BALANCING COGNITIVE DIVERSITY AND MUTUAL UNDERSTANDING IN MULTIDISCIPLINARY TEAMS

Introduction

Understanding the factors that influence team performance has implications for theorizing about small group behavior as well as for health care managers seeking to improve teamwork and outcomes. Internationally, many health plans and policies promote collaboration and partnership across professional divides, leading to increasing pressure on health and social care professions to work effectively in teams (Gilbert, Yan, & Hoffman, 2010). The current study aims to develop our understanding of team innovation, reflecting the introduction of ideas, processes, products, or services that are novel, or new to the team, and aim to be beneficial in the context of the team's objectives (Anderson & West, 1998; Fay, Borrill, Amir, Haward, & West, 2006). To be effective and take advantage of constantly changing technology and policy environments, the innovative capacity of health care teams is critical (Omachonu & Einspruch, 2010; Salge & Vera, 2009).

We focus our research on innovation in multidisciplinary teams, composed of two or more different professions working together, which play an increasingly important role in health care organizations (Mitchell, Parker, Giles, & White, 2010). The essential attribute of a multidisciplinary team is their professionally diverse composition (Zwarenstein, Goldman, & Reeves, 2009). Including different professions as members of a team is argued to generate significant positive outcomes (Friedman & Bernell, 2006) including enhanced planning and policy outputs, improved clinical services, increased innovation as well as improved problem-solving, less duplication and increased staff satisfaction (Zwarenstein et al., 2009). However, even though there is support for these positive findings, there are also many studies indicating

that health care teams are more complex than their non-medical counterparts, and that different professions do not always work easily together often engaging in conflict and dysfunctional dynamics lead to poor multidisciplinary team outcomes (Andreatta, 2010; Baldwin Jr & Daugherty, 2008).

Explanations for these ambiguous results have tended to focus on the existence of a dilemmatic structure in which professional diversity, reflecting teams comprised of different professions, can simultaneously generate positive effects, through knowledge-related benefits, such as better informed decision-making. However, professional diversity can also engender negative effects, subsequent to social categorization of individuals into groups on the basis of salient attributes (in this case, profession), which typically results in conflict and information withholding (Gebert, Boerner, & Kearney, 2006; Mitchell, Parker, Giles, & Boyle, 2014). In an effort to address this dilemma, researchers have argued that the inconsistent findings related to diversity may be addressed by employing objective measures of underlying cognitive diversity, defined as differences in knowledge and perspective, that are argued to arise from professional diversity and account for its positive effects (Kilduff, Angelmar, & Mehra, 2000).

While the configuration of members' attributes in a team has long been argued to influence team innovation, particularly in relation to the knowledge and skills available through members for application to their task (Bell, 2007; Kozlowski & Klein, 2000), to date, very little is known about the link between the configuration of members' cognitive attributes and team innovation. Most previous research investigating studies the effect of team configuration on innovation has focused on overt job-related or demographic variables (Hülsheger, Anderson, & Salgado, 2009; Mitchell & Boyle, 2015). Although these differences have been shown to influence team performance, there is evidence that underlying cognitive characteristics are better predictors of team innovation and indeed account for the much of the positive relationships

uncovered in studies of members' occupational and demographic attributes (Bell, 2007; Harrison, Price, Gavin, & Florey, 2002). This study investigates the impact of cognitive diversity in multidisciplinary teams to more accurately establish whether, and how, these knowledge differences influence team effectiveness.

In addition to team composition, prior theorizing on contributors to team innovation has highlighted the importance of team processes (see, for example, Fay et al., 2006; Hülsheger et al., 2009; Mitchell & Boyle, 2015; West et al., 2003). This study builds on evidence that it is through team processes that member contributions are used to generate innovations. Among the most studied team processes are those relating to member interaction, such as conflict (de Wit, Greer, & Jehn, 2012) and debate (Simons, Pelled, & Smith, 1999). Although meta-analysis indicates that conflict is not associated with team innovation (Hülsheger et al., 2009), more promising is work on debate (McLeod, Baron, Marti, & Yoon, 1997). Therefore, in addition to investigating the direct impact of cognitive diversity in multidisciplinary health care teams, we explore the role of debate, defined as the constructive, open discussion and advocacy of task-related differences (Simons et al, 1999) as a mediating mechanism capable of explaining the impact of cognitive diversity in multidisciplinary teams.

Sharing knowledge and integrating different ideas through the process of debate assumes a referential theory of meaning, which implies that meaning is universal within a team (Postrel, 2002). However, the diversity in knowledge that exists in different professions often implies differences in language and meaning as well as in the perceived values of members (Fredheim, Danbolt, Haavet, Kjonsberg, & Lien, 2011). Cognitive diversity may therefore generate dysfunctional dynamics consequent to misunderstanding (Mitchell et al., 2014). Differences between professions in the meaning of a word or concept can limit the effective sharing of knowledge between team members (Fredheim et al., 2011). Such a lack of shared understanding

of important task-related concepts is predictable in diverse teams and has been linked to communication difficulties and poor team outcomes (Cronin, Bezrukova, Weingart, & Tinsley, 2011). This suggests that the utility of cognitive diversity is dependent on the extent to which the team shares common meanings and interpretations. We therefore propose that the link between cognitive diversity and team performance through debate is contingent upon trans-specialist knowledge, knowledge shared by health care professionals, spanning specialist divides and enabling mutual, or shared, understanding (Postrel, 2002).

We construct a model of team innovation in which the relationship between cognitive diversity and innovation is mediated by debate and moderated by trans-specialist knowledge (Figure 1). To the best of our knowledge, little prior study has investigated the influence of trans-specialist knowledge as a boundary condition of cognitive diversity's role in team dynamics and innovation. The contribution of this study is particularly important as, while aspects of mutual understanding have rarely been investigated in relation to diverse team performance, sharing knowledge across domains has been consistently linked to misinterpretation and conflict (see, for example, Xyrichis & Lowton, 2008).

