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Abstract

This study examines the effects of a psychosocially safe environment and two types of shared leadership on project team creativity. We focused on specific dimensions of shared leadership to examine their association with creative outcomes. To measure the dimensions, we conducted a survey of 260 graduate and undergraduate students working in project teams at a large Southwestern university. We found that a psychologically safe environment enabled team members to perform task-oriented and relation-oriented tasks. However, only relation-oriented shared leadership positively influenced team creativity. Based on our findings, we provided research and practical implications, as well as study limitations and future research suggestions.

Keywords: psychological safety, shared leadership, team creativity

Collaboration helps solve complex problems by sharing different perspectives when working on a team project (Funk, 2014). Project require team members to perform a defined, specialized task within a definite time period (Chiocchio & Essiembre, 2009). However, there seems to have been little attention paid to the study of ways team members create an effective team environment where collaboration enables creativity. This study examined the effects of a safe environment for collaboration and sharing the leadership role to unleash the creative capability of their teams.

Team creativity is essential when members collaborate to generate new ideas by synthesizing different ideas and values (Campbell, 1960; Hoever, Van Knippenberg, Van Ginkel, & Barkema, 2012). While there are many studies on team creativity, very few studies have examined the effects of team contextual factors on team creativity (Shin, Kim, Lee, & Bian, 2012; Zhu, Gardner, & Chen, 2018). This is a critical omission from a theoretical standpoint because team creativity requires several conditions that enable contributions from all members to be crafted into joint solutions, such as working in a psychologically safe environment and having shared empowerment among team members.

Therefore, we examined the potential effects of psychological safety on shared leadership and team creativity because it represents the degree that members perceive the group as being a safe setting for interpersonal risk-taking (Edmondson, 1999). Since team creativity is difficult to achieve, we assumed that shared leadership would support it in a psychologically safe environment. For example, inclusive leadership positively relates to psychological safety, which, in turn, enhances team members' involvement in creative work (Carmeli, Reiter-Palmon, & Ziv, 2010). However, a recent meta-analysis study by Hülsheger, Anderson, and Salgado (2009) failed to find a consistent effect of psychological safety on innovative team performance, suggesting the need for future research. Thus, we explored the simultaneous effects of team members' contextual factors on team creativity by introducing psychological safety and shared leadership.

In a leaderless group, shared leadership emerges as an evolving "mutual influence process" (Pearce, 2004, p. 48) and is "relationally produced, emerging through interactions and communication between actors in a context" (Denis, Langley, & Sergi, 2012, p. 49). The literature has suggested that shared leadership can affect both team and individual outcomes (Nicolaides et al., 2014; Hülsheger et al., 2009). For example, shared leadership enhances individual creativity because team members tend to take the initiative to solve problems (Wood & Fields, 2007). Although organizations and higher education institutions rely on team structures to increase creativity, many researchers primarily looked at creativity as an individual level phenomenon (Hirst, Van Knippenberg, & Zhou, 2009; Kurtzberg

& Amabile, 2001; Zhang, & Bartol, 2010; Zhou & George, 2003). More studies examining the effects of shared leadership on team creativity (e.g., Lee, Lee, & Seo, & Choi, 2015; Serban & Roberts, 2016) are necessary as the concept represents a joint effort emerging from group interactions and activities, which may increase team creativity as a whole.

Since the mid-1990s, researchers have examined the value of shared leadership among team members but used various constructs (e.g., transformational, transactional, aversive, directive, and empowering leadership) and measurement strategies (i.e., aggregation methods, and social network approaches) to explore different behavioral forms of shared leadership (D'Innocenzo, Mathieu, & Kukenberger, 2016). Conceptually, relation-oriented and task-oriented leadership have been part of the research literature since the 1950s (Halpin, 1957), but the previous research literature focused on the style of a formal leader. Bass (1991) suggested the distinction between these two orientations represented transactional and transformational leadership, so a number of studies have compared these two styles of leadership at the individual level. In contrast, shared leadership emerged as a team performance factor fairly recently (e.g., Pearce, 2004; Pearce & Conger, 2002). However, empirical studies of the two dimensions of shared leadership have been rare. Our study adds value by examining the effects of the different dimensions of shared leadership on team creativity. This is the first study to use two dimensions from the Grille and Kauffeld's (2015) shared leadership scales.

