing contextualized task conflict measures (e.g., Arthur, Edwards, Bell, Villado, & Bennett, 2005). Knowledge gathered through a team task analysis could readily be applied to contextualizing a task conflict scale, by tailoring the item foci to the team's task, similar to the current research. A second limitation of the new measures is that, like Jehn's, they rely on self-reported perceptions of the frequency of task conflicts. There are legitimate questions regarding the extent to which individuals can recall the frequency in which different ideas, perspectives, and viewpoints the team has encountered throughout their work. However, often the self-report method will be the only possible tool in which research on task conflict will be feasible. In this regard, it is my view that the current measurement approach is an important step forward in the measurement of task conflict and that this technique has much to offer in the

way of future research. To my knowledge, it is one of the first major departures for the measurement of team task conflict.

Another issue related to the measurement of task conflict involves my decision to not incorporate a consideration of process conflict in my dissertation. Process conflict occurs when there are disagreements about roles, assignments, and how the work will be carried out (Jehn & Mannix, 2001). I did not consider process conflict because of the dearth of earlier research and the potential conceptual overlap between task conflict and process conflict. In seminal research involving process conflict, Jehn and Mannix found that high performing teams had higher process conflict at midpoints and endpoints than at earlier stages of their lifecycles. Low performing teams had low process conflict early on and at the endpoint of their lifecycle, and high process conflict at the midpoint of their lifecycle. Elsewhere, Goncalo, Polman, and Maslach (2010) found that early process conflicts were positively related to group performance whereas late process conflicts were negatively related to group performance. As stated by Poole and Garner (2006), however, there is very little research on process conflict. My own review of the literature, that included unpublished works, identified 10 studies involving a process conflict – team performance correlation. The average of these correlations was -.24, which suggests that process conflict is at least as harmful as relationship conflict and task conflict, on average (cf. De Dreu & Weingart, 2003). Taken together, it is unclear how a consideration of process conflict would affect the conclusions drawn here, although it may be interesting to consider this variable further in future research.

Measurement of Criteria

One limitation to the measurement of team outcomes was that the reliability of the team task performance measure could not be ascertained because each report was graded by only one

individual. The measure was, however, correlated with all study variables in the predicted direction (although not always significantly so), which is supportive of its construct validity. Team task performance also correlated positively and significantly with the measure of team innovation, suggesting the two criteria had some overlap but not complete redundancy. The fact that the team performance and innovation scores were correlated garners further support for their construct validity because the teams' projects were expected to be innovative, thereby leading to some convergence, yet there were numerous other dimensions of team task performance that would cause the correlation with innovation scores to be less than 1.0. Thus, team task performance scores appeared to have some validity.

For several reasons the measurement of team innovation might be considered a strength of the current research. First, the interrater reliability of the expert judge ratings of team innovation was within the acceptable range. Second, although previous research has used supervisor or self-ratings of innovation (e.g., endorsement of the item "the team is very innovative"), some have argued that, for superior measurement of team innovation, a specific team output (e.g., prototypes) must be the stimuli and multiple expert judges that are highly familiar with the task must be employed (Amabile, 1983; Shalley, 1991). Supervisor or self-ratings of innovation are suspect because it is unclear what is in the mind of the rater when he or she thinks of the term "innovation." Having expert raters with clear rating instructions rate a specific and tangible output that emerged from the identical set of task instructions compares favorably to many approaches to self and supervisor Likert-scale ratings used frequently in previous research (e.g., Chen & Tjosvold, 2002; Lovelace et al., 2001). Third, the scale underlying the innovation scores was a relative measure, the relative percentile method (RPM), and that scale is advantageous because it facilitates comparisons among teams that may

contribute to greater rating accuracy. That is, the RPM is theorized to capitalize on social comparison theory (Festinger, 1954), which posits that the accuracy of ratings on abstract constructs can be increased by introducing comparison stimuli (Goffin & Olson, 2011). This method appears to have been successful in the current research given the apparent reliability and validity of the judges' ratings, and future researchers measuring innovation and creativity – relatively abstract concepts – may also benefit from the RPM approach.

The Unit of Analysis and Factor Analysis

One of my committee members raised the issue of the unit of analysis used for investigating the distinctiveness of conflict variables. I used factor analysis of individual-level data to infer that conflict variables were distinctive, yet the hypotheses involving conflict variables were aggregated to the team level. Of course, it would have been inappropriate to conduct factor analyses on team-level data (using aggregated items) given the number of teams in this research and the sample size requirements of factor analysis. Sirotnik (1980) argued that psychometric analyses and hypotheses tests should be "coordinated." That is, if the construct is primarily composed of between-unit variance, group-level psychometric analyses should be applied; if the construct is composed of individual-unit variance, individual-level psychometric analysis should be applied. The proportion of between-team variance in conflict scales ranged from .05 to .26 in Study 2, thereby leaving room for considerable individual-level variance. Indeed, such constructs were referred to by Bliese (2000) as "fuzzy" composition variables because they represent a blend of individual- and team-level variance. Accordingly, there is no clear answer as to which level of analysis would be optimal, and, in my view, it is not clear that different results would be expected by level of analysis in the context of the present study.

Nevertheless, it would be interesting if future research investigated the implications of the unit-of-analysis problem for psychometrics (but see Sirotnik, 1980).

Future Research

Although I departed from previous research by attempting to address some measurement issues inherent in the traditional task conflict scale, future research may investigate further the construct validity of task conflict measures. One avenue for this work would be to consider the convergence of self-report and observer-coded occurrences of task conflict. For example, a team could be videotaped during an interaction and later the team's interaction could be coded and scored on task conflict (similar methodology was applied by Park & DeShon, 2010). Correlations between self-reported task conflict would be supportive of convergent validity. Possibly, however, there would be low correlations between the two measures. An investigation of relations with other variables, for each measure, would then shed light on their construct validity. A study of this nature could be helpful for the future development task conflict measurement and our understanding of this construct.