This article is structured as follows: First, we describe the theoretical foundations underpinning the influence of cognitive diversity on team dynamics and innovation. We then develop our research model and justify component hypotheses. Following this, we present our methodology and results and a discussion of our findings incorporating theoretical and practical implications.

Theory/Conceptual Framework

Prior diversity research has generated two different analytical perspectives that predict different outcomes for diverse teams (van Knippenberg & Schippers, 2007). When applied to multidisciplinary teams, the first perspective, which is termed the value-in-diversity perspective,

holds that different professions provide teams with a wide range of relevant expertise from which to draw than homogeneous groups. Consequent to this greater depth and breadth of knowledge, multidisciplinary teams are better resourced to make decisions and solve complex problems (Mitchell et al., 2010). The alternative perspective on diversity is based on social identity theory and its extension, social categorization. This perspective holds that the similarities and differences between professions lead to social categorizations into 'ingroup' and 'outgroup'. The similarity-attraction paradigm and theory of intergroup bias argue that members of the ingroup will be more likely to trust each other and share positive relationships while interactions with outgroup members will be characterized by hostility and information -withholding (van Knippenberg & Schippers, 2007).

Past research suggests that the social categorization argument is more relevant to bio-demographic diversity, but the value-in-diversity perspective is more relevant to cognitive diversity. That is, more readily perceptible diversity, such as diversity based on visible bio-demographic characteristics, is likely to trigger social categorization and associated conflict. However, deep-level underlying diversity, such as cognitive diversity, is likely to lead to knowledge-related benefits by providing team members with a broad range of ideas, perspectives, and potential solutions (Mitchell et al., 2010). Following these arguments, the benefits of cognitive diversity stem from the application of a range of relevant knowledge and skills to complex problems, as well as cross-fertilization and opportunity for novel connections, stimulating new ideas. Based on this value-in-diversity perspective, we argue that cognitive diversity engenders debate, which enhances team innovation. We further argue that the relationship between cognitive diversity and debate will be stronger when members have sufficient shared knowledge to minimize misunderstanding.

Cognitive Diversity and Debate in Multidisciplinary Teams

A positive link between cognitive diversity and debate is argued on the basis that the divergent expertise, knowledge and values of different members that are directed to the team's work, are likely to generate incongruent task perceptions. Such incongruent perceptions are likely to stimulate members to challenge each other's suggestions, deliberate alternative positions and justify conflicting viewpoints (Eisenhardt, Kahwajy, & Bourgeois, 1997), which constitutes debate. In healthcare teams, cognitive diversity may be reflected in differences between members regarding the knowledge of the patient or clinical situation, as well as experience of potential solutions to clinical problems. For example, in a study of knowledge related to pain, researchers found consistent and significant differences between healthcare professionals relating to indicators of pain as well as effects of subsequent drug administration and addiction risk (Lebovits et al., 1997). These knowledge differences are likely to generate dissimilar perceptions related to, for example, preferred solutions, which engender discussion of associated suggestions and motivate members to justify their own viewpoint and argue against those of others.

This is supported by empirical findings that communication between individuals with divergent perspectives, ideas and values may be sufficient to trigger behavior that aims to contest others' preferences and substantiate alternative approaches (Jehn & Greer, 2012). Past study indicates that cognitively diverse team members are liable to characterize issues differently and to have divergent ideas about what responses are most appropriate, which leads to debate on objectives, decision priorities, and potential solutions (Forbes & Milliken, 1999). This suggests the following hypothesis:

Hypothesis 1: Cognitive diversity will be positively related to debate in multidisciplinary teams.

Debating different ideas and perspectives leads team members to consider a wider variety of alternatives and also prompts the more careful and comprehensive consideration of these

alternatives (Boerner, Eisenbeiss, & Griesser, 2007). Such rigorous analysis fosters a deeper understanding of task-relevant issues and enhances knowledge sharing, both of which have been linked to enhanced problem-solving, better informed decisions and innovation (Simons et al., 1999). In addition, the debate of different ideas and positions, and the analysis of alternative proposed solutions has been found to prevent premature consensus (Schweiger, Sandberg, & Rechner, 1989). Debate also leads to the development of enhanced understanding and clarity regarding causal connections and successful actions and this prevents uncritical acceptance of what initially appears obvious to members (Schweiger et al., 1989). Such processes were found to reduce the likelihood that group members' existing preferences, such as those deriving from stereotypes, will bias the information they choose to retrieve, present, utilize and absorb (Lovelace, Shapiro, & Weingart, 2001).

Hypothesis 2: Debate is positively related to innovation in multidisciplinary teams.

We have argued that cognitive diversity is positive related to debate and that debate enhances team innovation. In combination, these arguments lead us to predict that debate will mediate a positive relationship between cognitive diversity and innovation in multidisciplinary teams:

Hypothesis 3: Debate mediates the positive relationship between cognitive diversity and innovation in multidisciplinary teams.

While there is convincing argument for the link between cognitive diversity and debate, there is also evidence that such diversity may generate hostility and conflict, which leads to information-withholding (van Knippenberg & Schippers, 2007). Recent research suggests inconsistencies between different individuals definitions and meaning, leading to misunderstanding, is an important factor explaining conflict and dysfunctional team dynamics (Cronin & Weingart, 2007). This suggests that for cognitive diversity to benefit team

performance requires sufficient shared knowledge to avoid significant misunderstanding.

