



Buffer or boost? the role of openness to experience and knowledge sharing in the relationship between team cognitive diversity and members' innovative work behavior

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Abstract

Although literature frequently argues that diversity stimulates innovative work behavior, theoretical perspectives and empirical findings on this relationship remain inconsistent. Based on self-category theory, this study aims to comprehensively investigate when and how team cognitive diversity benefits or inhibits innovative work behavior. We introduced a new context of research (i.e., virtual teams) during COVID-19 and tested a moderated mediation model using a two-wave survey of 238 employees from 56 virtual teams in China. The results indicated that team cognitive diversity negatively related to knowledge sharing, which in turn inhibited innovative work behavior. In addition, openness to experience moderated the relationship between team cognitive diversity and knowledge sharing, such that cognitive diversity positively related to knowledge sharing among employees with a high openness to experience, while it negatively related to knowledge sharing among those with low openness. These findings enrich the existing literature on innovation by clarifying the mechanisms and boundary conditions of team cognitive diversity and innovative work behavior.

Keywords Team cognitive diversity · Openness to experience · Innovative work behavior · Knowledge sharing

Introduction

Employees' innovative behavior has long been regarded as key to developing organisational breakthroughs and addressing complex challenges (Bednall et al., 2018; Janssen, 2005). Therefore, ways to improve employees' innovative behavior has attracted increasing attention from both practitioners and researchers (De Clercq et al., 2016; Liu et al., 2019; Newman et al., 2018). Team cognitive diversity reflects the extent to which team members differ in terms of attitudes, values, and norms (Kilduff et al., 2000). This cognitive diversity

could create multiple perspectives and cognitive resources of vital importance in creative tasks (Martins et al., 2013). Although literature frequently argues that team diversity—and especially diversity in cognition and perspectives—stimulates innovative work behavior, theoretical perspectives and empirical findings on this relationship remain inconsistent (e.g., Chen et al., 2019; Shin et al., 2012). Scholars suggested that a comprehensive understanding of how employees react to diversity might explain these mixed results (Guillaume et al., 2013; Shin et al., 2012). In other words, how individuals interpret team's cognitive diversity largely affects their subsequent attitudes and behaviors. Nevertheless, extant studies have rarely examined the individual differences (e.g. personality traits) in the relationship between team diversity and innovative behavior. Further, team cognitive diversity largely also reflects that team members have some conflicts in cognition and values (i.e., cognitive conflicts). While extant research on the relationship between conflicts and innovation mostly focused on the types of task conflicts or relationship conflicts (Chen et al., 2019; Lee et al., 2019), little is known about how and why members' diversity in cognition affecting individual innovative work behavior.

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To address these research gaps, we propose a theoretical framework derived from self-categorization theory (Turner et al., 1987). Self-categorization theory (Turner et al., 1987) contends that the psychological basis for group behavior is the categorization of self with others, and one defines oneself in terms of stereotypical group characteristics. Specially, those team members who are diverse in cognition will categorize themselves as out-group members, and are less likely establish shared identity with other members, which is central to employees' knowledge sharing (Crane, 2012). Thus, drawing on self-categorization theory, we posit those employees with diverse cognitions are less likely to share knowledge with others, which will certainly exert negative influences on innovative behavior.

Furthermore, incorporating the boundary effect of individual differences (i.e., openness to experience) is both beneficial and essential to clarifying the relationship between cognitive diversity and innovative behavior. Openness to experience is a key dimension of the 'big five' model of personality, and it involves curiosity, acceptance and creativity surrounding various thoughts, ideas, and perspectives (Costa & McCrae, 1992). Specifically, drawing on trait activation theory (Tett & Guterman, 2000), we posit that employee with a high openness to experience—who are broadminded and willing to accept novel perspectives—will be aroused by this trait-relevant situational cues (i.e. team cognitive diversity), and interpret this information as means to enrich their perspectives and improve themselves, which will increase their intention to share this knowledge with others.

The current study provides several contributions to existing literature. To start with, this study draws on the theory of self-category and proposes that team cognitive diversity leads to identity conflicts and negatively relates to innovative behavior via decreased knowledge sharing, which contributes new theoretical perspectives to literature on the diversity-innovation relationship. In addition, team cognitive diversity largely reflects that team members have some conflicts in cognitions and values (i.e. cognitive conflicts), which may lead to identity conflicts and prohibit them from sharing unique knowledge with other members, hindering the process of innovation (Schweisfurth & Raasch, 2020). In this sense, the current study offers implications to the existing research on the relationship between (task or relationship) conflict and creativity by employing the cognitive and identity perspectives. Finally, this study examines the relationship between team cognitive diversity and knowledge sharing in a virtual environment due to Covid-19, which contributes to the literature on knowledge sharing in virtual teams (e.g., Dulebohn & Hoch, 2017; Rosen et al., 2007).

Theory and hypotheses

Team cognitive diversity and knowledge sharing

Team diversity is an important topic in team literature (Meyer, 2017) and is defined as the differences between individuals on any attribute that may lead to the perception that another person is different from oneself (van Knippenberg et al., 2004). Although studies have attempted to investigate the consequences of team diversity, the existing results are far from unanimous; one way of addressing these issues involves associating different processes with different types or dimensions of diversity (Meyer, 2017), such as team cognitive diversity. Team cognitive diversity reflects employees' perceptions of the extent to which team members differ in terms of attitudes, values, and norms (Kilduff et al., 2000). Similarly, this study defines cognitive diversity as a specific type of team diversity that not only reflects the extent to which members of a team differ according to attitudes, values, and norms but also create multiple perspectives and cognitive resources, which are of vital importance for knowledge-based tasks (Martins et al., 2013).

