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Stimulating learning by empowering leadership

Can we achieve cross-level creativity simultaneously?

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Abstract

Purpose – The purpose of this paper is to answer the theoretical and practical calls for an examination of the multi-level effects of empowering leadership on creativity. In addition, it attempts to link empowering leadership to creativity from the perspective of information processing, which is different from traditional mechanisms of psychology.

Design/methodology/approach – Based on the perspective of information processing, the authors tested how and why different levels of empowering leadership may relate to team and individual creativity. Multi-source data were collected from 62 team leaders and 295 team members. Statistical methods, such as the hierarchical linear model, hierarchical regression analysis, and bootstrapping tests, were used to analyze the data.

Findings – The results show that team and individual learning mediate the effects of empowering leadership on creativity at the team and individual levels. Interestingly, the authors also found that team learning negatively moderates the indirect and positive effect of individual empowering leadership on individual creativity.

Research limitations/implications – The main limitation of this study is that the authors used cross-section data instead of longitudinal data to analyze the causal relationship. As such, the results may not truly reveal the causality.

Practical implications – The findings indicate that empowering leadership is important for stimulating both individual and team learning; thus, it benefits different levels of creativity. In addition, the results also suggest that there are interplay between different level mechanisms, and empowering team leader should trade-off individual and team learning effects in order to promote both team and individual creativity effectively.

Originality/value – This study contributes to the existing literature by providing a multi-level and cross-level analysis of empowering leadership and creativity. It clarifies how empowering leadership stimulates individual and team creativity at different levels simultaneously.

Keywords Creativity, Team learning, Empowering leadership, Individual learning

Paper type Research paper

Introduction

Creativity is often regarded as a key factor by which organizations can achieve sustained competitive advantages (George, 2007). Not surprising, considerable research efforts have identified the antecedent factors that influence creativity (Zhou and Shalley, 2008; Shalley *et al.*, 2004). Among these factors, the role of leadership has been assumed to be especially important and, as such, has been explored widely (Zhou and Hoever, 2014).

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A theme that has emerged across these leadership studies is empowering leadership, which meets the trend of providing high autonomy to employees and thereby critical for creativity (Townsend and Bennis, 1997; Chen *et al.*, 2011). Studies have attempted to link empowering leadership and creativity at individual and team levels, respectively (Zhang and Bartol, 2010; Hon and Chan, 2013), all highlighting the advantages of empowering leadership as a whole. However, creativity emerges across individual and team levels. Some researchers have also shown that the leadership effect may not be a "one-size-fits-all" story (e.g. Oke *et al.*, 2009). Thus, a critical question is does empowering leadership matter for different levels of creativity simultaneously? Despite the valuable contribution of previous studies, these studies have yet to integrate the different level effects of empowering leadership on creativity. Therefore, the first purpose of the present study is to offer a more comprehensive understanding of the relationship of empowering leadership and creativity by taking a multi-level perspective.

Furthermore, although past research has acknowledged the importance of empowering leadership on stimulating employee creativity, the crucial and potential explanatory mechanisms still need to be excavated further. Prior studies have suggested that psychological mechanisms, such as intrinsic motivation, are fundamental drivers of creativity (Amabile, 1985; Amabile *et al.*, 1996). Following this line of research, some scholars have shown that intrinsic motivation plays a pivotal mediation role between leadership and creativity (Shin and Zhou, 2003; Zhang and Bartol, 2010). However, Amabile (1988) also suggested that knowledge and expertise play important roles regarding promoting creativity. But interestingly, little attention has been paid to this area of research. According to the theory of information processing, creativity is produced during the process of the interaction of information or knowledge from different sources (Simon, 1978). Given that learning behavior is a typical process by which information is processed (Shiffrin and Schneider, 1977), it is important to understand whether leadership influences individual or team creativity through learning behaviors. Therefore, the second purpose of this study is to determine how information processing impacts the mediating role of learning behaviors on empowering leadership and creativity at different levels.

In addition, researchers have yet to consider the interplay between the team and individual-level mechanisms that bridge empowering leadership and creativity. Cohen and Bailey (1997) once argued that performance at one level may influence, or even conflict with, performance at another, while Kozlowski and Bell (2003) pointed out that few studies have systematically considered the top-down effects of contextual influences on individual functioning in teams. Nevertheless, despite consistent calls for research of this type, researchers have yet to address this gap, except for few exceptions (e.g. Chen *et al.*, 2007; Hofmann *et al.*, 2003). Therefore, in order to answer this call, we have developed and tested a multi-level model of empowering leadership and creativity through the lens of learning behaviors and to examine the interplay effects between different level mechanisms. More specifically, team learning may promote individual learning and influence individual creativity together with individual learning. Therefore, we attempt to examine the mediating effect of team learning on team-level empowering leadership and individual learning, as well as the moderating effect of team learning on the process that individual-level empowering leadership promotes individual creativity.