Trans-specialist knowledge reflects the extent to which shared meaning and knowledge are sufficient to enable communication of complex ideas between different team members (Postrel, 2002). Trans-specialist knowledge increases the likelihood that communication between cognitively diverse team members will be understood and facilitates accurate interpretation of the senders message (Cramton, 2001). Trans-specialist knowledge enhances communication and comprehension within cognitively diverse teams because the receiver will accurately comprehend the concepts and meanings that constitute the sender's message, unimpeded by semantic confusion. In addition, the sender is able to compose their message with an awareness of what the receiver is, or is not, likely to understand (Cramton, 2001). The existence of trans-specialist knowledge improves communication between diverse team members and therefore reduces the risk that conflict and hostility will emerge consequent to misunderstanding. Members of a cognitively-diverse team with low levels of trans-specialist understanding are likely to have mutual ignorance, reflecting individually-held unique knowledge but a lack of shared understanding of important concepts, which provides the ability to solve separate problems in specialist domain but high risk of misunderstanding when specialist perspectives or ideas are discussed. Conversely a team with high trans-specialist understanding is likely to have mutual, or shared, understanding across members and lower risk of miscommunication.

This leads to the following hypothesis:

Hypothesis 4: Trans-specialist knowledge moderates the relationship between cognitive diversity and debate in multidisciplinary teams. This moderating effect is such that the positive relationship between cognitive diversity and debate is likely to be stronger when trans-specialist knowledge is high than when trans-specialist knowledge is at a low level.

We have argued that debate mediates a positive relationship between cognitive diversity

and team innovation, and also that trans-specialist knowledge moderates the relationship between cognitive diversity and debate. Together, these arguments lead us to predict a moderated mediated pathway such that the mediated path between cognitive diversity and innovation through debate will be stronger when trans-specialist knowledge is high than when trans-specialist knowledge is at a low level.

Hypothesis 5: Trans-specialist knowledge will moderate the mediated path between cognitive diversity and innovation through debate such that this pathway will be stronger when trans-specialist knowledge is at a high level.

Method

Procedure and Sample

Following approval from our Human Research Ethics Committee, we collected data from health care professionals working in teams within an acute care hospital setting in a large metropolitan health district. Members of the research team were employed in the same health district but did not share a working relationship with any respondent teams. Teams were still operational when members completed the survey. To be included in our study, the team leader was required to complete the leader's survey, and members were required to complete the member's questionnaire. Surveys were numerically coded to allow the collation of member and leader responses while also ensuring participant anonymity. The leader's survey collected data on team demographics and composition, as well as performance. The member's survey collected data on our independent variables. The use of two surveys minimized risk of bias associated with reliance on a common source (Podsakoff, MacKenzie, & Podsakoff, 2012).

We distributed questionnaires to 210 teams. Teams were invited to participate by a member of the research team. Responses from the members and leader of 75 teams were received, providing a 36% response rate. We used an independent samples t-test to assess

whether there were any significant differences between teams responding to initial or later calls to participate. No significant mean differences were found for measures of team innovation, team composition or dynamics.

We undertook to assess the representativeness of our sample by comparing specific attributes with known population values relating to professional composition and average employee age (AIHW, 2006). In our study, participants had an average age of 41.8 years, which was proximal to the average age for health care professionals nationally (42 years). Our study sample was also similar to national values in terms of the distribution of health care professions. Nursing staff made up 54% of our sample and comprise 51.4% of the health workforce nationally. Physicians comprised 13.8% of our sample and make up 13.7% of health care professional nationally. This comparative date supports the representativeness of our sample.

The average number of professions represented in participant teams was 4, with the majority of teams including between 3 and 5 different professions in their membership. A wide range of professions were involved in participant teams including: Nurse, Dietician, Physiotherapist, Social Worker, Physician, Pharmacist, Occupational Therapist, Speech Pathologist, Radiographer and Psychologist. Members of our participant teams had been together for approximately two years. Team leadership was undertaken by different professions including nursing, medicine, physiotherapy, physiotherapy and social work. Nurses were the most frequent leaders (48%). The majority of participant teams responded that they were working to solve patient and clinical problems or otherwise improve clinical service, or under take specific initiatives such as the development of advanced models of care

A mean of 4.6 responses were received from each team, which represented 52% of team membership. Dawson's (2003) selection rate formula was used to assess whether the proportion of responses within each team was sufficient to allow group level generalization. Dawson's

formula provides an estimation of the accuracy of incomplete group data in predicting true scores based on number of responses per group (n) and group size (N) using the formula ($[N - n]/Nn$) . All of our participant teams scored a value of .32 or less, which are correlated with true scores at .95 or higher (Dawson, 2003). As a result all teams were included in our analysis.

Measures. We assessed reliability using composite reliability (CR) (Hair, Ringle, & Sarstedt, 2011). Composite reliability is calculated using the following formula: (sum of standardized loadings)^2/(sum of standardized loadings)^2 + (sum of indicator measurement error) (Fornell & Larcker, 1981; Hair, Anderson, Tatham, & Black, 1998). Composite reliability provides reliability evidence similar to Cronbach's alpha (Cronbach, 1951), however the latter is limited by its assumption that all scale items are equal in their reliability while the former does not make this assumption (Raykov, 1997). We further assessed convergent validity, which provides an indication of the extent to which items for one variable represent the same construct (Henseler, Ringle, & Sinkovics, 2009), using average variance extracted (AVE) criterion, which should exceed 0.5 for variables (Henseler et al., 2009). AVE is calculated as the (sum of squared standardized loadings) / (sum of squared standardized loadings + sum of the square of measurement error). The composite reliability of all latent constructs ranged from .62 to .96, which all exceeded the benchmark of 0.6 recommended by Bagozzi and Yi (1988). The AVE ranged from .53 to .85, also all above the recommended level (Hair et al., 2011).

We employed the approach advocated by Fornell and Larcker (1981), who proposed that discriminant validity is evidenced if a latent construct accounts for additional variance in its attendant indicators than it shares with other constructs in the model under investigation. To meet this condition, the average variance extracted (AVE) for each variable should be assessed against its squared correlations with all other variables. Following Fornell and Larcker (1981) we therefore compared the square root of the average variance extracted (AVE) for each variable

with the correlations between it and each other variable, as shown in Table 1 (Fornell & Larcker, 1981). The square root of each AVE ranged from .73 to .93, which was greater than the highest correlation between any variables, as shown in Table 1.