Knowledge sharing is defined as the concrete transfer of knowledgeable employees' work experience, techniques, and opinions to others, with the expectation that others will practically apply such knowledge in the workplace (Yu et al., 2013). According to Nonaka (1994), knowledge is divided into two different types: explicit and tacit knowledge. The former refers to formulas and processes, while the latter is defined as the shared experiences and knowledge to help others execute their goals and develop new ideas. Prior studies revealed many individual factors that impact employees' knowledge sharing. For instance, researchers found that conscientiousness is positively associated with tacit knowledge sharing, as conscientious individuals are more cooperative and display a more positive attitude towards sharing information (Obrenovic et al., 2021). Chang and Chuang (2011) show that altruism increases the quality and quantity of knowledge sharing in virtual communities. Similarly, Obrenovic et al. (2020) indicated that altruism, as a psychological motivation to exhibit community-beneficial behavior, has an indirect influence on tacit knowledge sharing with the subjective norm as a mediator. However, less is known about how the team-related factors exert an influence on knowledge sharing.

In this study, we draw on self-categorization theory and propose that team cognitive diversity is negatively related knowledge sharing. Self-categorization theory (Turner et al., 1987) contends that the psychological basis for group behavior is the categorization of self with others,

and one defines oneself according to stereotypical group characteristics. The categorization of a person as an in-group member rather than an out-group member establishes very different interpersonal relationships. Specially, those team members who perceive diverse team cognitions tend to easily see other members as out-group members because the weak shared values and cognition make it difficult for them to believe they are “like” the others within the group. Meanwhile, this emphasis on the importance of shared identities is central to knowledge sharing and helping (Crane, 2012). In other words, employees are less likely to share their knowledge with out-group members even though they are exposed to the different knowledge, perspectives, and cognitive resources. Liu et al (2019) also found that cognitive diversity can also elicit intergroup bias, with team members treating individuals with different cognitions as outgroup members and expressing interpersonal exclusion or aggression towards outgroup members (i.e., relationship conflict). This can undermine employees’ willingness to share knowledge.

To summarize, we argue that team cognitive diversity is significantly and negatively related to knowledge sharing because it is likely to be associated with social categorization processes and interfere employees’ willingness to share their knowledge. Thus, we hypothesize the following:

Hypothesis 1: Team cognitive diversity negatively relates to knowledge sharing.

Knowledge sharing and innovative work behavior

Innovative work behavior has been defined as the process, outcomes, and products of attempts to develop and introduce new, improved ways of doing things (Anderson et al., 2014). This study focuses on innovative work behavior (IWB) rather than creativity, as creativity only centres on the production of novel and useful ideas (Zhou & Shalley, 2003), while innovative work behavior consists of two other different behavioral tasks: idea promotion and realization (Janssen, 2000; Somech & Drach-Zahavy, 2013). While creativity is likely to relate to different perspectives, innovative work behavior calls for supporters surrounding the idea with some social activities to capture broad creative activities and processes (Janssen, 2000). Moreover, an individual’s openness to experience, intrinsic motivation, and proactive goal generation positively relate to innovative work behavior (Hammond et al., 2011; Montani et al., 2015; Tu & Lu, 2013). Previous research also documented that leaders are treated as one of the most salient antecedents of employees’ innovative work behavior. For instance, scholars found that empowering leadership positively impacts innovative work behavior during the COVID-19 pandemic by providing followers with feedback, sharing

valuable knowledge and information (Faulks et al., 2021). Faraz et al. (2019) also indicated that servant leadership has a direct positive impact on innovative work behaviour via psychological empowerment.

Categorisation-elaboration model (CEM) framework (van Knippenberg et al., 2004) asserts that diversity improves team performance through diverse information, skills, and perspectives. Scholars have observed that knowledge sharing is the basic means through which employees can commonly exchange their information, skills, and perspectives and contribute to innovation (Wang & Noe, 2010). In addition to transferring individuals’ knowledge into organizational knowledge to benefit organisational development (Wang & Wang, 2012), knowledge sharing can also contribute to individuals’ innovative behavior through the clash of ideas and perspectives. Many studies also observed a positive relationship between knowledge sharing and innovative behavior (Radaelli et al., 2014; Vandavasi et al., 2020). Scholars noted that knowledge sharing will enhance teams’ innovative behavior through shared leadership, which is a process of mutual influence within a team (Vandavasi et al., 2020). Further, Radaelli et al. (2014) explored the underlying connection between sharing and innovative behavior to suggest that the recombination and translation of knowledge embedded in knowledge sharing exert the most positive effects on innovative behavior (Gong et al., 2012). As knowledge sharing involves activities to exchange creative ideas between team members, and these are an important mechanism of innovative behavior, the following hypothesis is presented:

Hypothesis 2: Knowledge sharing positively relates to innovative work behavior.