The current study advances prior studies by proposing a multi-level model to delineate the relationship between empowering leadership and creativity. Compared to prior research, this study attempts to reveal the interplay between different levels of empowered learning effects and answer the proposed question of whether empowering leadership stimulates individual and team creativity simultaneously. In addition, the

study explores the critical mechanism by which empowering leadership influences creativity from the information processing perspective, which is different from previous research, which has approached the mechanism from the perspective of motivation or psychology. The study enriches our understanding of the "black box" between empowering leadership and creativity in a different light.

Literature review and hypotheses

As reviewed in the literature, empowerment has been conceptualized from two complementary perspectives (Spreitzer, 1995; Seibert *et al.*, 2011). First, scholars have defined it as a type of power sharing and have defined empowering leadership as a set of behaviors undertaken by a leader to help subordinates realize self-management. In this scenario, the power transfers from the leaders to the subordinates (Burpitt and Bigoness, 1997; Arnold *et al.*, 2000). However, some researchers have argued that this power-sharing view does not cover the entire essence of empowerment conception. Instead, they have suggested that empowerment should also include the ability of the leader to psychologically enable his followers. As such, using a self-efficiency viewpoint, they defined empowering leadership as a series of behaviors undertaken by a leader in order to increase his subordinates' task-related intrinsic motivation and reduce their feelings of powerlessness (Conger and Kanungo, 1988; Thomas and Velthouse, 1990). Ways by which to raise this motivation would be through placing an emphasis on the meaning of the job, providing autonomy to the employees, expressing confidence in the employees' competence, and removing constraints for performing the job (Zhang and Bartol, 2010). In this paper, we will use the integrative concept (i.e. power is shared with the subordinates with the goal of removing the subordinates' feeling of helplessness).

In addition, scholars have assessed leaders' empowerment at both the team and individual levels. Originally, empowerment had been defined as an individual-level variable measured by the employees' perception of the leader's empowerment level (Spreitzer, 1995). Later, Seibert *et al.* (2004) defined empowerment as a team-level variable measured by assessing the aggregation of entire team's perception of the leader's empowerment level. Due to these differing views, much research has focused on examining the relationship between empowering leadership and several important organizational outcomes, such as performance, organizational commitment, and creativity, at both the team and individual levels (e.g. Srivastava *et al.*, 2006; Vecchio *et al.*, 2010). However, the majority of these studies generally emphasizes the "one-size-fits-all" implantation and focuses on the psychological perspective of empowering leadership. As such, on one hand, these researchers have overlooked the interplay between the different level effects (Maynard *et al.*, 2012; Anderson *et al.*, 2004). On the other hand, little attention has been paid to the information processing processes, such as learning behaviors, which may also have a great influence on individual and team behaviors. Therefore, in order to fill this gap, we conduct a multi-level research study that examines the relationship between empowering leadership and creativity based on the information processing theory. The hypotheses model is shown in Figure 1.

Empowering leadership and team creativity

Team creativity refers to "teams producing novel ideas and solutions to maintain the firm's competitive edge" (Barczak *et al.*, 2010, p. 3). To our knowledge, only one study has examined the relationship between empowering leadership and team creativity. Drawing on the self-determination theory, Hon and Chan (2013) conducted research on international joint ventures and wholly owned subsidiaries of multi-national corporations. Their results

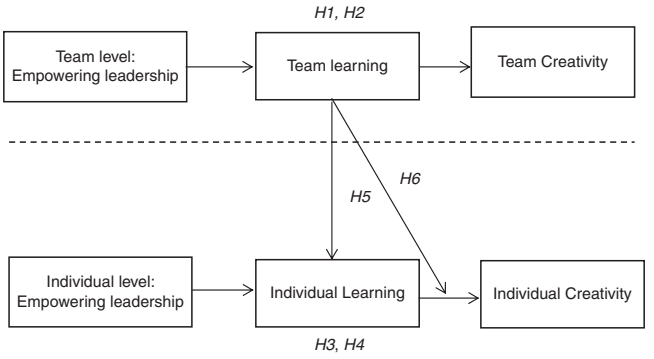

Figure 1. Model and hypothesized

showed that empowering leadership has a positive influence on team creativity and that behaviors associated with empowering leadership, such as providing autonomy to employees and encouraging employees to participate in decision making, have created excellent contexts within which to promote team creativity. In parallel, we propose the following hypothesis:

H1. Team empowering leadership is positively related to team creativity.

The mediation effect of team learning between team-level empowering leadership and creativity

Team learning refers to the collective sharing, acquisition, combination, and creation of knowledge by teams (Burke *et al.*, 2006; Argote *et al.*, 2001). In this process, team members can exchange and acquire knowledge through activities such as asking questions, looking for feedback, seeking information and exploring and experimenting the unknown (Gibson and Vermeulen, 2003; Wong, 2004). According to the theory of collective information processing (Propp, 1999), team creativity was produced during collective information processing process. Divergent knowledge possessed by different team members integrates during the team interaction process. This knowledge then produces novel ideas and solutions (i.e. team creativity). Therefore, due to the interactions involved in this process, the typical information process behavior of team learning can be seen as a team process that promotes team creativity.