Another issue for future research to consider is that task conflict could have non-linear relations with performance. To my knowledge there are three studies that have reported an inverted-U-shaped relationship between task conflict and team effectiveness (De Dreu, 2006; Farh, Lee, & Farh, 2010; Shaw et al., in press). Although not reported in the current research, I tested for a quadratic effect of both task conflict scales on team outcomes but no effect was found. The fact that very few studies have found support for a quadratic effect suggests that it may occur very rarely. Nonetheless, I believe my findings can be viewed as complementary to a curvilinear effect. In the presence of a quadratic effect, the interpretation would be that a moderate amount of conflict is helpful, whereas teams devoid of conflict and teams overloaded

with conflict will not perform well. My findings suggest that teams with relatively little – but not necessarily completely absent – task conflict can perform well when that conflict is cooperative and not competitive. Accordingly, some conflict may be encouraged but teams must be careful not to let this conflict turn burdensome which, incidentally, is consistent with recommendations from studies finding a curvilinear effect (for a review, see De Dreu, 2008). Thus, although there are slight differences of interpretation regarding the current research findings and those of studies reporting an inverted-U relationship, I do not see the interpretations as practically irreconcilable.

Regarding the current team outcomes studied in this research, team task performance and team innovation, it should be noted that both were highly relevant to the teams. As previously noted, the task performance measure had implications for students' course grades, and team innovation was emphasized throughout the course as an important characteristic of high-quality projects. Moreover, team task performance and team innovation have been theorized to benefit from the occurrence of task conflict (Jehn & Mannix, 2001; West & Anderson, 1996). Specifically, it may be that task conflict gives rise to new ideas and transforms those ideas into superior output. However, team task conflict was not beneficial for either of these outcomes, and perhaps this is because it has benefits only for much more specific, unidimensional criteria (see De Dreu, 2008). For example, if task conflict is ever beneficial, it may be under exceedingly narrow conditions such as during transition phases where the team engages in strategy formulation and planning, or when problem detection and recognition is paramount (see Marks et al., 2001 for a taxonomy of team processes). Interestingly, a recent study by Parks and DeShon (2010) found that dissenting opinions were related to increased detection of weapons in a luggage search decision-making task. This effect was mediated by increased discussion

stimulated by the dissenter. Thus, it would appear that in some decision-making tasks, task conflict has the potential to be helpful. Once the team moves into action phases characterized by long-periods of substantive task execution that involves little decision making, however, sustained task conflict may immobilize the team because members are not on the same page and therefore have difficulty progressing. Thus, it could be advantageous if future research examined task conflict and a narrower range of criteria.

Practical Implications

The results of the present research and previous studies, including meta-analyses (e.g., De Dreu & Weingart, 2003a; Hulsheger et al., 2009), suggest that high levels of task conflict are unlikely to be conducive to high team performance and innovation. Low levels of task conflict, however, managed in a cooperative environment may be one promising approach to facilitating effective teamwork. Note that this is not inconsistent with the inverted-U shaped relations discussed above. Surprisingly, however, organizational behavior textbooks (Greenberg, 2011) and some recent research articles continue to suggest (linear) positive effects of task conflict (e.g., Kotlyar & Karakowsky, 2006). These claims are, arguably, largely unwarranted and go against the vast majority of research involving task conflict, which suggests that high levels of task conflict are detrimental to team effectiveness. Moreover, the novel findings of this research suggest that even in teams managing conflict well (e.g., cooperatively), conflict management may not be helpful at high levels of task conflict. Taken together, managers, trainers, and teambuilding facilitators may be cautioned in advocating task conflict until further research establishes conditions under which task conflict can be beneficial, if this ever happens.

Whether or not task conflict should be encouraged is an issue with substantial relevance for teambuilding. There is a considerable amount of research suggesting that early team

interactions set the team on a trajectory toward success or failure (see Hackman, 2002; Mathieu & Rapp, 2009). If this is true, and if task conflicts are encouraged early on, there could be a severe risk of early team derailment that has long-term implications for the team. Thus, it would be my recommendation that teambuilding facilitators make comments about the value of task conflicts very carefully, acknowledge potential caveats shown by research, and only encourage task conflict where there exists some evidence to suggest that gains from such conflicts can outweight the potential costs (e.g., through local team task analysis). One thing is for certain: blindly advocating for and stimulating task conflict has serious potential to harm a team.

Regarding the topic of conflict management, the current research suggests that teams may benefit from cooperative conflict management, and from minimizing competitive conflict management. A practical implication of this finding is that team design principles could be tailored with the goal of emphasizing cooperation and de-emphasizing competition among team members. For example, making the team's mission clear to all team members, generating a team identity, and designing tasks in order to enhance perceptions of positive interdependence are recommendations for highlighting the team members' shared objectives (see O'Neill, Lewis, & Hambley, 2008). Moreover, team members and their leaders might be trained to recognize when interactions are becoming negative, to openly acknowledge the issue, and perhaps restructure the situation in order to move toward cooperation and the emphasis of shared, mutual goals. To the extent that team members genuinely possess competitive goals, revisions to team membership may be a potential alternative. The current research, and an enormous amount of earlier research, suggests that competitive conflicts are harmful to team effectiveness and maybe very destructive to satisfaction and morale.

One final implication for practice involves leadership. It is possible that task conflicts can be effectively handled under leadership that ensures the conflicts are well managed and do not become debilitating. In an experiment by Kotlyar and Karakowsky (2006), transformational leadership resulted in greater levels of relationship and task conflict compared to transactional leadership. The authors interpreted these findings as reflective of transformational leaders' ability to generate greater interest and motivation in the task, thereby leading to task conflicts. Moreover, Kotlyar and Karakowsky suggested that transformational leaders aroused emotions, such as passion and ego-involvement, and that that resulted in greater relationship conflict. This presents an interesting dilemma for transformational individuals who encourage intellectual challenges and appeal to individuals' values and self-concepts when emphasizing high quality team output. Such behaviors have been show to result in some beneficial effects, such as increased motivation of followers (Judge & Piccolo, 2004), but in the context of the team it appears to generate greater conflict, which may not always be supportive of team effectiveness. It appears that leadership behaviors that stimulate conflict should be used judiciously, such as during appropriate times of the team's task. There may be other times when leaders need to actually downplay intellectual stimulation in favor of moving forward with task completion and execution. Although there is a need for more research on leadership and conflict in teams, one implication for practitioners is that leaders likely need to be very cognizant of (a) when conflicts are to be tolerated and perhaps promoted, (b) when conflicts should be minimized, (c) the current conflict management atmosphere in the team, and (d) the possibility that at certain times there may be a need to emphasize transactional behaviors in order to reduce conflict and carry on with task completion.