The mediating effect of knowledge sharing

Given Hypotheses 1 and 2, we propose that knowledge sharing—as an activity and platform for team members to exchange their ideas and views—mediates the negative effects of team cognitive diversity on innovative work behavior. As previously mentioned, innovative work behavior not only requires novel ideas or perspectives, but also calls for some social activities to capture broad creative activities and processes (Janssen, 2000). Therefore, knowledge sharing as an essential social and sharing activity forms a bridge between team’s diverse ideas and innovative work behavior. In this study, we adopt perspectives from self-categorization theory to propose that those employees with diverse cognitions are easily seen as out-group members and they are less likely to share knowledge with others, which will certainly exert negative influences on innovative behavior. Thus, the following hypothesis is proposed:

Hypothesis 3: Knowledge sharing mediates the negative relationship between team cognitive diversity and innovative work behavior.

The moderating effect of openness to experience

Although the team's cognitive diversity may spur novel and useful ideas, the potential interpersonal disharmony triggered by distinct cognitions may be detrimental to the processes to implement these ideas (Chen et al., 2019). Therefore, cognitive diversity's potential effects on innovative work behavior are contingent upon individuals' perceptions and traits. Prior studies merely tested the moderating effects of contextual factors—such as the perceived support for innovation (Chen et al., 2019)—that might influence cognitive diversity's effects on innovative behavior, while overlooking the role of individual differences (i.e. personality traits) in such relationships. However, different personality traits reflect how people perceive and interpret the world, which then influences their subsequent behavior. As a dimension of the 'big five' model of personality, openness to experience involves curiosity, acceptance and creativity surrounding various thoughts, ideas, and perspectives (Costa & McCrae, 1992). People who are open to experience are typically active thinkers, broad-minded, and receptive to novel perspectives. Many studies found that openness to experience directly affects innovative behavior (Hammond et al., 2011), as highly open people tend to be flexible in their thinking, as well as curious and imaginative (Woods et al., 2018).

Therefore, this study examines the boundary effect of openness on cognitive diversity-knowledge sharing relationship by combining the self-category perspectives and trait activation perspectives (Tett & Guterman, 2000). Although those team members who perceive diverse team cognitions tend to easily see other members as out-group members, this self-category process may be contingent on individual personality traits (i.e., openness to experience). Openness to Experience is conceptualized as the most cognitive oriented personality trait (DeYoung et al., 2015), with implications for the cognitive process (Puentes-Díaz et al., 2022). More specially, employees high in openness to experience are typically broad-minded and are less likely to see themselves as out-group members and the self-category process does not work. In contrast, the self-category process plays a more significant role for employees who are low in openness to experience. In addition, the perspectives of trait activation theory are helpful to clarify the moderating role of openness to experience. Trait activation theory formalizes the trait-situation relationship by holding that the behavioral expression of a trait requires arousal of that trait by trait-relevant situational cues (Tett & Burnett, 2003). Employees' personality traits (e.g. openness to experience) are more likely to

be aroused or activated when a team provides substantial information to team members with various and novel things, ideas, and perspectives. In other words, employees with high openness to experience—will be aroused in these trait-relevant situational cues (team' cognitive diversity) and interpret this information as means to enrich their perspectives, which will increase their intention to share this knowledge with others. In contrast, employees with low openness to experience are unreceptive to team cognitive diversity and see others as out-group members, which prevents them from sharing with others and even leads to relationship conflicts (Chen et al., 2019). Thus, those with low openness to experience are less likely to share their knowledge than those with high openness to experience when faced with team cognitive diversity. Therefore, we posit that:

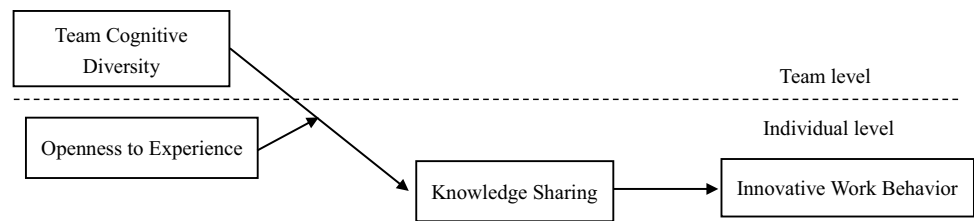
Hypothesis 4: Openness to experience moderates the relationship between team cognitive diversity and knowledge sharing, such that the team cognitive diversity positively relates to knowledge sharing among employees with high openness to experience and negatively relates to knowledge sharing among those with low openness to experience.

The moderated mediation by openness to experience

Based on Hypothesis 4, this study draws on trait activation theory to propose a moderated mediation hypothesis; specifically, employees with a low openness to experience may not benefit from cognitive diversity, or regard diverse cognition as a beneficial opportunity, and this diversity may even lead to relationship conflicts (Chen et al., 2019). Thus, those with a low openness to experience are less likely to share their knowledge, which will decrease their innovative behavior. On the contrary, those employees with a high openness to experience will be activated and motivated by the team's cognitive diversity, and regard this diversity as an opportunity to learn or improve themselves. As a result, they are likely to share this information and resources with other members, which will significantly increase their innovative behavior. In other words, openness to experience mitigates the negative effect of cognitive diversity on innovative work behaviour through decreased knowledge sharing (Fig. 1).