Evidence from prior research has indicated that team learning can be stimulated by empowering leadership. For example, Lorinkova *et al.* (2013) found that team members who utilized empowering leadership were more likely to engage in team learning behaviors, such as reflective communication, knowledge codification, and experimentation, since this learning process helped team members to better understand the roles and capabilities of others. Brooks (1994) found that difference in the power available to team members constrains team learning. Coincidentally, empowering leadership specifically attempts to eliminate the influence of power differences and, thus, benefits team learning. In addition, the behaviors of empowering leadership, such as encouraging team members to participate in decision-making processes, provide safe contexts for team members to share knowledge and learning (Mathieu *et al.*, 2006). Therefore, based on the above statements, we propose the following hypothesis:

H2. Team learning mediates the relationship between team empowering leadership and team creativity.

Empowering leadership and individual creativity

Individual creativity refers to employees' generation of new and useful ideas concerning the improvement of individual or team performances at work (Hirst *et al.*, 2009; Oldham and Cummings, 1996). Conceptually, empowering leadership is relevant to an individual's creativity. First, empowering leadership through emphasizing the meaning of work persuades employees to love their work and strive for better performances. Second, employees' perceptions of autonomy and participation in decision making are critical for the improvement of creativity (Amabile *et al.*, 2004). Third, when empowering leaders remove constraints related to employees' performances, they create contexts in which employees are encouraged to explore various creative alternatives before addressing a problem. As such, we propose the following hypothesis:

H3. Individual empowering leadership is positively related to individual creativity.

The mediation effect of individual learning between team-level empowering leadership and creativity

Individual learning has been conceptualized in various ways in different contexts. For example, Kolb (1984) suggested that learning is "a process whereby knowledge is created through the transformation of experience." Kim (1998) defined learning as "increasing one's capacity to take effective action." One constant in all of the definitions is that accessing and encoding information are two important parts of learning behaviors. Drawing from the information processing theory, which states that humans can be viewed as information processing units (Proctor and Vu, 2006), we define individual learning as the process by which an individual seeks and encodes information. From this perspective, individual creativity can be seen as the result of information or knowledge processing in an individual's mind. Thus, combining information from different sources creates new ideas. This perspective is consistent with prior research that suggests that individuals who are likely to learn more knowledge are more likely to be more creative because of their accumulation of substantial amount of knowledge (Amabile, 1988; Hirst *et al.*, 2009).

Evidence from the literature also indicates that empowering leadership stimulates individual learning and, thus, in turn, benefits individual creativity. First, empowering leaders attempt to reduce employees' feelings of helplessness, while also increasing the employees' task-related intrinsic motivation, two facts which have been shown to generate creative ideas (Thomas and Velthouse, 1990; Amabile, 1988). Furthermore, the context shaped by empowering leadership provides employees with a feeling of psychological safety and freedom to learn. As such, it maximizes the likelihood of employees' generating new and useful ideas (Valadares, 2004; Gong *et al.*, 2012). In addition, Zhang and Bartol (2010) showed that empowering leadership stimulates employees' psychological empowerment and, thus, increases creative process engagement. As such, we propose the following hypothesis:

H4. Individual learning mediates the relationship between individual empowering leadership and individual creativity.

The cross-level mediation effect of team learning between team empowering leadership and individual learning

A number of previous studies (e.g. Kim *et al.*, 2010; Edmondson *et al.* 2007; Van Woerkom and Croon, 2009) have indicated that collective behavior can direct and shape individual

behavior because team members attempt to maintain consistency with others in the group in order to obtain psychological safety and avoid being ostracized for being different (Ashby and Perrin, 1988). Given that empowering leadership at the team level can stimulate team learning (Lorinkova *et al.*, 2013) and evidences also suggests that team learning promotes individual learning (e.g. Kim, 1998), we propose the following hypothesis:

H5. Team learning mediates the relationship between team empowering leadership and individual learning.

The cross-level moderating effect of team learning between individual learning and individual creativity

We further explore the interaction effect of team and individual learning on individual creativity since these two levels of learning always co-exist in teams. Although team learning can facilitate individual learning, the knowledge that individuals learn through team learning might overlap with the knowledge that individuals seek and encode on their own. As team members usually work independently to finish similar tasks, the work-related information, and knowledge that team members get from team and individual learning might be homogenous to a large extent (Walsham, 2001). Previous studies have also supported the view that team members interact to learn from each other makes their knowledge and information toward to a similar trend (Reagans and Zuckerman, 2001; Perry-Smith, 2006). Thus, if the level of team learning is high, then individuals who in the team learn initiatively might waste lots of time to learn something what they already get from team learning activities. As mentioned previously, individual creativity can be seen as the outcome of processing information. Therefore, team learning has increased individuals' difficulty in regard to seeking and encoding heterogeneous information during individual learning. As such, team learning may hinder individual learning as it is related to boosting individual creativity:

H6. Team learning negatively moderates the relationship between individual learning and individual creativity, such that individual learning will have a stronger positive relationship with individual creativity when the level of team learning is low.