Conclusion

The present study found support for the distinctiveness of conflict type variables, conflict management variables, and two new measures of conflict involving contextual task conflict and its resolution. An integrative model, based on an extensive review of existing research, was developed and tested empirically. Whereas task conflict either had no effect on team outcomes or a deleterious effect, there were indications that low levels of task conflict where beneficial when managed cooperatively and non-competitively. Thus, it is recommended that practitioners, trainers, and team leaders cultivate teams with low levels of team conflict until further research supports a more favorable view of task conflict. The overarching theoretical contribution of this research is that it marries two separate literatures involving team conflict that, arguably, are incomplete without mutual consideration.

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APPENDICES

Appendix A

Ethics Approval Form (Personality Data Collection Period)

Western

Department of Psychology The University of Western Ontario
Room 7418 Social Sciences Centre,
London, ON, Canada N6A 5C1
Telephone: (519) 661-2067Fax: (519) 661-3961

Use of Human Subjects - Ethics Approval Notice

Review Number	**09 09 06**	**Approval Date**	**09 09 07**
Principal Investigator	**Natalie Allen/Tom O'Neill**	**End Date**	**10 04 30**
Protocol Title	**Towards an understanding of composition effects in teams**		
Sponsor	**n/a**		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

This approval shall remain valid until end date noted above assuming timely and acceptable responses to the University's periodic requests for surveillance and monitoring information.

During the course of the research, no deviations from, or changes to, the protocol or consent form may be initiated without prior written approval from the PREB except when necessary to eliminate immediate hazards to the subject or when the change(s) involve only logistical or administrative aspects of the study (e.g. change of research assistant, telephone number etc). Subjects must receive a copy of the information/consent documentation.

Investigators must promptly also report to the PREB:
a) changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely affect the safety of the subjects or the conduct of the study.

If these changes/adverse events require a change to the information/consent documentation, and/or recruitment advertisement, the newly revised information/consent documentation, and/or advertisement, must be submitted to the PREB for approval.

Members of the PREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the PREB.

Clive Seligman Ph.D.

Chair, Psychology Expedited Research Ethics Board (PREB)

The other members of the 2008-2009 PREB are: David Dozois, Bill Fisher, Riley Hinson and Steve Lupker

CC: UWO Office of Research Ethics

This is an official document. Please retain the original in your files

Appendix B

Ethics Approval Form (October-November Data Collection Period)

Department of Psychology The University of Western Ontario
Room 7418 Social Sciences Centre,
London, ON, Canada N6A 5C1
Telephone: (519) 661-2067Fax: (519) 661-3961

Use of Human Subjects - Ethics Approval Notice

Review Number	**09 11 10**	**Approval Date**	**09 11 20**
Principal Investigator	**Natalie Allen/ Tom O'Neill**	**End Date**	**10 04 30**
Protocol Title	**Towards an understanding of composition effects in teams (Continuation of 09 09 06)**		
Sponsor	**n/a**		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

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During the course of the research, no deviations from, or changes to, the protocol or consent form may be initiated without prior written approval from the PREB except when necessary to eliminate immediate hazards to the subject or when the change(s) involve only logistical or administrative aspects of the study (e.g. change of research assistant, telephone number etc). Subjects must receive a copy of the information/consent documentation.

Investigators must promptly also report to the PREB:
a) changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely affect the safety of the subjects or the conduct of the study.

If these changes/adverse events require a change to the information/consent documentation, and/or recruitment advertisement, the newly revised information/consent documentation, and/or advertisement, must be submitted to the PREB for approval.

Members of the PREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the PREB.

Clive Seligman Ph.D.

Chair, Psychology Expedited Research Ethics Board (PREB)

The other members of the 2009-2010 PREB are: David Dozois, Bill Fisher, Riley Hinson and Steve Lupker

CC: UWO Office of Research Ethics

This is an official document. Please retain the original in your files

Appendix C

Ethics Approval Form (February-March Data Collection Period)

Department of Psychology The University of Western Ontario
Room 7418 Social Sciences Centre,
London, ON, Canada N6A 5C1
Telephone: (519) 661-2067Fax: (519) 661-3961

Use of Human Subjects - Ethics Approval Notice

Review Number	**10 01 10**	**Approval Date**	**10 01 20**
Principal Investigator	**Natalie Allen/Tom O'Neill**	**End Date**	**10 04 30**
Protocol Title	**Towards an understanding of composition effects in teams**		
Sponsor	**n/a**		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

This approval shall remain valid until end date noted above assuming timely and acceptable responses to the University's periodic requests for surveillance and monitoring information.

During the course of the research, no deviations from, or changes to, the protocol or consent form may be initiated without prior written approval from the PREB except when necessary to eliminate immediate hazards to the subject or when the change(s) involve only logistical or administrative aspects of the study (e.g. change of research assistant, telephone number etc). Subjects must receive a copy of the information/consent documentation.

Investigators must promptly also report to the PREB:
a) changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely affect the safety of the subjects or the conduct of the study.

If these changes/adverse events require a change to the information/consent documentation, and/or recruitment advertisement, the newly revised information/consent documentation, and/or advertisement, must be submitted to the PREB for approval.

Members of the PREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the PREB.

Clive Seligman Ph.D.