In addition to the approach suggested by Fornell and Larcker (1981), we also employed the heterotrait multitrait (HTMT) ratio method to investigate the discriminant validity (Henseler, Ringle, & Sarstedt, 2014). The HTMT is the average of the heterotrait-heteromethod correlations relative to the geometric mean of the average monotrait-heteromethod correlation between constructs. Trait, in this case, refers to constructs while method, in this case, refers to items of measurement. Monotrait-heteromethod correlations are between two measurements of the same construct using different methods (i.e., items), while heterotrait-heteromethod correlations reflect the relationship between two measurements of different constructs using different methods. Comparing monotrait-heteromethod with heterotrait-heteromethod correlations allows us to gauge whether the correlation between the items used to measure the same construct are stronger than those between the items across constructs that are meant to measure different variables. Based on a recent Monte Carlo simulation study, the HTMT approach has been found to provide more accurate assessment of discriminant validity than the Fornell-Larcker criterion and examination of cross-loadings (Henseler et al., 2014). Two criteria are used to assess discriminant validity, a conservative criterion of .85 and a .90 criterion recommended to assess conceptually close constructs (Henseler et al., 2014). Our HTMT matrix, provided in Table 2, shows that none of our HTMT ratios were greater than .85, and indeed were well below this criterion.

Finally, we provide a matrix of cross-loadings for our measures (see Table 3). This matrix shows that all items had their highest loading with the expect parent scale again supporting our claims of discriminant validity (Thompson, 1997).

INSERT TABLES 1, 2 AND 3 ABOUT HERE

Cognitive Diversity: Cognitive diversity, defined as differences in knowledge and perspective, was operationalized as the perceived extent to diversity in the information and knowledge held by members. Cognitive diversity was measured using a three-item scale based on an existing measure and amended to reflect our focus on the team's task (Van der Vegt & Janssen, 2003). The scale asks participants to gauge to what extent members of the team raise issues which suggest that they have a different way of looking at the task; have different information and knowledge relevant to the team's task; and raise issues that have not been thought of by other members, but which are relevant to the team's work. Cognitive diversity was measured on a 7-point Likert scale anchored by 1 = Strongly Disagree and 7 = Strongly Agree. *Debate:* Debate, defined as open discussion and advocacy of task-related differences, was operationalized as the perceived level of deliberation and discussion within the team. In order to measure debate we chose three items based on previously validated measures (Simons et al., 1999). These items ask members to gauge to what extent team members deliberate over, or discuss, different ideas; openly challenge each other's opinions, and debate different ideas. Debate was measured on a 7-point Likert scale. *Trans-specialist Knowledge:* Trans-specialist knowledge, defined as knowledge shared by health care professionals, spanning specialist divides and enabling mutual understanding, was operationalized as the perceived extent to which shared knowledge between members facilitated full understanding of communications within the team. We measured trans-specialist knowledge using two scale items which we developed based on previous research (Postrel, 2002). Participants were asked to assess the extent to which members had sufficient shared knowledge to fully understand all of the matters raised by other members and whether there was evidence that some group members misunderstood the points raised by other members (reverse-coded). Trans-specialist knowledge was measured on a 7-point Likert scale. *Team Innovation:* Innovation, defined as the successful development of new ideas and approaches by the team, was

operationalized as the perceived success of the team in their efforts to develop new ideas. We used four items to measure innovation taken from previous research (West et al., 2003). Two items were assessed by the team leader who was asked to what extent the team produces new ideas and introduce specific changes, and to what extent the team is innovative. Two items were assessed by team members, who were asked to what extent the team was innovative and generated new ideas. This provided an additive member and leader measure reflecting the extent to which teams were perceived as generating new ideas and introducing changes.

Control Variables: We statistically controlled for the effect of three constructs by including these measures in our regression models and structural equation model. We used team size and tenure as control variables as both are linked to team processes and outcomes .We asked leaders to indicate the number of members and the length of time for which the team had been together. We also controlled for professional diversity based on its links to team dynamics, outcomes and to cognitive diversity (Mitchell et al., 2014). Blau's (1977) index of heterogeneity was used to measure professional diversity: $(1-\Sigma Pi^2)$, where Pi is the proportion of professions in ith category. Blau's (1977) index has wide-spread usage as a measure of team diversity (Kilduff et al., 2000). A higher score on Blau's index designates greater professional diversity.

Findings

Table 1 shows the means, standard deviations and correlations among the independent variables.

Insert Table 1 and Figure 1 Here

Full model results are provided in Figure 1. Ordinary Least Squares regression revealed a significant positive path coefficient for the impact of cognitive diversity on debate (β =.53, t = 7.29, p = .00) supporting hypothesis 1. Support was found for hypothesis 2, with a significant direct path coefficient for debate on team innovation (β =.39, t = 3.34, p = .001). A simple

mediated path between cognitive diversity and innovation through debate was also supported with a based on a product of coefficients test ($z = 2.22$, $p = .03$). A bootstrapped confidence interval for the indirect effect of cognitive diversity on innovation through debate did not include zero (95% CI .06 to .56) gave additional support for our mediating hypothesis 3. A direct relationship between cognitive diversity and innovation was supported ($\beta = .28$, $t = 2.30$, $p = .02$), which suggests that both a direct path and mediated path account for the effect of cognitive diversity on innovation.