Method

Sample and procedure

We collected the data from 80 research and development teams at 13 high-tech companies located in the China. In total, 398 members from 80 teams were invited to participate in our study, while 295 members (74 percent) from 62 (77.5 percent) teams provided useable responses. In the sample, the average team size was 4.76 members, and members' average age was between 20 and 30 years. Of the members, 68 percent were male. The average tenure of the team members was 4.19 years. Of the 62 supervisors, 73 percent were male; their average age was between 30 and 40 years, and their average tenure was 4.25 years. In addition, the majority of the supervisors had master's degrees.

In order to collect the data accurately, we required the participants to complete questionnaires in the guidance of our researcher. To avoid the deviations caused by potential common method biases, we collected the data from two different sources (i.e. supervisors and subordinates). The supervisor questionnaires were designed separately from the subordinate questionnaires. The questionnaires focusing on empowering leadership, individual learning, intellectual demands for work, intrinsic

motivation, and individual creativity were completed by the team member, while the team learning and team creativity questionnaires were rated by the supervisors.

Measures

Empowering leadership. We used the 12-item measure by Ahearne *et al.* (2005) to assess empowering leadership; this measure contains four dimensions: enhancing the meaningfulness of work; fostering participation in decision making; expressing confidence in high performance; and providing autonomy from bureaucratic constraints. A sample item is, "My manager helps me understand how my job fits into the bigger picture." Each item was rated from 1 (strongly disagree) to 6 (strongly agree). A second-order confirmatory factor analysis (CFA) were conducted for the scale, and the result demonstrated an acceptable model fit ($\chi^2(50) = 205.87$, $p < 0.001$; CFI = 0.90, GFI = 0.90, RMR = 0.08, RMSEA = 0.10), indicating that the dimensions are distinct and the notion is valid. Cronbach's α for the complete scale was 0.87. For team level measurement, we aggregated the data rated by each team member to assess team empowering leadership. In support of this aggregation, the r_{wg} statistic was 0.95, indicating a high interrater agreement (James *et al.*, 1984), and the variance between groups was significant, ICC(1) = 0.23 and ICC(2) = 0.58 (Bliese, 2000). Hence, the aggregation was justified (Klein and Kozlowski, 2000). Cronbach's α for team-level empowering leadership scale was 0.87.

Team learning. The four-item scale by Van Der Vegt and Bunderson (2005) was used to measure team learning (sample item: criticize each other's work in order to improve performance). Each item of the scale was rated from 1 (strongly disagree) to 5 (strongly agree). Because the measurement was rated by team members, we aggregated it to the team level by calculating the mean of each item. The statistics $r_{wg} = 0.85$, ICC(1) = 0.17, and ICC(2) = 0.49 indicated that the aggregation was justified (Klein and Kozlowski, 2000). The Cronbach's α for this study was 0.84.

Individual learning behaviors. As we mentioned previously that information searching and encoding is one important component of individual learning behaviors, we used a three-item scale adopted from one part of Zhang and Bartol's (2010) creativity process engagement measure, focusing on assessing information searching and encoding to assess individual learning behaviors. Each item of the scale was rated from 1 (strongly disagree) to 5 (strongly agree), and a sample item from the scale was "I search for information from multiple sources." The Cronbach's α value was 0.83.

Team creativity. For assessing team creativity, we used Shin and Zhou's (2007) four-item scale, which focused on three aspects of team creativity, namely, newness, significance, and usefulness of the idea. Each item of the scale was rated from 1 (poorly) to 7 (very much), and sample items were "How well does your team produce new ideas?" and "How useful are those ideas?" The Cronbach's α value was 0.76.

Individual creativity. We adapted Scott and Bruce's (1994) six-item measure to assess individual creativity (sample item: "searches out new technologies, processes, techniques, and/or product ideas"). Responses were ranged from 1 (strongly disagree) to 7 (strongly agree), and the coefficient α was 0.93.

Control variables. According to previous literature, we selected some important demographic variables which may affect the statistical result as control variables. For the individual level, employees' age, gender, education level, team tenure, and intellectual demands for the work (the four-item scale by Morgeson and Humphrey (2006); a sample: "my job does not need too much innovation"; items rated on five-point scale; $\alpha = 0.80$) were

controlled. Prior study indicates that intrinsic motivation is an important mediation factor to stimulate individuals' creativity (Zhang and Bartol, 2010), so we also controlled for intrinsic motivation in our study. We adapted Zhang and Bartol's (2010) way to assess intrinsic motivation (three-item scale; a sample item is "I enjoy finding solutions to complex problems"; five-point scale; $\alpha = 0.82$). For team level, the age, gender, and education level of the team leader; the team size; average team tenure and team function were controlled for the study.

Results

Descriptive statistics

Table I presents the means, standard deviations, and zero-order Pearson correlations of both individual and team variables. As shown in the table, at the individual level, empowering leadership was significantly related to both individual learning ($r = 0.31$, $p < 0.01$) and individual creativity ($r = 0.24$, $p < 0.01$). At the team level, empowering leadership was positively related to team learning ($r = 0.66$, $p < 0.01$) and team creativity ($r = 0.49$, $p < 0.01$). These results provided initial support for some of our hypotheses.