Chair, Psychology Expedited Research Ethics Board (PREB)

The other members of the 2009-2010 PREB are: David Dozois, Bill Fisher, Riley Hinson and Steve Lupker

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Appendix D

Task and Relationship Conflict Items

Task Conflict

Item	A very small amount	A little	Some	A considerable amount	A lot
How much disagreement was there among the members of your group over their opinions?					
How many disagreements over different ideas were there?					
How many differences about the content of decisions did the group have to work through?					
How many differences of opinion were there within the group?					

Relationship Conflict

Item	A very small amount	A little	Some	A considerable amount	A lot
How much emotional conflict was there among the members of your group?					
How much anger was there among the members of the group?					
How much personal friction was there in the group during decisions?					
How much were personality clashes between members of the group evident?					
How much tension was there in the group during decisions?					

Appendix E

Cooperative and Competitive Conflict Management Items

Cooperative Conflict

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
Team members encourage a 'we are in it together' attitude as they negotiate their differences.							
Team members seek a solution that will be good for all of us.							
Team members treat conflict as a mutual problem to solve.							
We work so that to the extent possible we all get what we really want.							
Team members combine the best of positions to make an effective decision.							

Competitive Conflict

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
Team members demand that others agree to their position.							
Team members want others to make concessions but do not want to make concessions themselves.							
Team members treat conflict as a win–lose contest.							
Team members state their position strongly to get their way.							

Appendix F

Constructive Controversy Items

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
Team members express their own views directly to each other.							
We listen carefully to each other's opinions.							
Team members try to understand each other's concerns.							
We try to use each other's ideas.							
Even when we disagree, we communicate respect for each other.							
We work for decisions we both accept.							
All views are listened to, even if they are in the minority.							
We use our opposing views to understand the problem.							

Appendix G

Items for Contextual Task Conflict and Contextual Task Conflict Resolution

Contextual task conflict[a]	Contextual task conflict resolution[a]
When working on your team's problem definition, to what extent did team members *express* different opinions, viewpoints, and perspectives?	To what extent were these different opinions, viewpoints, and perspectives *resolved* before settling on the team's final problem definition?
When deciding on your team's design concept for the MDP[b] project, to what extent did team members *express* different opinions, viewpoints, and perspectives?	To what extent were these different opinions, viewpoints, and perspectives *resolved* before deciding on your team's design concept?
When developing your team's design prototype, to what extent did team members *express* different opinions, viewpoints, and perspectives?	To what extent have these different opinions, viewpoints, and perspectives been *resolved*?
When preparing for your team's MDP presentation, to what extent did team members *express* different opinions, viewpoints, and perspectives?	To what extent were these different opinions, viewpoints, and perspectives *resolved* before making your team presentation?

Note. [a]Scale anchors were 1 (A very small amount), 2 (A little), 3 (Some), 4 (A considerable amount), and 5 (A lot). [b]MDP refers to Major Design Project. The contextual task conflict and contextual task conflict resolution items were interspersed in the survey, beginning with the contextual task conflict item (see Appendix K).

Appendix H

Manipulativeness Items

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
When I go out with my friends, we usually engage in the activities that I have suggested.					
By flattering someone I can make him or her more apt to agree with me.					
I will pretend to be extremely interested in what a person is saying in order to get something.					
I help others knowing that I may also need their help some day.					
To make someone feel superior, I will pretend not to know much about something, even though I actually do.					
As a salesperson, I would be good at convincing others to buy my products.					
I do favors for people so that they will feel obligated to do me favors in return.					
I don't use compliments as a way to get people to like me. (R)					
In the end, I usually get my way.					
I can do a good job of pretending that I like someone even when I dislike them.					
I often think up ways to get what I want from other people.					
I am uneasy with using my influence to get things to go my way. (R)					
I can easily persuade others to do my work.					
I like to influence others in their decisions.					
I will let friends beat me at games in order to make them feel good.					

Appendix I

Narcissism Items

Read each pair of statements below and place an "✓" by the one that comes closest to describing your feelings and beliefs about yourself.

1. ___ I really like to be the center of attention *
   ___ It makes me uncomfortable to be the center of attention
2. ___ I am no better or no worse than most people
   ___ I think I am a special person *
3. ___ Everybody likes to hear my stories *
   ___ Sometimes I tell good stories
4. ___ I usually get the respect that I deserve
   ___ I insist upon getting the respect that is due me *
5. ___ I don't mind following orders
   ___ I like having authority over people *
6. ___ I am going to be a great person *
   ___ I hope I am going to be successful
7. ___ People sometimes believe what I tell them
   ___ I can make anybody believe anything I want them to *
8. ___ I expect a great deal from other people *
   ___ I like to do things for other people
9. ___ I like to be the center of attention *
   ___ I prefer to blend in with the crowd
10. ___ I am much like everybody else
    ___ I am an extraordinary person *
11. ___ I always know what I am doing *
    ___ Sometimes I am not sure of what I am doing
12. ___ I don't like it when I find myself manipulating people
    ___ I find it easy to manipulate people *
13. ___ Being an authority doesn't mean that much to me
    ___ People always seem to recognize my authority *
14. ___ I know that I am good because everybody keeps telling me so *
    ___ When people compliment me I sometimes get embarrassed
15. ___ I try not to be a show off
    ___ I am apt to show off if I get the chance *
16. ___ I am more capable than other people *
    ___ There is a lot that I can learn from other people

Note. Items marked with an asterisk are keyed in the positive direction. An individual's score is calculated by summing his or her selected items that have an asterisk.

Appendix J

Secondary Psychopathy Items

Item	Disagree Strongly	Disagree Somewhat	Agree Somewhat	Agree Strongly
I find myself in the same kinds of trouble, time after time.				
I find that I am able to pursue one goal for a long time. (R)				
I don't plan anything very far in advance.				
I quickly lose interest in tasks I start.				
Most of my problems are due to the fact that other people just don't understand me.				
Before I do anything, I carefully consider the possible consequences. (R)				
I have been in a lot of shouting matches with other people.				
When I get frustrated, I often "let off steam" by blowing my top.				
Love is overrated.				