To examine the relationships of a psychologically safe environment, shared leadership, and team creativity for team assignments, the following research question guided this inquiry: Do psychologically safe environments and shared leadership enable higher levels of team creativity?

Literature Review and Hypotheses

We reviewed scholarly articles that studied team psychological safety and shared leadership as potentially important factors in enabling creativity in project teams. Then, we reviewed antecedents of team creativity.

Team Psychological Safety

Team member engagement in learning-oriented, knowledge-based work can be more effective when team members feel psychologically safe (Edmondson, 2004). Psychological safety implies that group members value each other's skills and talents, feel free to take risks, share information, and discuss mistakes without fear of retribution (Edmondson, 1999, 2002, 2012). Team psychological safety refers to a "shared belief that the team feels safe for interpersonal risk taking" (Edmondson, 1999, p. 354). Based on systematic literature review of psychological safety, 62 empirical studies have focused on the outcomes of psychological safety, such as performance, creativity, employee attitudes (e.g., positive attitudes towards teamwork), communication, knowledge sharing, and learning behaviors (Newman, Donohue, & Eva, 2017).

Furthermore, team psychological safety is critical in relationship with team conflicts, because when team members experience high levels of team psychological safety initially followed by an increasing relationship conflict within the team over time, team identification decreased, resulting in lower satisfaction with the team (Johnson & Avolio, 2018). Psychological safety appears to enable team members to use task conflict effectively to generate more creative ideas and critically discuss decisions, without taking the constructive conflict personally (Bradley, Postlethwaite, Klotz, Hamdani, & Brown, 2012). Therefore, psychological safety has relevance to team processes (e.g., shared leadership) as well as team creative outcomes.

Shared Leadership

Most work on leadership has focused on traditional leadership in which one individual projects downward influence on organizational members (Pearce & Sims, 2000). However, as teams become more complex, shared leadership may be more effective for leading teams (Pearce, Manz, & Sims, 2009; Pearce & Sims, 2000). A growing number of studies have examined shared leadership in teams (i.e., collective leadership and distributed leadership), and scholars noted that shared team leadership can affect team effectiveness (Day, Gronn, & Salas, 2004; Han, Lee, Beyerlein, & Kolb, 2018; Marks, Mathieu, & Zaccaro, 2001: Mathieu, Maynard, Rapp, & Gilson, 2008).

Although scholars have recently suggested a variety of definitions of shared leadership (Carson, Tesluk, & Marrone, 2007; Pearce & Conger, 2002; Pearce & Sims, 2000; Zhou, 2012), we found similar characteristics among these definitions (Day, Gronn, & Salas, 2004). Shared leadership acknowledges the interdependent nature of leadership through "collective achievement, shared responsibility, and the importance of teamwork" (Fletcher & Käufer, 2003, p. 23). We adopted Carson et al.'s (2007, p. 1218) definition of shared leadership as "an emergent team property that results from the distribution of leadership influence across multiple team members". According to Carson et al. (2007), leadership originates from individual team members taking responsibility for activities that influence the other team members through interaction. As a result, a leadership network shapes and influences the whole team's actions and outcomes. Under the concept of shared leadership, task-oriented and relation-oriented shared leadership were categorized separately (Grille & Kauffeld, 2015), so we have chosen these two sub-concepts of shared leadership.

Task-Oriented Shared Leadership (TOSL). A task process consists of the activities that team members deliberately execute to achieve a goal. TOSL indicates team members sharing concern for achieving a good standard of performance (Grille & Kauffeld, 2015). Behaviors related to task-oriented leadership include coordination activities, such as organizing work, assigning work to team members, and explaining rules and standard procedures (Yukl, Gordon, & Taber, 2002). Explicit communication supports what needs to be done and how it should be done to promote effective team performance. To explain whether and how TOSL relates to team creativity, we adopt the information exchange perspective (Mesmer-Magnus & DeChurch, 2009), which covers knowledge exchange and task-oriented communication related to the generation of creative ideas (Smith, Collins, & Clark, 2005). Information exchange is an important process linked to team creativity because sharing task-relevant information leads to more thorough and creative information processing, problem solving, and decision making (Van Knippenberg, De Dreu, & Homan, 2004).