To test hypotheses 4, a standardized cross-product interaction construct for cognitive diversity and trans-specialist knowledge was computed and included in the equation. The regression analysis revealed a significant path coefficient for the interaction variable regressed on debate ($\beta = .27$, $t = 3.15$, $p = .002$) providing support for hypothesis 4. A bootstrapped confidence interval for the interaction that did not include zero provided additional support (95% CI .01 - .46). We used the Johnson-Neyman technique to investigate the significance regions for the moderator (Preacher, Rucker, & Hayes, 2007). These analyses revealed that cognitive diversity was positively and significantly associated with debate when trans-specialist knowledge was greater than 3.9 with an effect size of .30 ($t = 2.00$, $p = .05$). These results provide support for hypothesis 4 by indicating that cognitive diversity has a positive impact on debate when trans-specialist is at a relatively high level and no significant impact on debate when trans-specialist knowledge is low.

We tested our full moderated mediated model between cognitive diversity and team innovation through debate contingent on trans-specialist knowledge using partial least squares (PLS) structural equation modelling (SEM). PLS SEM is a causal modelling tool that is increasingly used in health and team research (Henseler et al., 2009). We used SmartPLS software (Ringle, Wende, & Will, 2005). PLS SEM analysis showed that the overall model

explained 37% of the variance in innovation and 52% of the variance in debate which can be interpreted as an indicator of moderate and good fit respectively (Chin, 1998). We also used PLS SEM to investigate the predictive relevance of our model, or the ability of the model to effectively predict dependent variables of interest. Our model resulted in a Stone–Geisser criterion Q2 value of .33 for debate and .19 for innovation which is substantially above the threshold value of zero, and which suggests that our model is capable of predicting debate and innovation (Henseler et al., 2009).

Discussion

The purpose of this research was to investigate whether cognitive diversity leads to increased innovation in multidisciplinary health care teams. To achieve this objective, this study explored the mediating role of debate in a path between cognitive diversity and innovation and the moderating role of trans-specialist knowledge in the relationship between debate and cognitive diversity. Our results provide support for a mediated relationship between cognitive diversity and team innovation through debate, which exists only when trans-specialist knowledge is at a high level. The results show that multidisciplinary teams are likely to engage in debate consequent to cognitive diversity, contingent on trans-specialist knowledge. Our study is amongst the first to explore the role of cognitive diversity in multidisciplinary health care teams, and one of the only studies to bring together research in the area of healthcare teamwork with past research in the area of mutual understanding and trans-specialist knowledge. As such, we are able to make several significant contributions to our understanding of healthcare team innovation.

Previous research has found that effective performance in diverse teams, including multidisciplinary teams, is linked to the juxtaposition of individual perspectives against opposing or divergent ideas (Mitchell et al., 2014). Our findings support the role of cognitive diversity in engendering innovation in such teams, both indirectly and directly. Health care organizations face

considerable pressure to innovate, with demands to adopt new technologies and new approaches to care, and respond to emerging, complex clinical challenges (Salge & Vera, 2009). We provide support for the benefits of diversity for teams faced with such pressures. Further, we proposed a more refined approach to understanding the benefits of diversity by focusing on cognitive diversity which allowed us to achieve a clearer understanding of the impact of cognitive perspectives in healthcare teams. Strong support for the impact of this aspect of diversity suggests that an important implication of our study is that cognitive diversity, rather than professional diversity, may be a more fruitful area of research, capable of better explaining how and when innovation is likely to occur in health care teams.

We hypothesized a role for debate as a mediator explaining the impact of knowledge differences on the generation of useful new ideas. We found support for this path, confirming that engagement in deliberation allows members to better utilize the breadth of available knowledge. Our findings also suggest that while cognitive diversity is likely to engender debate, this is reliant on the extent to which members share sufficient understanding of important concepts to allow discussion without misunderstanding. This is an important finding in the context of past study suggesting that it diverse teams are more likely to be a location in which efforts at communication are thwarted (Fredheim et al., 2011). Indeed, health care researchers have long recognized the existence of barriers to communication in multidisciplinary teams (Sheehan, Robertson, & Ormond, 2007). For example, research into multidisciplinary stroke care suggests that occupational therapists, psychologists and physiotherapists shared ‘basic, or ‘generic’ language but specialist knowledge was unshared, differentiated professions and created communication difficulties between these professions (Baxter & Brumfitt, 2008). Our findings suggest that to overcome these barriers, the multidisciplinary team requires trans-specialist knowledge reflecting shared language and mental models that are sufficiently broad and

comprehensive to enable mutual understanding of each member's diverse knowledge. It is only through the existence of a matching language, reflected in trans-specialist knowledge, that quality information exchange is enabled.

Past study also suggests that low levels of trans-specialist knowledge not only increases the language barriers to effective communication, but it also triggers members to make attributions regarding the cause of communication errors (Alavi & Tiwana, 2002). When making attributions relating to the cause of errors consequent to misunderstanding, multidisciplinary teams are more likely to make disparaging, personal attributions, due to the impact of social categorization (Mitchell et al., 2010). Our study did not investigate the impact of trans-specialist knowledge on negative team dynamics, however future research into its impact on affective conflict is warranted, particularly given the negative impact of such conflict in multidisciplinary teams (Mitchell et al., 2014).

Practice Implications

Our results have a number of implications for healthcare management. Primarily, our findings suggest the importance of encouraging the manifestation of cognitive diversity in teams. While the antecedents of cognitive diversity were not a specific part of this study, previous research on interventions such as brainstorming and devil's advocacy has concluded that groups using such techniques generate more information and construct more alternative solutions to a problem (Eisenhardt et al., 1997). In addition, strategies such as labeling diverse expertise have been shown to lessen the likelihood that members will constrain their discussion and will move beyond shared knowledge to discuss unique perspectives and ideas (Stasser, Stewart, & Wittenbaum, 1995). Healthcare managers would be well-advised to encourage the inclusion of such strategies in teamwork, particularly where team success necessitates innovation. Health care managers should also be aware of the need to develop sufficient shared knowledge to enable mutual

understanding. Experience in interprofessional education and training has been shown to facilitate communication through shared language and meaning (Brock et al., 2013) and is recommended by our findings. Beyond these interventions, the development of a workplace climates that encourage multidisciplinary collaboration, reflected in participative safety, has been found to reduce facilitate collaboration across professional boundaries (Anderson & West, 1998; Nembhard & Edmondson, 2006; Poulton & West, 1999).