Appendix K

Contextual Task Conflict and

Contextual Task Conflict Resolution Items as Shown in Surveys

	A very small amount	A little	Some	A considerable amount	A lot
1. When working on your team's problem definition, to what extent did team members *express* different opinions, viewpoints, and perspectives?	1	2	3	4	5
➔ To what extent were these different opinions, viewpoints, and perspectives *resolved* before settling on the team's final problem definition?	1	2	3	4	5
2. When deciding on your team's design concept for the MDP project, to what extent did team members *express* different opinions, viewpoints, and perspectives?	1	2	3	4	5
➔ To what extent were these different opinions, viewpoints, and perspectives *resolved* before deciding on your team's design concept?	1	2	3	4	5
3. When developing your team's design prototype, to what extent did team members *express* different opinions, viewpoints, and perspectives?	1	2	3	4	5
➔ To what extent have these different opinions, viewpoints, and perspectives been *resolved*?	1	2	3	4	5
4. When preparing for your team's MDP presentation, to what extent did team members *express* different opinions, viewpoints, and perspectives?	1	2	3	4	5
➔ To what extent were these different opinions, viewpoints, and perspectives *resolved* before making your team presentation?	1	2	3	4	5

Appendix L

Team Task Performance Rating Form

Criteria	Weight	Rating
Executive Summary A summary of the report intended for an executive audience. It should summarize the problem statement, discussion, conclusions and recommendations. It should clearly identify costs and implications.	5	
Problem Definition The report must clearly and correctly identify and define the problem, requirements, and design constraints.	10	
Background Research, Innovation and Emerging Technology The report should demonstrate sufficient background research into existing and emerging technologies relevant to the project. Innovative solutions based on emerging technologies should be considered among the design alternatives.	10	
Design Methodology The report must demonstrate the use of appropriate engineering design methodology. Multiple alternatives must have been considered and evaluated before selecting a final design or solution. Non-technical issues such as environmental impact, safety, legal requirements, etc. must be considered as appropriate.	20	
Engineering Validation An appropriate understanding and application of engineering principles and concepts must be demonstrated. Design decisions, evaluations and trade-offs must be properly justified using mathematical modeling, computer simulation and prototype testing as appropriate.	20	
Design Documentation Designs and solutions must be fully documented with schematics, working drawings, bills of materials, cost analysis, etc. as appropriate. There should be sufficiently detailed documentation to permit the project to be duplicated or continued by others. If appropriate, the report should also contain assembly and operating instructions for the user of the design.	20	
Conclusions and Recommendations Concise statement of the outcome; evidence that the project objectives have been met. Must follow from and supported by the body of the report.	5	
Technical Writing Grammar, spelling, conciseness, clarity.	5	
General Organization Cover page, formatting and layout, table of contents, sequence of chapters, references, appendices, etc.	5	
Total		

Appendix M

Examples of Team Innovation Stimuli

Green Technology

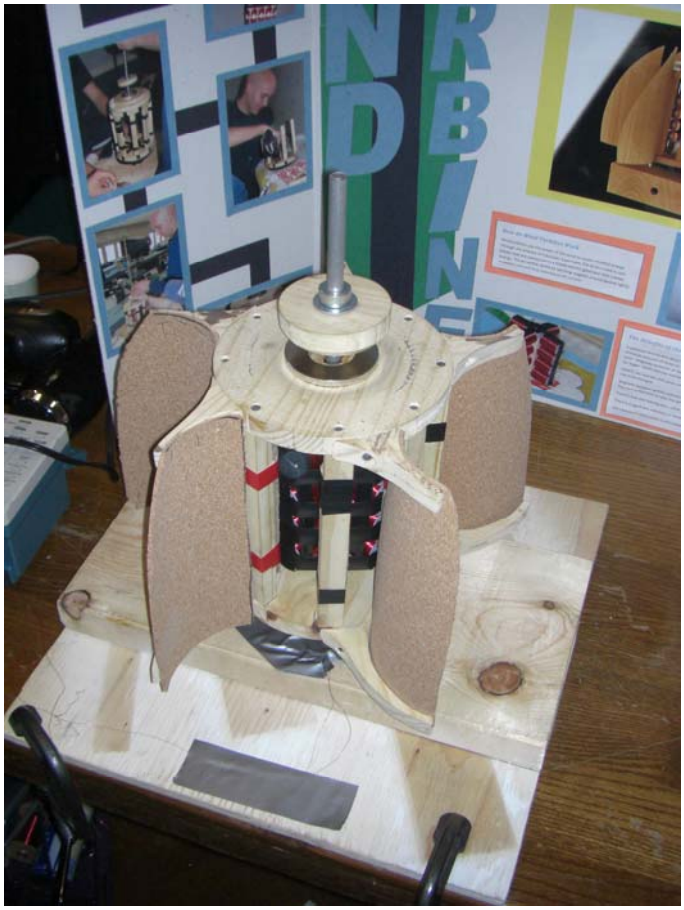
- Wind

Concept

- Magnetically-levitated wind turbine

Concept Description

- It's a turbine that levitates, in a stable way, and generates power as demonstrated by attaching it to a voltmeter
- Levitated by magnets, which allow the turbine to spin very easily because of reduced friction compared to traditional turbines
- The fan blades resemble sails, they run vertically, and the turbine sits on vertical rod
- Turbine is supported by magnets at base with south ends facing each other



Green Technology

- Solar

Concept

- Pop-can furnace

Concept Description

- Pop cans in series and painted black, through which air travels via a small computer fan
- The pop cans have flaps left in each so the air can stay inside when the fan turned off
- As the air goes through tubes (i.e., series of cans), it gets heated by the sun, but the air has to stay in cans in order to heat up, so that is the purpose of the flaps
- Once heated by the sun, the air is then channeled out with a small computer fan

Appendix N

Expert Judge Instructions and Rating Form for Team Innovation Measurement

Verbal instructions for raters

The following innovation ratings of ES 1050 team projects are to be made with reference to all 82 teams' ES 1050 projects. In principle, the innovation ratings of all team projects could be measured and then ranked from most effective to least effective. A typical team project of average effectiveness should appear in the middle of the ranking. Thus, 50% of the other projects would be more effective than average and 50% would be less effective than average.