Hypothesis 5: Openness to experience moderates the (negative) mediating effect of knowledge sharing on the relationship between team cognitive diversity and innovative work behavior, such that the (negative) mediating effect of knowledge sharing is weaker for those with high openness to experience compared with those with low openness to experience.

Fig. 1 Presents this study's research model



Method

Participants

Our data were collected online due to the spread of COVID-19 in 2020. Participants were from high-tech enterprises with 58 teams, and were in Shandong, Beijing, and Xinjiang provinces, China. These teams' members were working entirely from home during the period of COVID-19, and they communicated with each other online. Data was collected in two phases. First, we contacted human resources department managers to compile a list of volunteer employees. Second, these managers helped us distribute questionnaire information to those volunteers, who completed the questionnaires online. We distributed 400 questionnaires and 301 were returned. After collecting all the questionnaires, we matched questionnaires by using codes previously set for participants in each team. Then, we eliminated invalid questionnaires with irresponsible or missing answers and excluded the teams with less than three members (Hox et al., 2017; Zhang et al., 2022). Ultimately, we obtained a valid sample consisted of 238 employees from 56 teams. The average team size is 4.25 members. In terms of gender, the sample consists of 41.6% female ($N=99$) and 58.4% male ($N=139$), with an average age of 32.90 years ($SD=8.08$). In terms of education, 1.3% reported education below a bachelor's degree, 49.2% reported a bachelor's degree and 49.5% reported masters or doctoral degrees. In terms of tenure, 12.0% had one year of employment, 11% had one to three years, 13.6% had three to five years, and 63.4% more than five years.

Measures

Team cognitive diversity We assessed team cognitive diversity using a scale from previous study (Van der Vegt & Janssen, 2003). This scale had four items, for example, 'I think differently from other members of the team' and 'I have different knowledge structures and skills with other members of the team'. The items were scored on a seven-point Likert scale, ranging from one ('strongly disagree') to seven ('strongly agree'). The Cronbach's alpha of this assessment was 0.80. Following the steps suggested by researchers (Shin et al., 2012), team cognitive diversity should be aggregated

using multiple ratings from employees. To justify the aggregation, we calculated the intraclass correlation coefficient (ICC (1) and ICC (2)). ICC (1) refers to the proportion of the total variance explained by group membership, and ICC (2) refers to the extent to which the average ratings in the groups help to differentiate between groups (Bliese, 2000). The values of ICC (1) and ICC (2) were 0.71, and 0.91, respectively. Both ICC (1) and ICC (2) were within the acceptable value range (LeBreton & Senter, 2008), which indicates that the team cognitive diversity among members was similar within the teams and significantly differ across the teams. Moreover, we calculated the interrater agreement (rwg). For team cognitive diversity in this study, the values for the median and mean rwg were 0.88 and 0.87, respectively. The value of rwg of each group exceeded 0.70, which is commonly used to justify the aggregation of individual-level measures to the organisational level (Klein & Kozlowski, 2000). These results justified the aggregation.

Openness to experience The measurement of this variable drew on items from the openness dimension of experience in the Big-Five personality scale (Denissen et al., 2008). A sample item in this category was 'I am interested in many different things', with items scored on a five-point Likert scale ranging from one ('strongly disagree') to five ('strongly agree'). The Cronbach's alpha of this assessment was 0.86.

Knowledge sharing This five-item scale was adopted from Szulanski's (1996) work and revised according to the Chinese context, with such a sample item as 'I am willing to share my knowledge and experience with others'. The items were scored on a five-point Likert scale ranging from one ('strongly disagree') to five ('strongly agree'). The Cronbach's alpha of this assessment was 0.90.

Innovative work behavior This study measured innovative behavior with eight items from Ng and Lucianetti's (2015) previous study. Sample items included 'I create new ideas for improvements' and 'I search for new work methods, techniques, or instruments. The items were scored on a seven-point Likert scale ranging from one ('strongly disagree') to seven ('strongly agree'). The Cronbach's alpha for this assessment was 0.92.

Control variables First, our controls were established according to previous studies (e.g. Bednall et al., 2018; Giebels et al., 2016; Liu et al., 2016), and included such demographic variables as age, gender, education, the nature of their company; organisational tenure, and professional backgrounds.

Result

Analytic strategy

Firstly, confirmatory factor analysis (CFA) was carried out using AMOS.17 to examine the convergent and discriminant validity of the variables. We then calculated the mean, standard deviation (SD) and simple correlations among all variables to provide preliminary support for the subsequent hypothesis testing. Secondly, considering that the data in this study contained both individual-level variables and team-level variables, we tested our hypotheses using multilevel regression analyses (Hox et al., 2017).