Relation-Oriented Shared Leadership (ROSL). Relation-oriented team processes enhance the emotional strength of a team, such as support and collaboration, resulting in both positive team attitudes and increased performance (Mannix & Neale, 2005; Thilo, 2005). ROSL behaviors include respecting team members' opinions and connecting emotionally to members (Yukl et al., 2002). Effective team members practice a variety of positive socio-emotional behaviors, such as supporting team members and showing consideration for the needs and feelings of others (Yukl et al., 2002). Likewise, shared team leadership is one of the important process factors that leads to team creativity and performance (Wang, Waldman, & Zhang, 2014). Therefore, it is important to examine what team members share in what kind of context, and learn how shared leadership affects different output variables. In this paper, we will examine team creativity as our output variable, as discussed in the next section.

Team Creativity

Researchers have begun to study how team creativity can be enhanced as many project teams desire to produce creative outcomes (Joo, Song, Lim, & Yoon, 2012; Zhu et al., 2018). Team creativity can be defined as the "joint novelty and usefulness of a final idea developed by a group of people" (Hoever et al., 2012, p. 983). Although many studies explored a concept of creativity at the individual level, researchers have only recently started to examine team creativity as one of the key factors for organizational success (Perry-Smith & Shalley, 2014).

Researchers have found both positive and negative antecedents of team creativity. For example, inhibitors to team creativity may include distrust between team leaders and members, personality differences, and generational differences in viewpoints (Han, Chae, Macko, Park, & Beyerlein, 2017). Rosso (2014) also found that lacking time, equipment, and human resources can be top constraints for R&D team creativity. On the other hand, the need for an integration of ideas and perspective taking is key in fostering team creativity, as creative solutions are required in complex situations (Hoever et al., 2012). In addition, Zhu et al. (2018) found that a collaborative team climate can be positively related to creativity. Specifically, team creativity researchers suggest that team members who feel psychologically safe may contribute unique expertise and insights, so they cooperatively craft inputs into useful and original solutions (Han et al., 2017; West, 2002).

Hypothesized Research Model

The model was framed by using the perspective of the traditional input-process-outcome (IPO) model to illustrate the pattern of emergent team processes. The IPO framework has served as a major team model for decades (Salas, Stagl, & Burke, 2004). For this study, the team input (team psychological safety) was identified as team process enablers. The team processes (shared leadership) were used to capture team dynamics, and the team output was used as team outcomes (team creativity).

Creativity can seem risky because it introduces novel ideas that other members are likely to reject. Consequently, behavior cues from other members that signal psychological safety act as important contextual variables related to creativity (George, 2007). When team members feel psychologically safe sharing creative ideas, they are more likely to come up with innovative solutions and engage in initiative and proactive behaviors (Edmondson, 2004; Kark & Carmeli, 2008; Zhang & Bartol, 2010). Psychological safety increases the likelihood that team members feel free to question suggestions and decisions without fear of negative interpersonal consequences, so they tend to behave more creatively (Burke, Stagl, Salas, Pierce, & Kendall, 2006). Over time, members who had the opportunity to explain their new ideas were more creative than members that had been given no voice (Streicher, Jonas, Maier, Frey, & Spießberger, 2012). Under a low level of psychological safety, people may feel helpless or at risk when speaking, which hinders their attempts at creativity (Baer & Frese, 2003). Psychological safety will thus influence the team's creativity. Based on the literature review, we suggest the following hypotheses:

Hypothesis 1: Psychological safety among team members positively affects team creativity.