Discriminant validities

A CFA model was conducted to test the discriminant validity of our latent independent variables. In order to adequate statistical power, we followed Wang and Zhu's (2011) way to formed parcels. Empowering leadership was modeled as a single factor, with each of the four dimensions as indicators. Team learning was modeled with four raw items. Individual learning was modeled with three raw items. The result as shown in Table II, the three-factor model demonstrated a good fit to the data (χ^2 (41) = 100.63, $p < 0.01$; NFI = 0.93; CFI = 0.96; TLI = 0.94; RMSEA = 0.07). In addition, all of the factor loadings were significant, indicating convergent validity.

Hypothesis testing

We used SPSS19.0 and HLM6.08 to conducted hierarchical regression and hierarchical linear models for our hypotheses testing. All independent variables added into the model were centralized during analysis. We test our hypotheses step by step: first, the team-level direct and indirect effects were tested by adding empowering leadership and team leaning one by one on the premise of controlling other relative variables. Second, we tested the individual-level hypotheses in the same way. Finally, we added team learning to check the cross-level mediate and moderate effects.

H1 and *H2* propose that team-level empowering leadership is positively relative to team creativity, and team learning plays a mediate role between the two. Table III presents all the team-level model effects. As it shown, when added empowering leadership as a predictor variable (Model 2), the coefficient of empowering leadership was significant ($r = 0.59$, $p < 0.001$), and the adjusted R^2 increased from 0.05 to 0.40. It was a great improvement for the only control variables model. Thus, *H1* was supported. In the further analysis (Model 3), when we added team learning in to the model, empowering leadership became no longer significantly relative to team creativity ($r = 0.27$, ns), and the coefficient of team learning was positively significant ($r = 0.43$, $p < 0.01$). In addition, adding team learning accounts for 7 percent increase of the model interpretation power ($\Delta R^2 = 0.07$, $p < 0.001$) and p-value for the indirection effect test of team empowering leadership on team creativity was significant ($\beta = 0.38$, $p < 0.001$). Thus, *H2* was supported.

Table I.
Means, standard deviations, and correlations

Variables	*M*	SD	1	2	3	4	5	6	7	8	9	10	11
1-1: individual-level													
1. Age (category)	2.41	1.21											
2. Gender	0.68	0.47	0.08										
3. Education level	2.57	0.88	0.29**	−0.01									
4. Team tenure	4.19	2.78	0.71**	0.04	0.05								
5. Intellectual requirement	3.56	0.65	0.35**	−0.15**	0.11	0.30**	(0.80)						
6. Intrinsic motivation	3.71	0.77	−0.03	−0.05	−0.18**	−0.08	0.32**	(0.82)					
7. Individual-level empowering leader	4.64	0.71	0.10	−0.21**	0.13*	0.04	0.46**	0.54**	(0.87)				
8. Individual learning	4.00	0.74	0.16**	0.00	0.24**	0.07	0.21**	0.20**	0.31**	(0.83)			
9. Individual creativity	4.17	0.98	0.13*	−0.02	0.18**	0.14*	0.08	0.20**	0.24**	0.54**	(0.93)		
1-2: team-level													
1. Leader age (category)	3.77	1.38											
2. Leader gender	0.73	0.45	−0.15										
3. Leader education level	3.05	0.78	0.28*	0.13									
4. Team size	4.76	0.97	−0.47**	0.00	−0.38**								
5. Average team tenure	4.25	1.88	0.47	−0.21	0.14	−0.16							
6. Function 1	0.23	0.42	−0.05	−0.01	−0.03	0.10	0.01						
7. Function 2	0.23	0.42	−0.05	−0.10	−0.08	0.22	0.17	−0.29*					
8. Function 3	0.26	0.44	−0.01	0.03	0.01	−0.12	−0.06	−0.32*	−0.32*				
9. Team-level empowering leadership	4.65	0.46	0.14	0.16	0.06	−0.10	0.19	0.13	−0.09	−0.02	(0.89)		
10. Team learning	3.73	0.45	−0.30*	0.07	−0.06	0.23	−0.06	0.17	0.05	0.01	0.66**	(0.85)	
11. Team creativity	3.69	0.45	−0.31*	0.07	−0.20	0.22	−0.27*	0.14	−0.03	0.08	0.49**	0.67**	(0.76)

Notes: $n = 62$. Reliabilities are in parentheses. *$p < 0.05$; **$p < 0.01$

H3 and *H4* states that individual-level empowering leadership is positively related to individual creativity, and individual learning mediates the relationship between the two. Table IV presents all the regression results of the individual-level and cross-level effects. As shown in Table IV, empowering leadership was positively relative to individual creativity ($r = 0.21$, $p < 0.01$, Model 2). However, when adding intrinsic motivation and empowering leadership together, the coefficient of empowering leadership was no longer significant ($r = 0.02$, ns, Model 4), and the coefficient of intrinsic motivation was significant ($r = 0.30$, $p < 0.001$, Model 3), implying that intrinsic motivation may serve as a mediation. This result is similar to the one we got when adding individual learning and individual empowering leadership in the model together ($r_1 = 0.06$, ns; $r_2 = 0.49$, $p < 0.001$, Model 4). In Model 5, we controlled for intrinsic motivation, adding the three variables together, and the result demonstrated that the coefficients of intrinsic motivation and individual learning were both