Confirmatory factor analysis

A confirmatory factor analysis was conducted to test the convergent and divergent validity of the measurement model's latent variables. The average variance extracted (AVE) and construct reliability (CR) values of all variables are greater than 0.5 and 0.7, respectively (Hair et al., 2005), and the value of Cronbach's Alpha of all variables exceeds 0.7. These results indicated a good convergent validity and reliability of the variables. The hypothesized four-factor model (Model 1) had the best and most acceptable fit ($\chi^2=462.29$, $df=224$, $RMSEA=0.06$, $CFI=0.92$; $TLI=0.91$; $IFI=0.92$). After adding the common method factor to the four-factor model, the index of model fit was not significantly improved ($\Delta\chi^2=-34.86$, $\Delta RMSEA=0.00$,

$\Delta CFI=0.01$; $\Delta TLI=0.01$; $\Delta IFI=0.01$), indicating that the variables were not affected by common method bias. A one-factor model (Model 5) exhibited a significantly worse fit with the data ($\chi^2=1589.89$, $df=230$, $RMSEA=0.16$, $CFI=0.56$, $TLI=0.51$, $IFI=0.56$). As Models 2, 3, and 4 had similarly poor fits, we concluded that the hypothesized four-factor model presented the best fit to the data. Table 1 displays the confirmatory factor analysis results.

Descriptive statistics

We calculated the mean, standard deviation (SD), and simple correlations among the variables. Innovative work behavior was significantly associated with knowledge sharing ($r=0.55$, $p<0.01$) and openness to experience ($r=0.38$, $p<0.01$). Further, knowledge sharing positively correlated with openness to experience ($r=0.36$, $p<0.01$). These results provided preliminary support for the following hypothesized relationships. Table 2 presents the correlation results.

Testing the hypotheses

Considering the use of multilevel data, we tested our hypotheses using multilevel regression analyses (Hox et al., 2017). The results of multilevel regression analyses were presented in Table 3. The Model 3 results demonstrated that team cognitive diversity was negatively associated with knowledge sharing ($b=-0.08$; $p<0.01$), thus Hypothesis 1 was supported. The Model 2 results showed that knowledge sharing was positively associated with innovative work behaviours ($b=0.67$; $p<0.01$), thus Hypothesis 2 was supported. Moreover, the indirect effect between cognitive diversity and innovative behavior through knowledge sharing was significant (indirect effect $b=-0.07$, $p<0.05$, 95% CI=[-0.13, -0.02]). Hypothesis 3 was verified.

Table 1 Comparison of measurement models

Model		χ^2	df	$\Delta\chi^2 (df)$	CFI	TLI	IFI	RMSEA
Model 1	Four-factors Model: team cognitive diversity, openness to experience, knowledge sharing, IWB	437.13	224		.92	.91	.92	.06
Model 2	Three-factors Model: openness to experience and knowledge sharing were combined into one factor	906.25	226	469.12**(2)	.77	.75	.78	.11
Model 3	Three-factors Model: knowledge sharing and IWB were combined into one factor	899.72	227	462.59**(3)	.78	.75	.78	.11
Model 4	Two-factors Model: team cognitive diversity and openness to experience were combined into one factor, IWB and knowledge sharing were combined into one factor	1175.01	229	737.88**(5)	.69	.66	.69	.13
Model 5	One-factors Model: All items were loading on to one factor	1589.89	230	1152.76**(6)	.56	.51	.56	.16

IWB=innovative work behavior, CFI=comparative fit index, TLI=Tucker-Lewis index, and RMSEA=root mean square error of approximation. * $p<0.05$, ** $p<0.01$

Table 2 Mean, standard deviation and the correlation coefficient

Variables	Mean	SD	1	2	3	4	5	6	7
Team level									
1. Team cognitive diversity	4.22	1.08							
2. Team types	2.18	1.19	-.22**						
Individual level									
1. Gender	.58	.49							
2. Age	32.90	8.08	-.13*						
3. Education	3.38	.70	-.16*	.08					
4. Major	2.30	1.01	-.28**	.01	.27**				
5. Tenure	3.66	1.41	-.26**	.63**	.16*	.05			
6. Openness to experience	3.57	.58	-.15*	-.02	-.04	.06	.09		
7. Knowledge sharing	4.30	.61	-.05	.06	-.07	-.02	.13*	.36**	
8. Innovative work behavior	5.52	.91	-.12	.16*	.07	.09	.20**	.38**	.55**

* $p < 0.05$, ** $p < 0.01$; male = 1, female = 0; tenure: 1 = within 1 year, 2 = 1–3 years, 3 = 3–5 years, 4 = 5–10 years, and 5 = 10+ years; Team types: 1 = teams in State-owned enterprises, 2 = teams in public sectors; 3 = teams in private or foreign enterprises; 4 = other types; SD = standard deviation; and HR = human resources

Table 3 Results for multilevel regression (2–1–1 Model)