Psychological safety and empowerment can also affect teams in terms of task- and relation-oriented shared leadership (Carson et al., 2007; Grille, Schulte, & Simone Kauffeld, 2015). A sense of psychological safety within the team enables members to enhance TOSL by opening up to feedback from others and encouraging knowledge sharing, which affects the degree to which team members accept mutual performance monitoring (Robson, Katsikeas, & Bello, 2008; Yagil & Luria, 2010). Concerning ROSL, psychological safety provides the opportunity to enhance the quality of interpersonal relationships within the team (Yagil & Luria, 2010). Positive interpersonal relationships relate to willingness to support other members, share experiences and expertise, and identify opportunities for common improvement (Rhee, 2007; Yagil & Luria, 2010). Creating a safe environment encourages learning for team members through sharing their experiences (Merriam, Caffarella, & Baumgartner, 2012). Individuals who trust and get along well with each other effectively share knowledge without fear (Choo, Linderman, & Schroeder, 2007, Kostopoulos & Bozionelos, 2011). Therefore, we hypothesize that:

Hypothesis 2: Psychological safety positively affects task-oriented shared leadership.

Hypothesis 3: Psychological safety positively affects relation-oriented shared leadership.

We also argue that shared leadership has a positive effect on team creativity. Previous studies have shown that shared leadership can enhance individual creativity (Wood & Fields, 2007), as well as team creativity when mediated by team processes experienced by team members (Gu, Chen, Huang, Liu, & Huang, 2016; Hülsheger et al., 2009; Kirkman & Rosen, 1999; Lee et al., 2015)A meta-analytic study summarizing 30 years of creativity research (Hülsheger et al., 2009) found that team processes, such as task-orientation and team cohesion, better predict team creativity than individual creativity. According to a recent empirical study, shared leadership related positively to both team creativity and individual creativity via knowledge sharing (Gu et al., 2016). Lee et al. (2015) reported that shared leadership positively contributed to team creativity. When it comes to a creative task, Serban and Roberts (2016) found that task cohesion was positively associated with shared leadership, which improved task satisfaction of a team. Interestingly, teams seem to require relational processes over time, whereas task-oriented processes are temporary (Amabile, Barsade, Mueller, & Staw, 2005). Integrating TOSL with information exchange perspectives and ROSL, we argue that shared team leadership motivates team creativity. Therefore, we propose the hypotheses below:

Hypothesis 4: Task-oriented shared leadership among team members positively affects team creativity.

Hypothesis 5: Relation-oriented shared leadership among team members positively affects team creativity.

Figure 1 depicts the hypothesized relationships in the research model. We examined how the two dimensions of shared leadership play a role when considering a psychologically safe team environment on team creativity. We then focused on the logic behind the mediating effects of two dimensions of shared leadership between psychological safety and team creativity. The support behind the mediation effects is based on a conceptual framework of antecedents and outcomes of shared leadership (Kang and Svensson, 2018) and an empirical study (Serban & Roberts, 2016). Both argued that one of the antecedents of shared leadership is having a supportive environment, and outcomes of shared leadership include creativity and performance. Lastly, we have included several control variables in the research model to focus on the relationship among team process factors.

[Insert Figure 1 about here]

Methods

Sample and Data Collection

We invited students from organized graduate and undergraduate courses in an educational human resource development department at a large Southwestern university. Most of those teams conduct a project involving organizational clients in the profit or not-for-profit sectors lasting from four to ten weeks during the semester. Projects typically involve the following phases: build a relationship with the client, write a proposal approved by client and instructor, prepare questions for survey or interview data collection, collect and analyze data, write a report concluding with recommendations, and present the findings in a meeting with the client. Some of the teams attend class on campus and thus have the opportunity to meet face-to-face, supplementing meetings with electronic communications. Other classes are online with students geographically dispersed; thus they work virtually, relying on electronic communication devices all or most of the time. Online and offline teams meet the same project requirements, although online teams rely more on virtual collaboration.

The students represented both undergraduate and graduate levels. As a part of convenience sampling, all instructors in the department received invitations to involve their students in the study. Out of 20 faculty members, half of them agreed to encourage students to participate in this study. This study collected data through online-questionnaires about four weeks into the semester, and 287 students participated in the online survey. Of the 287 students, a subset of 260 provided usable data.