Model	χ^2	df	χ^2/df	NFI	CFI	TLI	RMSEA
Three-factor model	104.96	41	2.56	0.93	0.96	0.94	0.07
Two-factor Model 1: empowering leadership and team learning combined	215.85	43	5.02	0.86	0.88	0.85	0.09
Two-factor Model 2: empowering leadership and individual learning combined	389.57	43	9.06	0.74	0.76	0.69	0.16
Two-factor Model 3: team learning and individual learning combined	430.14	43	10.00	0.71	0.73	0.66	0.17
One-factor model	517.40	44	11.76	0.65	0.67	0.59	0.19
Null model	291.07	44	6.62	0.81	0.83	0.79	0.14

Table II. Results of confirmatory factor analysis for the measures of the variables studied

Variables	Team creativity M1	M2	M3
Intercept	3.91 (0.55)***	1.38 (0.63)*	1.26 (0.60)*
Control variables			
Leader age	−0.05 (0.05)	−0.06 (0.04)	−0.02 (0.04)
Leader gender	0.03 (0.13)	−0.07 (0.11)	−0.02 (0.10)
Leader education	−0.06 (0.08)	−0.05 (0.07)	−0.08 (0.06)
Team size	0.04 (0.07)	0.04 (0.06)	0.01 (0.06)
Average team tenure	−0.04 (0.04)	−0.07 (0.03)*	−0.06 (0.03)*
Function 1	0.22 (0.16)	0.19 (0.13)	0.11 (0.12)
Function 2	0.09 (0.17)	0.14 (0.13)	0.05 (0.13)
Function 3	0.18 (0.15)	0.18 (0.12)	0.12 (0.12)
Main variables			
Team-level empowering leadership		0.59 (0.10)***	0.27 (0.15)
Team learning			0.43 (0.16)**
R^2	0.17	0.49	0.55
Adjusted R^2	0.05	0.40	0.47
ΔR^2	0.17	0.32***	0.07***
F(df)	1.37 (8.53)	5.60 (9.52)***	6.34 (10.51)***

Notes: $n = 62$ team. Values are unstandardized coefficients, with standard errors in parentheses. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed)

Table III. Hierarchical regression results for team creativity

Variables	Individual creativity						Individual learning	
	M1	M2	M3	M4	M5	M6	M7	M8
Intercept	4.23***	4.18***	4.24***	4.21***	4.23***	4.28***	4.10***	4.10***
Level 1 control variables								
Gender	−0.03	−0.03	−0.06	−0.01	−0.01	−0.02	−0.02	0.02
Age	−0.06	−0.02	−0.04	−0.05	−0.06	−0.05	0.01	0.01
Education	−0.04	−0.06	−0.08	−0.04	−0.05	−0.02	−0.04	−0.04
Team tenure	−0.01	−0.01	0.01	0.00	0.01	0.03	−0.00	−0.00
Intellectual requirement	−0.03	−0.09	−0.15	−0.10	−0.13	−0.13	−0.02	−0.02
Intrinsic motivation			0.30***		0.17**	0.16**	0.32***	0.32***
Individual-level empowering leadership		0.21**	0.02	0.06	−0.04	0.03		
Individual learning				0.49***	0.45***	0.44***		
Level 2 control variables								
Leader gender	0.04	0.04	0.05	0.05	0.05	0.02	−0.22*	−0.22
Leader age	0.10	0.10	0.10	0.10	0.10	0.14*	0.06	0.05
Leader education	0.06	0.06	0.06	0.06	0.06	0.04	0.19*	0.19*
Team size	−0.19	−0.19	−0.19	−0.19	−0.19	−0.22	−0.14*	−0.13*
Average team tenure	0.09*	0.09*	0.09*	0.09*	0.09*	0.08**	−0.02	−0.02
Function 1	−0.06	−0.06	−0.06	−0.05	−0.05	−0.17	0.15	0.16
Function 2	−0.01	−0.01	−0.01	−0.00	−0.00	−0.07	0.19	0.20
Function 3	0.03	0.03	0.03	0.03	0.03	−0.03	0.11	0.12
Team-level empowering leadership							0.16**	0.18*
Team learning						0.20***		−0.03
Cross-level interactions								
Team learning × individual learning						−0.37***		
Level 1 residual variance (σ^2)	0.66	0.64	0.60	0.50	0.48	0.42	0.32	0.32
Level 2 residual intercept variance (τ_{00})	0.19	0.19	0.19	0.22	0.22	0.20	0.12	0.12
$R^2_{within\text{-}team}$	0.00	0.03	0.09	0.24	0.27	0.36	0.14	0.14
$R^2_{between\text{-}team}$	0.34	0.34	0.34	0.24	0.24	0.31	0.33	0.33
R^2_{Total}	0.11	0.13	0.17	0.24	0.26	0.34	0.20	0.20
Deviance	793.82	790.37	776.31	733.01	731.32	697.45	607.07	611.68

Notes: Team $n = 62$, employee $n = 295$. $R^2_{within\text{-}team}$ and $R^2_{between\text{-}team}$ represent proportions of variance reduction relative to the null model. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed)