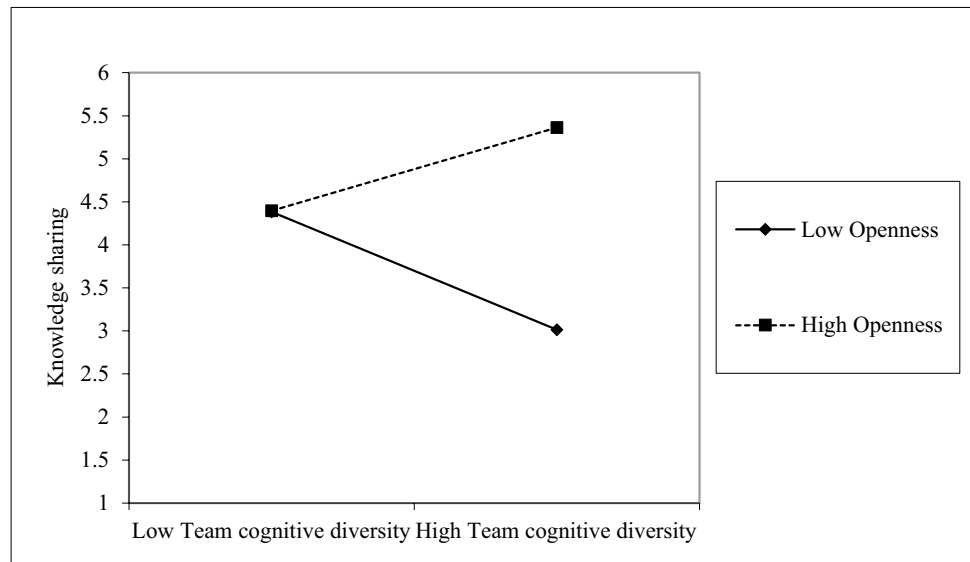
Model	Innovative work behavior				Knowledge sharing					
	Model 0		Model 1		Model 2		Model 3		Model 4	
Parameter	B	SE	B	SE	B	SE	B	SE	B	SE
Fixed effect										
Within model										
Intercepts	5.53**	.06	5.53**	.06	5.53**	.06	4.29**	.03	4.29**	.03
Gen			.26*	.13	.15	.13	.15	.11	.90	1.56
Age			-.01	.01	-.01	.01	-.00	.01	-.04	.07
Edu			-.14	.12	-.05	0.08	-.13	.08	.24	.45
Major			.01	.05	.03	.05	-.03	.04	-.06	.34
Tenure			.15**	.05	.10*	.04	.07	.03	.19	.20
Knowledge sharing					.67**	.19			.59*	.26
Openness to experience									-.05	.06
Between model										
Team types							-.02	.03	-.14	.28
Team Cognitive Diversity							-.08**	.03	-.10**	.03
Openness to experience * Team Cognitive Diversity									.59**	.24
Random effect										
Intercept σ^2_{u0}	.27	.07	.29	.08	.35	.12	.06	.00	.07	.01
σ^2_e	.86	.75	.84	.70	.73	.54	.60	.36	.56	.31
Deviance	626.08		631.30		584.18		463.52		432.08	

* $p < .05$; ** $p < .01$

Hypotheses 4 suggested that openness to experience moderated the team cognitive diversity-knowledge sharing relationship. The results of Model 4 revealed that the interaction between the team’s cognitive diversity and openness to experience was positively associated with knowledge sharing ($b = 0.59, p < 0.05$). The simple slope analysis showed that the relationship between team cognitive diversity and

knowledge sharing was negative and significant when openness to experience was low (simple slope = $-0.44, p < 0.01, 95\% \text{ CI} = [-0.68, -0.20]$), but the relationship was positive and significant when openness to experience was high (simple slope = $0.24, p < 0.05, 95\% \text{ CI} = [0.04, 0.47]$), which suggested that Hypothesis 4 is supported. Figure 2 illustrates the moderating effect of openness to experience.

Fig. 2 The moderating effect of openness to experience



Hypothesis 5 proposed that openness to experience moderated the indirect effects of knowledge sharing on the cognitive diversity-innovative work behavior relationship. We used the M-plus 7.0 to test whether the mediation was moderated by openness to experience. The results indicated that the index of moderated mediation was significant ($IMM = 0.49$, $p < 0.05$, 95% $CI = [0.12, 0.86]$). The results indicated that the indirect effect was negative and significant when openness to experience was low (indirect effect = -0.32 , $p < 0.05$, 95% $CI = [-0.54, -0.10]$), but positive and non-significant when openness to experience was high (indirect effect = 0.17 , $p > 0.05$, 95% $CI = [0.03, 0.34]$), suggesting that the indirect effect of cognitive diversity on innovative work behavior through knowledge sharing varied at different levels of openness to experience.

Discussion

This study draws on a perspective based on self-categorization theory and trait activation theory to explore the factors and mechanisms linking team cognitive diversity and innovative work behavior. Specifically, we tested the mediating effect of knowledge sharing on the team's cognitive diversity-innovative behavior relationship and the moderating effect of openness to experience.

Differing from the CEM framework (van Knippenberg et al., 2004) which asserts that diversity improves team performance through varied information, skills, and perspectives in team-level analyses, this study introduces individual-level analyses and focuses on individual interpretations of the team context (cognitive diversity). Based on the CEM framework (van Knippenberg et al., 2004), it is usually assumed that diversity improves positive outcomes

(e. g., creativity) through varied information, skills, and perspectives in team-level analyses. However, according to social information processing theory (Salancik & Pfeffer, 1978), individual innovative behavior largely depends on how individual interpret and process this diversity. In other words, if employees categorized as out-group members by other members, they are less likely to share their knowledge engage in creative tasks even though they are exposed to the different knowledge, perspectives, and cognitive resources. There are many studies focused on individual perceptions of conflict on their creativity (e.g., Jehn et al., 2010; Kurtzberg & Mueller, 2005). However, the current research emphasizes the role of individual interpretation and procession of the diversity in the mechanisms of innovative behavior, not merely the individual perceptions. Because we argue that how individual interpret this diversity and then categorize themselves may exert stronger influence on their identities and subsequent innovative behavior than their perceptions. The results of this study support our argument.