Measures

We conducted an online survey about one month after the semester began to examine team members' perceptions of psychological safety, shared leadership, and team creativity. The survey questionnaire consisted of scales representing the variables described above with course and team identifiers.

Team Psychological Safety. Edmondson's (1999) team psychological safety scale was used to assess team members' perceptions. The psychological safety scale consists of seven items on a 5-point Likert-type scale. A sample item is: "Working with members of this team, my unique skills and talents are valued and utilized." Cronbach's alpha for this scale was .82. The reliability, validity, and factor structure of the measure were reported in Edmondson's (1999) study.

Shared Leadership. We assessed shared leadership with the questionnaire by Grille and Kauffeld (2015). The questionnaire measures four different aspects of shared leadership behavior: task-, relation-, change-, and micropolitic-oriented leadership using 5-point Likert-type scales. The four scales demonstrated good measurement qualities in a confirmatory factor analysis in two independent German samples (Grille & Kauffeld, 2015). For this study, we used the task-oriented leadership scale and the relation-oriented shared leadership scale because change- and micropolitical-oriented leadership dimensions are more relevant to a corporation setting than a higher education setting. Cronbach's alpha of the TOSL scale was .81 in study 1 and .84 in study 2; the ROSL scale was .88 in study 1 and .91 in study 2, respectively (Grille & Kauffeld, 2015). In their studies, Confirmatory Factor Analysis provided evidence of discriminant validity. In addition, the two scales correlated with related measures, such as transformational and transactional leadership, providing evidence of convergent validity. The TOSL scale consists of items such as: "As a team we ensure that everyone knows their tasks." The ROSL scale consists of items such as: "We support each other in handling conflicts within the team."

Team Creativity. We asked for individual team members' perceptions about their team's creativity using three items on a five-point scale (Kratzer, Leenders, and Van Engelen, 2010), such as, "how would you rate the newness and originality of the solutions your team finds to problems?" Cronbach's alpha for this scale was .86.

Control Variables. First, we collected data of possible correlates of the main variables as possible demographic controls, such as age, gender (0 = female and 1 = male), and level of education (0 = undergraduate and 1 = graduate). Second, we controlled for the following variables: course type (0 = offline, 1 = online), extent of rich communication media use, and number of team members.

In terms of online and offline media richness, we used an existing measure of electronic communication dependence (Kirkman, Rosen, Tesluk, & Gibson, 2006). Possible media choices included face-to-face meetings, videoconferencing, teleconferencing, discussion boards, email, instant messaging, knowledge repositories, and planning and scheduling tools. We asked participants to report the percentage of time they spent using each type of media when carrying out work, with their percentages summing to 100 percent. Communication media that are synchronous occurs in real time and allows non-verbal communication that are generally regarded as richer media (Kirkman & Mathieu, 2005); therefore, we classified face-to-face meetings, video-conferencing, and teleconferencing as richer communication media, as compared with the other options. We then aggregated the percentage of time spent in face-to-face meetings, video-conferencing, and teleconferencing as a measure of rich communication to indicate how often team members used these three forms of media.

Analysis

To examine the hypothesized model, the present study adopted structural equation modeling (SEM). In the present study, SEM analysis was performed using the AMOS statistical package (version 20), and thus a full-information maximum likelihood (FIML) was adopted to address missing values. To evaluate the fitness of the research model as well as alternative models, this study used the Tucker–Lewis index (TLI ≥ .90, Hu & Bentler, 1999), the comparative fit index (CFI; ≥ .90, Hu & Bentler, 1999), the root mean square error of approximation (RMSEA; ≤ .08, Browne & Cudeck, 1993), and the standardized root mean square residual (SRMR; ≤ .08, Hu & Bentler, 1999). Finally, as this study used cross-sectional data, Harman's single-factor test (Harman, 1967) was conducted to identify the common method variance bias.