Table IV.
Hierarchical linear modeling results for individual creativity and learning

significant ($r_1 = 0.17$, $p < 0.01$; $r_2 = 0.45$, $p < 0.001$, Model 5), but the coefficient of individual empowering leadership was no longer significant ($r = -0.04$, ns, Model 5). In addition, adding individual learning accounts for a 0.24 increasing of the total R^2 statistic ($R_{total} = 0.24$, $p < 0.001$, Model 4), indicating that the fitting effect was improved a lot. Using Mplus 6.0, we conducted indirection effect tests in both team- and individual-level analyses (Table V). At the individual level, we tested and compared the indirect mediate effect of intrinsic motivation and individual learning. As shown in

Table V, the mediation effect of intrinsic motivation was not significant while individual learning had passed the indirect effect test ($\beta = 0.15$, $p < 0.001$). Therefore, our *H3* and *H4* were all supported.

H5 proposes that team learning mediates the relationship between team-level empowering leadership and individual learning. As shown in Table IV, the coefficient of team empowering leadership was significant ($r = 0.16$, $p < 0.01$, Model 7), indicating that team empowering leadership was positively relative to individual learning. However, adding team leaning made the coefficient between the two still significant ($r = 0.18$, $p < 0.05$, Model 8), and the coefficient of team learning was not significant ($r_1 = -0.03$, ns, Model 8), Indicating that team learning did not mediate the relationship between the two. Thus, *H5* was not supported. *H6* states that team learning moderates the relationship between individual learning. As shown in Table IV, the interaction of team learning and individual learning was significant ($r = -0.37$, $p < 0.001$, Model 6), and adding this term contributes to a 41.7 percent increase of total R^2 relative to Model 4, indicating a great improvement for the model. Table VI presents the mediated moderation effect test result. As shown in Table VI, in both high (M+1 SD) and low (M−1 SD) team-learning conditions, the indirect effects was both significant ($\beta = 0.21$, $p < 0.01$; $\beta = 0.12$, $p < 0.01$). In order to reveal the interactive effect more clearly, we plot the relationship between individual learning and individual creativity at both high (M+1 SD) and low (M−1 SD) level of team learning condition. As shown in Figure 2, when team learning was low, the relationship between individual learning and individual creativity was much more positive. Hence, *H6* was strongly supported.

Discussion

Drawing from information processing theory, we conducted a multi-level research, which revealed the relationship between empowering leadership and creativity from a more comprehensive perspective. Our results showed that both individual-and team-level empowering leaderships were positively related to individual and team creativity. In the

Table V. Indirect effects of team level

Path	Indirect effect	SE	Est./SE	*p*-value (two-tailed)
Team empowering leadership → team learning → team creativity	0.381	0.040	9.561	0.000
Individual Empowering leadership → intrinsic motivation → individual creativity (ind1)	0.036	0.034	1.069	0.285
Individual Empowering leadership → individual learning → individual creativity (ind2)	0.152	0.038	3.957	0.000
Ind2-ind1	0.116	0.052	2.202	0.028

Table VI. Results of the moderated mediation effect

Level of team learning	Indirect effect	SE	Est./SE	*p*-value (two-tailed)
Condition indirect effects assuming normal distribution				
Low team learning (−1 SD)	0.214	0.065	3.271	0.001
High team learning (+1 SD)	0.120	0.041	2.916	0.004
Different effect between high and low team leaning (high-low)	−0.094	0.035	−2.707	0.007

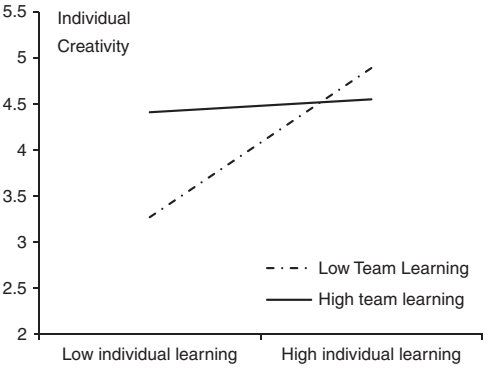

Figure 2.
Interaction between individual learning and team learning

mechanism processes, we discovered that individual and team learning played important mediating roles in individual and team levels, respectively, in regard to the empowerment effects on creativity. To our surprise, the results demonstrated that team-level empowering leadership cannot stimulate individual learning via team learning. This result may have occurred because individuals who attend team learning activities frequently may lack the motivation necessary to search for knowledge on their own. Despite this reason, we cannot deny that a team learning climate may stimulate individuals to learn. Thus, the relationship between team and individual learning must be more complex than that we had proposed. Interestingly, team learning negatively moderated the positive relationship between individual learning and individual creativity, such that when team learning was low, the relationship between the two was more positive, indicating that different levels of learning behaviors may dampen the cross-level learning effect on creativity.