This study also reveal that cognitive diversity perceptions negatively associates with knowledge sharing, which is consistent with previous studies. For example, Chen et al. (2019) found that the relationship conflict mediated the relationship between cognitive diversity and innovative behavior, arguing that deep-level differences may induce negative emotions and reduced self-identity, impeding their innovative behavior. In addition, though the association between cognitive diversity and knowledge sharing is significant, we notice that its effect size is relatively small. There are two possible explanations. First, the data in this study is collected during the COVID-19, when the teams work by online communications and this may interfere with team members' knowledge sharing, compared to the face-to-face communications. Moreover, the relationship between cognitive diversity and

knowledge sharing may not be stable or strong enough, and it varies in terms of individual differences (e.g. openness to experience in this study) and situational factors. Considering these points above, we believe this finding is reasonable, and future studies are also suggested to further verify it. Furthermore, knowledge sharing is found to significantly mediate the relationship between the combined interactive effect of cognitive diversity and openness to experience on innovative behavior. This study focuses on innovative work behavior rather than creativity because the latter only centres on the idea production (Zhou & Shalley, 2003), while innovative work behavior consists of idea promotion and realisation (Janssen, 2000; Somech & Drach-Zahavy, 2013). Creativity may relate to different perspectives, but innovative work behavior calls for support for the idea through some social activities to capture broad creative events and processes (Janssen, 2000). Therefore, knowledge sharing—as an activity to exchange creative ideas between team members—is an important mechanism of innovative behavior.

Another interesting finding of this study is that perceived team cognitive diversity negatively related to innovation through decreased knowledge sharing. Results showed that the indirect effect between cognitive diversity and innovative behavior through knowledge sharing is significant ($b = -0.03$, $p < 0.05$), while the total effects is not significant ($b = 0.03$, $p > 0.05$), which demonstrates that the positive direct effect of cognitive diversity on innovative behavior may be offset by its negative indirect effect through knowledge sharing. This finding provides valuable insights to mechanisms of cognitive diversity on employees' innovation that the self-category process and shared identities of employees are of great significance for teams or organizations, and this process may even compromise the benefits of the diverse cognitive resources. The interesting findings from the perspectives of self-category also contribute to our understating of diversity-innovation relationship.

Finally, openness to experience is found to mitigate the negative influence of cognitive diversity on then innovative behavior via knowledge sharing. We observe a noteworthy phenomenon in the workplace that cognitive diversity's influence on innovative work behavior varies from person to person. Specifically, employees open to novel, different ideas are more likely to absorb and utilise these new cognitions to strengthen their innovative performance. In contrast, employees resistant to different cognitions exhibit few improvements in their innovative performance. Thus, we hypothesize that openness to experience may act as an important factor influencing the relationship between cognitive diversity and innovative work behavior, which is verified in the current study. In addition, many studies found that openness to experience positively related to innovative behavior (Hammond et al., 2011), as people with high openness are flexible in their thinking, as well as curious and

imaginative (Costa & McCrae, 1992; Woods et al., 2018). However, these studies primarily focused on the direct effects of openness on experience, with research rarely examining its boundary effects on IWB. This study's results support our hypotheses and reveal that openness to experience moderates the team's cognitive diversity-knowledge sharing relationship. The team's cognitive diversity negatively relates to knowledge sharing among those with a low openness to experience as they may not regard the diversity in cognition as a beneficial opportunity. However, it is likely that cognitive diversity leads to relationship conflicts (Chen et al., 2019), and thus, those with a low openness to experience are less likely to share their knowledge.

Theoretical implications

The study provides several contributions to the literature. First, extant theoretical perspectives and empirical findings on cognitive diversity and innovative behavior relationship remain inconsistent (Chen et al., 2019; Shin et al., 2012). For example, the categorisation-elaboration model (CEM) framework (van Knippenberg et al., 2004) asserts that diversity improves team performance through diverse information, skills, and perspectives. However, this study draws on the theory of self-category and propose that team cognitive diversity leads to identity conflicts and negatively relates to innovative behavior via decreased knowledge sharing, which contributes new theoretical perspectives to literature on the diversity-innovation relationship;

In addition, by incorporating the internal context—or specifically, openness to experience—as an important boundary condition, the study provides new insights into the mixed prior results regarding the relationship between teams' cognitive diversity and innovative behavior. Prior studies only tested the moderating effect of contextual factors, such as the perceived support for innovation (Chen et al., 2019). The study explores the interaction between individual and contextual factors and the impacts of this relationship on employees' innovative behavior, which deepens our understanding of innovative behavior. Previous studies have revealed that individual factors—such as creative self-efficacy (Newman et al., 2018), positive effects (Mielniczuk & Laguna, 2018) and proactive goal generation (Montani et al., 2015)—and such contextual factors as the organisational culture (Liu et al., 2019) and leadership (Wang et al., 2019) impact innovative behavior or creativity. Our study extends existing literature by examining the interactive effects of both individual factors (openness to experience) and contextual factors (team cognitive diversity) on innovative behavior.