Data Analysis and Results

In this section, we discussed the process of data analysis and its results. Most participants were female (66.5%), white (60.0%), undergraduate students (70.0%), majoring in the same department (65.8%) with a mean age of 24.6. Table 1 shows the demographics of the participating students. We investigated students' ethnicity, education level, gender, and course type, and the number of students in each team.

[Insert Table 1 about here]

Verification of Validity and Reliability

To check the quality of the scales, we performed a Confirmatory Factor Analysis and calculated Cronbach's α in order to verify scale validity and reliability. According to the results, the factor loading of all items on its respective latent variable was significant and higher than .05. Each variable (psychological safety .702; TOSL .867; ROSL.883; creativity .864) also met the criterion Cronbach's α of .60 (Van de Ven & Ferry, 1980) for internal consistency.

We conducted Harman's single-factor test (Harman, 1967) in order to check the common method bias. The analysis revealed two factors with eigenvalues greater than 1.00 among four factors; no single factor explained a majority of the variance (the first factor explaining 35.661%). This indicates that the common method bias is not a serious issue in this study.

Descriptive Statistics and Correlation Analysis

Means, standard deviations, skewness, kurtosis, and correlation were calculated. The mean and standard deviation of age were 24.57 and 7.11, and the mean and standard deviation of team size were 3.16 and 1.69, respectively. Team size ranged from three to eight. The mean and standard deviation of all study variables in this study showed

distributions from 3.62 to 3.98, and from .56 to .68 on five-point scales, respectively. The normality assumption was also satisfied (skewness < 2, kurtosis < 7; West, Finch, & Curran, 1995). Correlations are presented in Table 2. Correlations among the study variables were statistically significant ranging from r = .376 to r = .773. The result of collinearity diagnostics indicated that multi-collinearity did not occur (r < .90; tolerance > 0.1; VIF < 10; Kline, 2005).

[Insert Table 2 about here]

Analyses of the Structural Models

Table 3 presents the fitness indices for research models. To evaluate the fitness of the structural model, this study used TLI, CFI, RMSEA, and SRMR. These indexes pursue parsimony of the model and are relatively less sensitive to the sample size than other indexes (Browne & Cudeck, 1993). The results indicated that the data fit the structural model.

[Insert Table 3 about here]

Table 4 shows the results of research model from Figure 1 (Model 1) and the results after the addition of the control variables (Model 2). The results of Model 2 indicated that no control variables showed significant relationships in the model with this data set except for the parameter from team size to TOSL.

[Insert Table 4 about here]

Psychological safety had a positive impact on both TOSL (β = .705, p < .001; supporting H2) and ROSL (β = .698, p < .001; supporting H3), whereas the direct effect of psychological safety on team creativity was not significant, thus failing to support Hypothesis 1. Interestingly, ROSL had a positive influence on team creativity (β = .422, p < .05; supporting H5), but the parameter between TOSL and creativity was not significant, thus failing to support H4.

Although both ROSL and TOSL are components of shared leadership and their correlation was .77 in the model, their relationships with creativity were quite different. Thus, we additionally analyzed Task-oriented Shared Leadership-Mediating Model (TSMM) and Relation-oriented Shared Leadership-Mediating Model (RSMM), respectively. The goodness-of-fit indices of the TSMM (TLI = .921, CFI = .940, RMSEA = .059, and SRMR =.0552) and RSMM (TLI = .961, CFI = .970, RMSEA = .041, and SRMR =.0458) met the criteria.

Table 5 shows the results of the TSMM and RSMM. In both models, psychological safety still had a positive effect on TOSL (β = .702, p < .001) and ROSL (β = .700, p < .001). The effect of psychological safety on creativity, like the previous analysis, was not significant in either model. Taken together, the reason the lack of a significant relationship between TOSL and creativity in TSMM was determined to be due to the high correlation between TOSL and ROSL, which warrants further investigation.

[Insert Table 5 about here]

A summary of the results of our hypotheses testing is depicted in Figure 2.