Theoretical implications

Our findings contribute to the extant theory and research literature in a number of ways. First, the current study represents the first efforts within the field to examine the relationship between empowering leadership and creativity at multiple levels simultaneously. Prior studies have examined the influence of empowering leadership on creativity at either individual or team level (Zhang and Bartol, 2010; Hon and Chan, 2013). Some scholars have argued that leadership effects at different levels may interplay with each other, thus they appeal to study the leadership effects from a multi-level perspective. Our research has filled this gap and advanced our understanding of the relationship between empowering leadership and creativity. Our results have indicated that empowering leadership benefits creativity at different levels. However, we also found an interplay effect that showed that different levels of mechanisms interacted with each other to exert influence on individual creativity.

Second, drawing from the information processing theory, our research proposed and examined how learning behaviors play roles in empowering leadership in regard to leading teams' or employees' creativity. Prior studies that have utilized the motivation theory have examined intrinsic motivation and psychological empowerment, which have played pivotal mediating roles between empowering leadership and creativity in empirical settings (Shin and Zhou, 2003; Zhang and Bartol, 2010). Our study complements these prior studies by introducing the information processing mechanism, which explains additional variances beyond the above motivational factors. These findings also support

Amabile's (1988) argument that knowledge and expertise as the same key components as intrinsic motivation as related to promoting creativity.

Third, in order to comprehensively understand the relationship between empowering leadership and creativity, we have examined the interplay between the different levels (Chen *et al.*, 2007; Kozlowski and Bell, 2003). Following this line, we not only investigated the mediating effect of team learning that bridges team-level empowering leadership and individual learning but also examined the moderating effect of team learning on individual learning predicting individual creativity. By doing so, we have systematically considered the top-down effects of team factors on individual behavior. Interestingly, we found that team learning negatively moderated the positive relationship between individual learning and individual creativity. Thus, despite the fact that empowering leadership can stimulate creativity in different levels simultaneously, leaders should also be aware of the trap of information homogeneity (i.e. team members' thinking and knowledge become similar). In order to maximize the team members' creativity, leaders need to trade-off team and individual learning simultaneously. To address the homogeneity problem, external learning might be a good source for providing heterogeneous information.

Managerial implications

For managerial and organizational practices, our research offers some important implications. First, our findings indicate that leaders play important roles in regard to leading both team and individual creativity. Thus, managers in creative organizations, such as scientific research teams in colleges, can use the empowering leadership theory to stimulate the creativity of subordinates and the team as a whole. For example, leaders can emphasize the meaning of the work, encourage employees to participate in the decision-making process, and remove some of the bureaucratic constraints in order to increase the employees' decision autonomy. These leadership behaviors could stimulate team members to learn for themselves and shape a team learning climate, which, in turn, can improve individual and team creativity. Generally, empowering leadership is a powerful response to the complex and ever-changing external environment.

Second, prior research has indicated that team creativity is not simply a sum of the individual members' creativity (Pirola-Merlo and Mann, 2004). For team creativity to occur, the team members must interact and the team must process and integrate the members' cognitive resources. Our results indicate that team learning is an important process for knowledge and information integration. Information sharing and interaction among team members can improve the entire team's cognitive level and stimulate the team members' divergent thinking, which, in turn, benefits team creativity. Therefore, for organizational management practices, managers should encourage and increase opportunities for cooperation among employees in order to develop a beneficial team learning climate, which will increase creativity.

Finally, our results indicated the existence of a substitution effect between team and individual learning. That is to say, individuals can improve their creativity through individual learning, but for the one who have attended many team learning activities, it may weaken the positive effect of individual learning on individual creativity. This result may have occurred due to the overlapping of knowledge gained during individual and team learning. Therefore, individuals should balance their individual and team learning. In regard to managers in the team with high-level team learning climate, they should encourage subordinates to learn information not related to their jobs in their spare time so as to increase their knowledge diversity.

Limitations and future research directions

This research was meant to link empowering leadership and creativity at multiple levels; however, some limitations do exist. First, although our sample consisted of team members and supervisors in order to avoiding the common method variance, we used cross-section data instead of longitude data, which may lead to a difficulty in regard to revealing the causality between the two factors, because effects of the antecedents on the results emerge after a certain period. Thus, this study suffers from a limitation in regard to the cross-section data. Second, our research only focused on one type of individual learning behavior (i.e. information seeking and decoding). However, individual learning can be made up of a number of other behaviors, including imitative learning and direct practical experience learning. As we did not include any of these other behaviors in our study, our study is limited in this regard.

As to future study, time-series designs and experimental studies can be used to examine the multiple-level relationship of empowering leadership and creativity further. Also, researcher could explore the mediating factors from other perspectives. Previous research has focused on the relationship between empowering leadership and creativity from psychological and cognitive perspectives; however, our research approaches the mechanism from the information processing perspective. Many scholars suggest that our abilities to think and be creative are unconscious actions. As our unconscious actions affect our conscious actions, future studies should explore the influence of empowering leadership on the sub-conscious (e.g. epiphany). In addition, some other boundaries or moderating factors should be taken into account. In our research, we took into consideration the moderating impact of team learning on the relationship between individual learning and individual creativity. Future studies could pay attention to other moderator factors, such as a team's goal and performance orientations. Different team goals may lead to changes in team members' behavioral patterns and focuses and, thus, may influence their actions.

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