Limitations

Our relatively small sample size may have reduced the chance that significant relationships would be found in our analysis. However, our hypotheses were supported, which gives confidence in the identified relationships. Another potential limitation of our research stems from the cross-sectional nature of our design, which limits our capacity to claim support for causal relationships. Data on our dependent variable was drawn from both team members and team leaders, who completed two different surveys. The data on our independent variables, reflecting team dynamics, including moderator variables, was collected from team members. This approach to data collection provides some basis to argue that the risk of common method bias in mitigated. In addition, our investigation of discriminant validity, based on Fornell and Larcker (1981) and the HTMT ratio method (Henseler et al., 2014), provides support for the capacity of our items to effective discriminate between different constructs in our models. However, we recognize that objective and independent ratings of team performance would provide a superior capacity to assess the impact of cognitive diversity on actual innovation. Future research in this area could employ stronger method designs incorporating longitudinal measures, and objective measures, which would overcome the risk of method bias and allow stronger claims of causality.

In addition, we recognize that our data was collected within an acute care context, which may limit the generalizability of our findings and suggests the benefit of future research directed

towards investigating whether our findings hold across types of institutions (for example, primary care institutions) as well as across countries. Finally, we understand that our assessment of each construct was based on quantitative survey measures, which may not fully capture the full scope of each variable, particularly in different contexts. For example, our measure of trans-specialist knowledge may not have been sufficiently comprehensive and unable to detect specific areas in which members did not share knowledge and were open to misunderstanding. This suggests value in a qualitative exploration which focuses on better understanding ideas such as trans-specialist knowledge and cognitive diversity, and how these exist in different contexts.

Conclusion

In summary, our model and results provide an extended and refined view of professionally-diverse teams, and suggest that cognitive diversity in such teams is critical to innovation. For health care managers, our results also confirm that while cognitive diversity provides the capacity for multidisciplinary teams to develop innovative solutions, they also require sufficient trans-specialist knowledge to enable the debate of diverse perspectives. This recommends the use of strategies to increase the likelihood that different perspective will be raised, and also prioritizes initiatives such as multidisciplinary training, that allow the development of shared language and meaning.

References

AIHW. (2006). Health and Community Services Workforce 2006. Canberra: Australian Institute of Health and Welfare.

Alavi, M., & Tiwana, A. (2002). Knowledge Integration in Virtual Teams: The Potential Role of KMS. *Journal of the American Society for Information Science & Technology, 53*(12), 1029-1037.

Anderson, N., & West, M. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. *Journal of Organizational Behavior, 19*, 235-258.

Andreatta, P. B. (2010). A typology for health care teams. *Health Care Management Review, 35*(4), 345-354.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*(1), 74-94.

Baldwin Jr, D. C., & Daugherty, S. R. (2008). Interprofessional conflict and medical errors: results of a national multi-specialty survey of hospital residents in the US. *Journal of Interprofessional Care, 22*(6), 573-586.

Baxter, S. K., & Brumfitt, S. M. (2008). Professional differences in interprofessional working. *Journal of Interprofessional Care, 22*(3), 239-251.

Bell, S. T. (2007). Deep-level composition variables as predictors of team performance: a meta-analysis. *Journal of Applied Psychology, 92*(3), 595-615.

Blau, P. M. (1977). *Inequality and heterogeneity : a primitive theory of social structure*. New York: Free Press.

Boerner, S., Eisenbeiss, S. A., & Griesser, D. (2007). Follower behavior and organizational performance: The impact of transformational leaders. *Journal of Leadership & Organizational Studies, 13*(3), 15-26.

Brock, D., Abu-Rish, E., Chiu, C.-R., Hammer, D., Wilson, S., Vorvick, L., Blondon, K., Schaad, D., Liner, D., & Zierler, B. (2013). Interprofessional education in team communication: working together to improve patient safety. *BMJ quality & safety, 22*(5), 414-423. doi: 10.1136/bmjqs-2012-000952

Chin, W. W. (1998). Commentary: Issues and opinion on structural equation modeling. *MIS Quarterly*, vii-xvi.

Cramton, C. D. (2001). The mutual knowledge problem and its consequences for dispersed collaboration. *Organization Science, 12*(3), 346-371.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.

Cronin, M. A., Bezrukova, K., Weingart, L. R., & Tinsley, C. H. (2011). Subgroups within a team: The role of cognitive and affective integration. *Journal of Organizational Behavior, 32*(6), 831-849. doi: 10.1002/job.707

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

Dawson, J. (2003). *Do we have enough? The accuracy of incomplete data from small groups.* Paper presented at the Academy of Management Meeting Best Paper Proceedings, Briarcliff Manor, NY.

de Wit, F. R. C., Greer, L. L., & Jehn, K. A. (2012). The paradox of intragroup conflict: A meta-analysis. *Journal of Applied Psychology, 97*(2), 360-390. doi: 10.1037/a0024844