For the following judgments, we ask you to estimate the relative level of project innovation of each of the team projects in your package. First you should rank order the projects by arranging them on your desk. Next, you should assign values on the 100-point scale that indicate each team's relative level of project innovation.

I will now show you an example rating form.

I will now show you the definition of team project innovation.

Do you have any questions?

You may now begin.

Please ask if questions arise or clarification is needed.

Definition & Instructions

The demonstration of a green technology that …

(a) clearly illustrates how the technology works, and
(b) is novel, unique, and original

Notes

1. Rate projects relative to one another. To gather a general impression, first rank order the projects. Make further refinements by assigning a rating to each project relative to the others and the average ES 1050 project.

2. Do not base ratings on the specific green technology selected (e.g., solar, wind).

3. Use only the knowledge of the projects given to you in the descriptions – not pre-existing knowledge you might have.

Rater Information

Rater name: _____

Studio number: _____

Date:_____

TA for fall / winter (please circle one or both)

Day 1, Day 2, or Day 3? (please circle one)

Set 1, Set 2, or Set 3? (please circle one)

Rating Form

The demonstration of a green technology that …

(a) clearly illustrates how the technology works, and
(b) is novel, unique, and original

|---------|---------|---------|---------|---------|---------|---------|---------|--------|---------|---------|
0 50 100
Below Average Average for ES1050 Above Average

Project _____: better than _____% of all projects
Project _____: better than _____% of all projects
Project _____: better than _____% of all projects
Project _____: better than _____% of all projects
Project _____: better than _____% of all projects
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Project _____: better than _____% of all projects
Project _____: better than _____% of all projects

Appendix O

Ethics Approval Form (Expert Judge Data Collection)

Department of Psychology The University of Western Ontario
Room 7418 Social Sciences Centre,
London, ON, Canada N6A 5C1
Telephone: (519) 661-2067Fax: (519) 661-3961

Use of Human Subjects - Ethics Approval Notice

Review Number	**10 02 15**	**Approval Date**	**10 02 24**
Principal Investigator	**Natalie Allen/Tom O'Neill**	**End Date**	**10 04 30**
Protocol Title	**Expert ratings of engineering project team innovation**		
Sponsor	**n/a**		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

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b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely affect the safety of the subjects or the conduct of the study.

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Members of the PREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the PREB.

Clive Seligman Ph.D.

Chair, Psychology Expedited Research Ethics Board (PREB)

The other members of the 2009-2010 PREB are: David Dozois, Bill Fisher, Riley Hinson and Steve Lupker

CC: UWO Office of Research Ethics

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CURRICULUM VITAE

EDUCATION AND DEGREES

Candidate for Doctor of Philosophy (Ph.D.) 2007- Present
Industrial and Organizational Psychology
The University of Western Ontario

Dissertation: "An Integrative Model of Team Conflict and Conflict Management"

Supervisor: Dr. Natalie Allen
April 2011 graduation date

Master of Science (M.Sc.), Psychology 2007
The University of Western Ontario
Thesis: "The Criterion Validity of Broad Factors versus Narrow Personality Traits at the Team Level"

Bachelor of Arts (B.A.), First Class Honors in Psychology 2005
University of Calgary

MAJOR AWARDS

Post-doctoral Fellowship (with Dr. Piers Steel) 2011
Social Sciences and Humanities Research Council of Canada
Value: $81,000, declined

Doctoral Fellowship 2007-2010
Social Sciences and Humanities Research Council of Canada
Value: $105,000

Ontario Graduate Scholarship 2007
Value: $20,000, declined

Canadian Graduate Scholarship 2005
Social Sciences and Humanities Research Council of Canada
Value: $17,500

JOURNAL ARTICLES

Chiocchio, F., Grenier, S., O'Neill, T. A., Willms, J. D., & Savaria, K. (in press). Multilevel effects of collaboration on performance: A validation in service project teams. *International Journal of Project Organisation and Management*.

O'Neill**,** T. A., & Allen, N. A. (2011). Personality and the prediction of team performance. *European Journal of Personality, 25,* 31-42.

O'Neill, T. A., Goffin, R. D., & Gellatly, I. R. (2010). Test-taking motivation and personality test validity. *Journal of Personnel Psychology, 9,* 117-125.

O'Neill, T. A., & Hastings, S. E. (2010). Explaining workplace deviance behavior with more than just the "Big Five." *Personality and Individual Differences, 50,* 268-273.

Paunonen, S. V., & O'Neill, T. A. (2010). Self reports, peer-ratings, and construct validity. *European Journal of Personality, 24,* 189-206.

Hastings, S. E., & O'Neill, T. A. (2009). Predicting workplace deviance using broad and narrow personality traits. *Personality and Individual Differences, 47,* 289-293.

MacDonnell, R., O'Neill, T. A., Kline, T. J. B., & Hambley, L. H. (2009). Bringing group-level personality to the electronic realm: A comparison of face-to-face and virtual contexts. *The Psychologist-Manager Journal, 12,* 1-24.

O'Neill, T. A., Goffin, R. D., & Tett, R. P. (2009). Content validation is fundamental for optimizing the criterion validity of personality tests. *Industrial and Organizational Psychology: Perspectives on Science and Practice, 2,* 509-513.

O'Neill, T. A., Hambley, L. A., Greidanus, N., MacDonnell, R., & Kline, T. J. B. (2009). Predicting teleworker success: An exploration of personality, motivational, situational, and job characteristics. *New Technology, Work, and Employment, 24,* 144-162.

O'Neill, T. A., & Kline, T. J. B. (2008). Personality as a predictor of teamwork: A business simulator study. *North American Journal of Psychology, 10,* 65-77.

Hambley, L. A., O'Neill, T. A., & Kline, T. J. B. (2007). Virtual team leadership: Perspectives from the field. *International Journal of e-Collaboration, 3,* 40-64.

> Reprinted In J. Kisielnicki (Ed.), (2008), *Virtual technologies: Concepts, methodologies, tools, and applications* (pp. 1231-1253). Hershey, PA: IGI Global.