Furthermore, we contribute to the literature on knowledge sharing in virtual teams by testing the relationship between team cognitive diversity and knowledge sharing in

a virtual environment due to Covid-19. Sharing knowledge, experiences, and insights are critical for accomplishing the missions of teams (Rosen et al., 2007). Different from the normal teams, virtual teams connect knowledge workers through electronic mediums to achieve a shared objective (Dulebohn & Hoch, 2017). In the virtual team environment, knowledge sharing mechanisms include interactions via e-mails, telephone, instant messaging, text messaging, electronic bulletin boards, and other forms. Knowledge sharing in virtual teams could digitally or electronically unite experts in highly specialized fields working at great distances from each other (Hao et al., 2018; Rosen et al., 2007), reducing the costs of sharing knowledge and better leveraging their collective expertise across organizational and geographical boundaries (Dulebohn & Hoch, 2017; Pangil & Chan, 2014). However, the limited communication in virtual teams reduces opportunities for virtual team members to have useful conversations, identify common interests, and engage in self-disclosure, which interferes with the development of trust and creates a major barrier to knowledge sharing. Moreover, virtual teams are vulnerable to technology constraints, team leader constraints on knowledge sharing, and failure to develop a transactive memory system (Rosen et al., 2007). Consistent with these findings, the current study draws on self-category perspectives and reveals the negative influence of team cognitive diversity on knowledge sharing, contributing to the research on the antecedents of knowledge sharing in virtual teams.

Finally, the current study offers implications to the existing research on the relationship between task conflict or relationship conflict and creativity (Chen et al., 2019; Lee et al., 2019) by employing the perspectives of conflicts in cognitive and identity. However, the current study emphasizes the role of individual interpretation and processing of the diversity in shaping their innovative behavior, not merely the individual perceptions. Because we argue that how individuals interpret this diversity and then categorize themselves may exert strong influence on their perceived identities and subsequent innovative behavior.

Practical implications

The results provided several practical implications for organizations. First, this study suggests that cognitive diversity does not necessarily improve and even hinder employees' innovative work behavior. Therefore, it is necessary for organizations and team leaders to pay more attentions to members' cognitive diversity. For example, creating an inclusive climate and organizing team-building activities can boost the mutual recognition and trust among team members, which are helpful to build shared identities and contribute to innovation.

Second, knowledge sharing was found to bridge the effects of cognitive diversity impacts on innovative behavior. Knowledge sharing is an important mechanism for innovation as employees with different cognitions interact and share their knowledge with each other, which not only broadens their horizons and enriches their perspectives, but also alleviates potential relational conflicts to boost their innovative performance. The implication for managers is that organizing activities like knowledge- or experience-sharing is beneficial in helping employees maximize their potential and know each other better, which can greatly improve individual and team performance.

Finally, this study revealed that openness to experience moderates the relationship between perceived team cognitive diversity and knowledge sharing, and the mediating effects of knowledge sharing as well. Although team diversity in cognition may spur employees' creative potential, whether this potential promotes or hinders depends on the individual difference (openness to experience). The implication of this finding for management practice lies in that managers or team leaders should incorporate openness to experience as an important criterion in the processes of building heterogeneous teams, or encourage team members to develop open and inclusive minds to accept new things and ideas.

Limitations and future research directions

This study has some limitations that must be addressed in the future. First, the data in this study were self-reported, and the results could be prone to common method bias (Podsakoff et al., 2003, 2012). Future research could also address the common method bias and causal relationships by employing an experiment- or field-based study, or a combination of survey and experiment. Another limitation of this study is the omission of the role of work design (e.g., task complexity and task interdependence). Specially, the team's members with diverse backgrounds will perform well when the tasks are complex, in that these complex tasks require a diverse range of skills and knowledge. In addition, if the teams with high task independence (i.e., employees work independently within their domain of expertise to meet the team's goals), then members may be less likely to share their unique knowledge with others. Consequently, work design is worth being examined as an important boundary condition in the future studies. Prior researchers have distinguished knowledge sharing as explicit knowledge sharing (i.e. can be formally and systematically stored, articulated, and disseminated in certain codified forms such as manual files) and tacit knowledge sharing (i.e. is difficult to be transformed into explicit form) (Nonaka, 1994; Smith, 2001). Team cognitive diversity may exert a stronger negative effect on tacit knowledge sharing than explicit knowledge sharing, because tacit knowledge sharing is largely facilitated by

sociability and friendship (Osterloh & Frey, 2000), which can be examined by future studies. Finally, given that this study was conducted in virtual team environments that may limit members' communication and affect their team identity to some extent, whether the results of this study can be applied to face-to-face contexts needs further examination.

Conclusions

Drawing on perspectives of self-categorization theory, this study demonstrates that the employees with diverse cognitions are likely to be seen as out-group members, which exerts negative influences on innovative behavior via decreased knowledge sharing. In other words, this self-categorization process may sabotage the potential benefits of the diverse cognitive resources on innovation. In addition, openness to experience was found to mitigate the negative influence of self-categorization process and help individuals capitalize the potential benefits of cognitive diversity for their innovation. Hopefully, these findings provide valuable insights to the literature on innovation and managerial practices.

Author contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [Guodong Cui], [Fuxi Wang] and [Ying Zhang]. The first draft of the manuscript was written by [Guodong Cui] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data availability The datasets analyzed during the current study are available at <https://osf.io/j8s2w/>.

Declarations

Conflict of interests The authors declare that they have no conflict of interests.

Ethics approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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