Eisenhardt, K. M., Kahwajy, J. L., & Bourgeois, L. J., III. (1997). Conflict and strategic choice: How top managemen teams disagree. *California Management Review, 39*(2), 42-61.
Fay, D., Borrill, C., Amir, Z., Haward, R., & West, M. (2006). Getting the most out of multidisciplinary teams: A multi-sample study of team innovation in heatlh care. *Journal of Occupation and Organizational Psychology, 79*(4), 553-567.
Forbes, D. P., & Milliken, F. J. (1999). Cognition and Corporate Governance: Understanding Boards of Directors as Strategic Decision-Making Groups. *Academy of Management Review, 24*(3), 489.
Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing research, 18*(1), 39-50.
Fredheim, T., Danbolt, L. J., Haavet, O. R., Kjonsberg, K., & Lien, L. (2011). Collaboration between general practitioners and mental health care professionals: a qualitative study. *Int J Ment Health Syst, 5*(1), 13-19.
Friedman, L. H., & Bernell, S. L. (2006). The Importance of Team Level Tacit Knowledge and Related Characteristics of High-Performing Health Care Teams. *Health Care Management Review, 31*(3), 223-230.
Gebert, D., Boerner, S., & Kearney, E. (2006). Cross-functionality and innovation in new product development teams: A dilemmatic structure and its consequences for the management of diversity. *European Journal of Work & Organizational Psychology, 15*(4), 431-458.
Gilbert, J. H., Yan, J., & Hoffman, S. J. (2010). A WHO report: Framework for action on interprofessional education and collaborative practice. *Journal of Allied Health, 39*(Supplement 1), 196-197.
Hair, J. F., Anderson, R., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis*. Upper Saddler River, NJ: Prentice Hall.
Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *The Journal of Marketing Theory and Practice, 19*(2), 139-152.
Harrison, D. A., Price, K. H., Gavin, J. H., & Florey, A. T. (2002). Time, teams, and task performance: changing effects of surface- and deep-level diversity on group functioning *Acad. Manage. J.* (Vol. 45, pp. 15-1029).
Henseler, J., Ringle, C. M., & Sarstedt, M. (2014). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 1-21.
Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *Advances in International Marketing, 20*, 277-319.
Hülsheger, U. R., Anderson, N., & Salgado, J. F. (2009). Team-level predictors of innovation at work: a comprehensive meta-analysis spanning three decades of research. *Journal of Applied Psychology, 94*(5), 1128.
Jehn, K. A., & Greer, L. L. (2012). Diversity as Disagreement: The Role of Group Conflict. In Q. Roberson (Ed.), *The Oxford Handbook of Diversity and Work* (pp. 179). New York, NY: Oxford University Press.
Kilduff, M., Angelmar, R., & Mehra, A. (2000). Top Management Team Diversity and Firm Performance: Examining the Role of Cognitions. *Organization Science, 11*(1), 21-34.
Lebovits, A., Florence, I., Bathina, R., Hunko, V., Fox, M., & Bramble, C. (1997). Pain knowledge and attitudes of healthcare providers. *Clinical Journal of Pain, 13*(3), 237-243.

Lovelace, K., Shapiro, D. L., & Weingart, L. R. (2001). Maximizing crossfunctional new product teams' innovativeness and constraint adherence: A conflict communications perspective *Academy of Management Journal* (Vol. 44, pp. 779-793).

Mitchell, R., & Boyle, B. (2015). Professional diversity, identity salience and team innovation: The moderating role of openmindedness norms. *Journal of Organizational Behavior, Early View*, 1-22. doi: 10.1002/job.2009

Mitchell, R., Parker, V., Giles, M., & Boyle, B. (2014). The ABC of health care team dynamics: Understanding complex affective, behavioral, and cognitive dynamics in interprofessional teams. *Health Care Management Review, 39*(1), 1-9.

Mitchell, R., Parker, V., Giles, M., & White, N. (2010). Review: Toward Realizing the Potential of Diversity in Composition of Interprofessional Health Care Teams An Examination of the Cognitive and Psychosocial Dynamics of Interprofessional Collaboration. *Medical Care Research and Review, 67*(1), 3-26.

Nembhard, I. M., & Edmondson, A. C. (2006). Making it safe: The effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams. *Journal of Organizational Behavior, 27*(7), 941-966.

Omachonu, V. K., & Einspruch, N. G. (2010). Innovation in healthcare delivery systems: A conceptual framework. *The Innovation Journal: The Public Sector Innovation Journal, 15*(1), 1-20.

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology, 63*, 539-569.

Postrel, S. (2002). Islands of Shared Knowledge: Specialization and Mutual Understanding in Problem-Solving Teams. *Organization Science, 13*(3), 303-320.

Poulton, B. C., & West, M. A. (1999). The determinants of effectiveness in primary health care teams. *Journal of Interprofessional Care, 13*(1), 7-18.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate behavioral research, 42*(1), 185-227.

Raykov, T. (1997). Scale reliability, Cronbach's coefficient alpha, and violations of essential tau-equivalence with fixed congeneric components. *Multivariate behavioral research, 32*(4), 329-353.

Ringle, C., Wende, S., & Will, A. (2005). SmartPLS version 2.0 M2: Hamburg,, Germany: Institute for Operations Management and Organization at the University of Hamburg.

Salge, T. O., & Vera, A. (2009). Hospital innovativeness and organizational performance: Evidence from English public acute care. *Health Care Management Review, 34*(1), 54-67.

Schweiger, D., Sandberg, W., & Rechner, P. (1989). Experiential effects of dialectical inquiry, devil's advocacy, and consensus approaches to strategic decision making. *Academy of Management Journal, 32*, 745-772.

Sheehan, D., Robertson, L., & Ormond, T. (2007). Comparison of language used and patterns of communication in interprofessional and multidisciplinary teams. *Journal of Interprofessional Care, 21*(1), 17-30.

Simons, T., Pelled, L. H., & Smith, K. A. (1999). Making Use of Difference: Diversity, Debate, and Decision Comprehensiveness in Top Management Teams. *Academy of Management Journal, 42*(6), 662.

Stasser, G., Stewart, D. D., & Wittenbaum, G. M. (1995). Expert roles and information exchange during discussion: The importance of knowing who knows what. *Journal of Experimental Social Psychology, 31*, 244-265.