Hambley, L. A., O'Neill, T. A., & Kline, T. J. B. (2007). The effects of leadership and communication medium on team interaction styles and outcomes. *Organizational Behavior and Human Decision Processes, 103,* 1-20.

Book Chapters

O'Neill, T. A., & Kline, T. J. B (2010). Virtual teams: Difficult groups across all factors of process, context, and structure. In S. Schuman (Ed.), *The handbook for working with difficult groups: How they are difficult, why they are difficult, what you can do* (pp. 189-206). San Francisco: Jossey-Bass.

O'Neill, T. A., Lewis, R. J., & Hambley, L. A. (2008). Leading virtual teams: Potential problems and simple solutions. In J. Nemiro, M. Beyerlein, S. Beyerlein, & L. Bradley (Eds.), *Handbook of high performance virtual teams: A toolkit for collaborating across boundaries* (pp. 213-238). San Francisco: Jossey Bass.

Non-refereed Contributions

O'Neill, T. A. (2008). *Test and item bias: Meaning, sources, and detection*. Ottawa, ON, Canada: Directorate of Human Resources Research and Evaluation, Department of National Defense.

Manuscripts Under Review

O'Neill, T. A., & Allen, N. A. Team meeting attitudes: Investigation and conceptualization of a new construct. Manuscript submitted to *Small Groups Research*. Revise & resubmit stage.

O'Neill, T. A., Goffin, R. D., & Gellatly, I. R. The teamwork-knowledge, skills, and abilities test: Its validity and psychometric properties. Manuscript submitted to *International Journal of Selection and Assessment.* Revise & resubmit stage.

O'Neill, T. A., Goffin, R. D., & Gellatly, I. R. Revealing hidden personality-criterion relations and ways to reduce the horror of rater variance using crossover linear modeling. Manuscript submitted to *Organizational Research Methods*.

O'Neill, T. A., Lewis, R., & Carswell, J. Employee personality, justice perceptions, and the prediction of workplace deviance. Manuscript submitted to *Personality and Individual Differences*.

Refereed Conference Presentations

O'Neill, T. A., & Allen, N. J. *Presenting a new measure of task conflict and an integrative model of team conflict and conflict management*. In A. G. Tekleab & N. Quigley (Chairs), *New perspectives in teams research*. Symposium in preparation for the annual meeting of the Academy of Management, San Antonio, TX.

O'Neill, T. A., McLarnon, M., & Gardner, R. C. *Use (and misuse?) of regression coefficients in management research*. Poster to be presented at the annual meeting of the Canadian Society for Industrial and Organizational Psychology, Toronto, ON, Canada.

O'Neill, T. A., & Schneider, T. *Graduate-student research in I-O psychology*. Symposium to be presented at the annual meeting of the Canadian Society for Industrial and Organizational Psychology, Toronto, ON, Canada.

Doyle, K., O'Neill, T. A., & Allen, N. A. *Personality and the prediction of group processes and emergent states*. Poster to be presented at the annual meeting of the Canadian Society for Industrial and Organizational Psychology, Toronto, ON, Canada.

O'Neill, T. A., Goffin, R. D., & Gellatly, I. R. Do supervisor ratings of employee performance reflect actual job performance? Poster to be presented at the annual meeting of the Society for Industrial and Organizational Psychology, Chicago, IL.

Schneider, T., O'Neill, T. A., Stirling, A., & Paunonen, S. V. Measurement specificity and the relation between personality and emotional intelligence. Poster to be presented at the annual meeting of the Society for Industrial and Organizational Psychology, Chicago, IL.

O'Neill, T. A., Allen, N. J., & Klammer, J. D. (2010, August). The elusive search for the potentially positive effects of task conflict. In F. Chiocchio (Chair), *Dynamics of team conflict*. Symposium presented at the annual meeting of the Academy of Management, Montreal, Quebec, Canada.

Allen, N. J., & O'Neill, T. A. (2010, July). *The trajectory of emergence: Mining the literature for clues*. Extended abstract presented at the annual meeting of the Interdisciplinary Network for Group Research, Washington, DC.

O'Neill, T. A., Goffin, R. D., & Tett, R. P. (2010, June). Personality and behavior in organizations: Can we do better than the "Big Five?" In L. K. Hamilton (Chair), *Applications of personality in organizations: Recent empirical finding and theoretical issues*. Symposium presented at the annual meeting of the Canadian Psychological Association, Winnipeg, Canada.

O'Neill, T. A. (2010, April). *A Simple, Parsimonious Overview of Interrater Agreement for Industrial-Organizational Psychologists*. Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, Atlanta, GA.

O'Neill, T. A., Goffin, R. D., & Gellatly, I. R. (2009, August). *The teamwork-knowledge, skills, and abilities test: Its validity and psychometric properties*. Paper presented at the annual meeting of the American Psychological Association, Toronto, Ontario.

O'Neill, T. A., & Hastings, S. E. (2009, June). *Predicting workplace deviance using Big Five and non-Big Five personality variables*. Poster presented at the annual meeting of the Canadian Psychological Association, Montreal, Quebec.

O'Neill, T. A. (2009, June). Team members interacting over time: Do emergent states actually emerge? In N. A. Allen (Chair), *Engineering the study of teams over time.* Symposium presented at the annual meeting of the Canadian Psychological Association, Montreal, Quebec.

O'Neill, T. A., Goffin, R. D., & Gellatly, I. R. (2009, April). *Test-taking motivation and personality test validity*. Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, New Orleans, LA.

Hastings, S. E., & O'Neill, T. A. (2008, June). *Predicting workplace deviance using broad and narrow personality traits.* Poster presented at the annual meeting of the Canadian Psychological Association, Halifax, Nova Scotia.

Wang, X-H., O'Neill, T. A., Klammer, J., & Allen, N. A. (2008, April). *Committed to the team: Want to, ought to, or have to?* Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, San Francisco, CA.

O'Neill, T. A., & Allen, N. A. (2007, July). *Broad versus narrow traits: Assessing the bandwidth-fidelity tradeoff at the team-level.* Poster presented at the annual meeting of the Interdisciplinary Network for Group Research, Lansing, MI.

O'Neill, T. A., Allen, N. J., Klammer, J., Ross, S., & Lundberg, E. (2007, June). *Personality in teamwork: An empirical evaluation of "Big Five" factors versus facets.* Poster presented at the annual meeting of the Canadian Psychological Association, Ottawa, Ontario.

Hambley, L. A., O'Neill, T. A., Greidanus, N., MacDonnell, R., & Kline, T. J. B. (2007, April). *Predicting teleworker success: Personality and motivational traits*. Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, New York.

MacDonnell, R., O'Neill, T. A., Kline, T. J. B., & Hambley, L. A. (2007, April). *Personality in virtual teams: A lab-based study.* Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, New York.

O'Neill, T. A., & Parfyonova, N. M. (2006, July). *Team performance measurement: Problems and pitfalls*. Paper presented at the annual meeting of the Administrative Sciences Association of Canada, Banff, Alberta.

O'Neill, T. A., & Kline, T. J. B. (2006, July). *Personality as a predictor of teamwork: A business simulator study*. Poster presented at the annual meeting of the Canadian Psychological Association, Calgary, Alberta.

Hambley, L. A., O'Neill, T. A., & Kline, T. J. B. (2006, April). *Virtual team leadership: Perspectives from the field.* Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, Dallas, TX.

O'Neill, T. A., Kline, T. J. B., & Hambley, L. A. (2005, August). *The effects of personality and communication medium on team outcomes.* Paper presented at the annual meeting of the Academy of Management, Honolulu, HI.

Hambley, L. A., O'Neill, T. A., & Kline, T. J. B. (2005, August). The effects of leadership style and communication medium on team interaction styles and outcomes. In D. A. Waldman (Chair), *Formal and shared leadership in virtual teams*. Symposium conducted at the annual meeting of the Academy of Management, Honolulu, HI.

MANUSCRIPTS IN PROGRESS

Allen, N. J., & O'Neill, T. A. (writing stage). A review of the empirical and theoretical support for the "emergence" of team-level constructs.

O'Neill, T. A. (writing stage). An overview and critical examination of interrater agreement statistics for organizational research.

O'Neill, T. A. & Allen, N. J. (writing stage). Implications of cooperative and competitive conflict management: It depends on task conflict.

O'Neill, T. A., Goffin, R. A., & Rothstein, M. G. (writing stage). Maximizing the value of pre-employment personality testing: The quest for valid personality-oriented job analysis. In R. P. Tett & N. Christiansen (Eds.), *Handbook of Personality at Work*. Routledge.

O'Neill, T. A., & Paunonen, S. V. (invited chapter, planning stage). Breadth in personality assessment: Implications for the understanding and prediction of work behavior. In R. P. Tett & N. Christiansen (Eds.), *Handbook of Personality at Work*. Routledge.

O'Neill, T. A., Schneider, T., Poole, A., & Paunonen, S. V. (data collection stage). Taking a narrow stance on personality and its measurement in the prediction of leadership competencies.

O'Neill, T. A., Woodley, H., Allen, N. A., Thussu, S., Marcotte, E. & Boyd, A. (data analysis stage). The interactive effect of team feedback and performance on future team performance.

➔ Authorship to be determined

TEACHING EXPERIENCE

The University of Western Ontario

The Psychology of People, Work, and Organizations (taught 4 times) 2009- Present

- Developed the course outline and slides
- Selected the text and readings
- Administered lectures; met with students
- Wrote all exam questions without an exam bank; graded exams
- Managed a teaching assistant

Statistics in Education Research (graduate course) 2010

- Designed the course from virtually no previous materials
- Developed and administered all lectures and computer tutorials
- Selected chapters from various textbooks for weekly readings
- Implemented new data sets for instructional use
- Constructed and scored six weekly assignments and two major assignments
- Wrote and graded two exams; met with students

Introduction to Industrial and Organizational Psychology 2009, 2011

- Developed the course outline and slides
- Selected the text and readings
- Administered lectures; met with students
- Wrote all exam questions without an exam bank; graded exams

Applications of Psychology (online course) 2008

- Wrote all new exam items; administered and graded exams
- Met with students

INDUSTRY EXPERIENCE

INDEPENDENT CONSULTING

Developed CEO performance appraisal form using Behaviorally Anchored Rating Scales methodology 2009-2010

I/O AREA CONSULTING GROUP

Co-leader of job analysis project team 2009-2010

Validation of a selection-test battery for executives 2006

INTERNSHIP, *Sigma Assessment Systems* 2007

Participated in the construction of a leadership development feedback tool and various consulting projects

SERVICE, MENTORSHIS, & ACCOLADES

Elected graduate student representative on the executive committee of the Canadian Society for Industrial and Organizational Psychology	2010-Present
Honors Thesis Advisor of Kevin Doyle *Facet-level Personality Predictors of Perceptions of Group Processes*	2009-2010
Independent Studies Thesis Advisor of Alicia Murji *Review of the Antecedents of Team Performance*	2009-2010
Southwestern Ontario I/O Student Conference	
Co-founder and co-organizer	2006
Member of organizing committee	2009
I/O area website development group	2009
Graduate student ethics board representative	2009-Present
Workforce and resource planning committee	2005 – 2006
Ad-hoc Reviewer	
Personality and Individual Differences	2011-Present
Small Groups Research	2010-Present
Reviewer for the Academy of Management conference	2006-Present
Outstanding Reviewer Award	2007, 2009
Reviewer for the Society of I/O Psychology conference	2008-Present
Nominated for UWO Award of Excellence in Undergraduate Teaching	2010-2011

MEMBERSHIPS

Society for Industrial and Organizational Psychology	2005-Present
Academy of Management	2005-Present
Canadian Society for Industrial and Organizational Psychology	2005-Present
American Psychological Association	2009-Present
Interdisciplinary Network for Group Research	2007, 2010
Administrative Sciences Association of Canada	2006