Thompson, B. (1997). The importance of structure coefficients in structural equation modeling confirmatory factor analysis. *Educational and Psychological Measurement, 57*(2), 5-19.

Van der Vegt, G. S., & Janssen, O. (2003). Joint impact of interdependence and group diversity on innovation *J. Manage.* (Vol. 29, pp. 29-51).

van Knippenberg, D., & Schippers, M. l. C. (2007). Work Group Diversity. *Annual Review of Psychology, 58*(1), 515-541.

West, M. A., Borrill, C. S., Dawson, J. F., Brodbeck, F., Shapiro, D. A., & Haward, B. (2003). Leadership clarity and team innovation in health care. *Leadership Quarterly, 14*(4/5), 393.

Xyrichis, A., & Lowton, K. (2008). What fosters or prevents interprofessional teamworking in primary and community care? A literature review. *International Journal of Nursing Studies, 45*(1), 140-153.

Zwarenstein, M., Goldman, J., & Reeves, S. (2009). Interprofessional collaboration: effects of practice-based interventions on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews, 3*(CD000072).

TABLE 1.

Variable Means, Standard Deviations and Correlation Coefficients

		M	*SD*	1	2	3	4	5	6	7
1	Professional Diversity	.51	.15							
2	Team Tenure	3.27	1.53	-.13						
3	Team Size	8.34	5.84	-.04	.09					
5	Cognitive Diversity	5.33	.58	-.02	.04	.09				
6	Debate	5.09	.63	.05	-.14	.02	.61**			
7	Trans-specialist Knowledge	4.67	.66	-.06	-.14	.07	.57**	.54**		
8	Innovation	5.07	.82	-.02	.14	.05	.43**	.43**	.56**	

*p<.05 **p<.01 01

TABLE 2.

Heterotrait-Monotrait (HTMT) Ratios

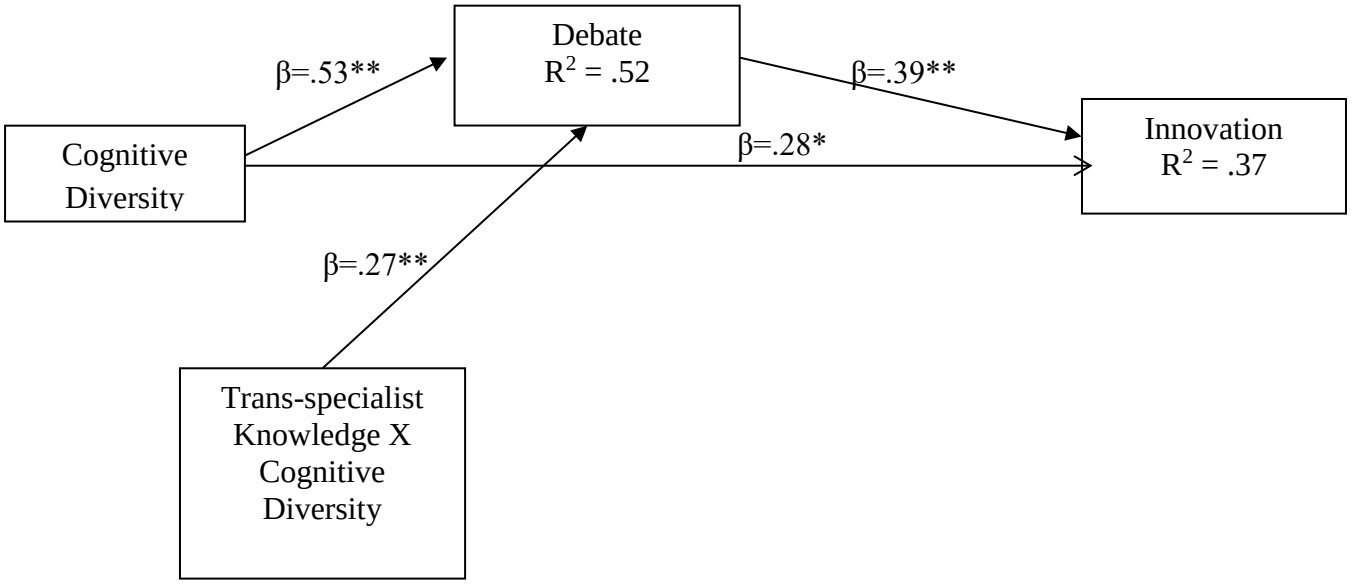
		1	2	3	5	6	7	8
1	Professional Diversity							
2	Team Tenure	-.13						
3	Team Size	-.04	.09					
5	Cognitive Diversity	-.02	.05	.09				
6	Debate	.11	-.18	.01	.75			
7	Trans-specialist Knowledge	-.15	.06	.07	.28	.33		
8	Innovation	-.03	.14	.06	.53	.54	.23	

TABLE 3.

Matrix of Cross-Loadings

	Cognitive Diversity	Debate	Trans-specialist Knowledge	Innovation
Cognitive Diversity 1	**.89**	.60	.25	.54
Cognitive Diversity 2	**.87**	.55	.15	.36
Cognitive Diversity 3	**.81**	.45	.25	.36
Debate 1	.41	**.73**	.31	.23
Debate 2	.45	**.91**	.27	.39
Debate 3	.67	**.85**	.15	.60
Trans-specialist 1	-.25	-.28	**.92**	-.20
Trans-specialist 2	-.25	-.28	**.90**	-.21
Innovation 1	.52	.56	.15	**.90**
Innovation 2	.59	.58	.15	**.89**
Innovation 3	.20	.18	.11	**.74**
Innovation 4	.13	.16	.27	**.69**

FIGURE 1
Path Model of Cognitive Diversity's Effects on Innovation with Coefficients


Debate
R^2 = .52
β=.53**
β=.39**
Cognitive Diversity
β=.28*
Innovation
R^2 = .37
β=.27**
Trans-specialist Knowledge X Cognitive Diversity