[Insert Figure 2 about here]

Discussion

In this study, we found that a psychologically safe environment and relation-oriented shared leadership promote creativity in team projects. Previous studies supported the importance of psychological safety in the development of shared leadership (e.g., Carmeli et al., 2010; Nembhard & Edmondson, 2006). Our study expands the research of Edmondson and her colleagues (Edmondson, 1999, 2004; Nembhard & Edmondson, 2006), by focusing on the effect of psychological safety on two specific aspects of shared leadership and team creativity.

Our study demonstrates the importance of psychological safety, which leads to ROSL, which enhances team creativity. When team members cultivate a social climate in which they feel safe to speak up, they may become more willing to improve ROSL, which results in openness to discuss new ideas with their team members and generate novel and useful solutions. The characteristics of ROSL include: (a) addressing each member's concerns, (b) recognizing good performance, (c) promoting team cohesion, and (d) supporting each other when handling conflicts within the team (Grille & Kauffeld, 2015). Other researchers also support this relationship by arguing that social support promotes

creative teams (Madjar, Oldham, & Pratt, 2002; Rhee, 2007), which not only expand individual members' cognitive and psychological resources, but also enhance synergistic dynamics among team members to elevate overall team creativity (Rhee, 2007). ROSL and team psychological safety act as prerequisites to performance, because in their absence, team members can be defensive or become silent when their ideas are criticized or rejected (Yaniv, 2004).

This study sheds light on the role of shared leadership because we found that team psychological safety leads to team creativity only when ROSL occurs. A direct relationship between psychological safety and team creativity did not occur when shared leadership was included in the model, which may clarify the claims of other scholars in the psychological safety and behavior literature (e.g., Baer & Frese, 2003; Gong, Cheung, Wang, & Huang, 2012). Although it may be true that a psychologically safe team environment can enhance team creativity, other variables seem to play important mediating roles in addition to ROSL. For example, positive group affective tone related to team creativity when team trust is low, which means that members might perceive conditions of psychological safety under these variable combinations (Tsai, Chi, Grandey, & Fung, 2012). To further examine this possibility, it would be interesting to explore conditions where the joint influence of high levels of team psychological safety and TOSL might affect team creativity, such as routine work, complex projects, or large team sizes where a level of formal organization aids the group process. Researchers can also include different variables with shared leadership, such as trust or task-conflict, when looking at the effect of psychological safety on team creativity to clarify the relationship.

Interestingly, although the impact of ROSL in this model was statistically significant, we found that TOSL, such as monitoring a team's goals and assigning tasks, did not significantly affect team creativity. This seems to imply that close monitoring or controlling the behavior of team members may not lead to a members' creative output (e.g., George & Zhou, 2001; Zhou, 2003), although that may be less likely in collectivist cultures (Hui, Au, & Fock, 2004). Therefore, although the lack of a significant relationship between TOSL and creativity in this study seems surprising, the result does align with the aforementioned studies that have examined the negative effect of TOSL.

Additionally, in our model, no control variables, such as age, gender, education level, course type, and degree of media richness, showed significant relationships with the main variables except for the relationship of team size and TOSL. This suggests that as team size increases, TOSL increases, which may indicate that increased complexity created by adding members requires more attention to the organizing activities of TOSL. In this study, the highest response rates (47.7 %) involved groups of four members, and the largest teams included 7-8 members (23.8%). As instructors tend not to design student teams with more than 10 students, we may interpret this result to suggest that large groups may perform well when using TOSL compared to a small group with 3-4 members – an implication worth further investigation.

In contrast to studies from 10 or 15 years ago, (e.g., Gurtner, Kolbe, & Boos, 2007; Kirkman, Rosen, Tesluk, & Gibson, 2004), we found no difference between virtual and face-to-face teams in their pattern of shared leadership and creativity. This suggests that virtual and face-to-face interactions may not be significantly different now due to the development of technology because virtual communication now enables immediate feedback through overcoming the limitations of time and space (Malhotra & Majchrzak, 2014). According to a meta-analysis study with 1,105 experimental studies of technology use in higher education (Schmid et al., 2014), learning is best supported when each member is actively engaged via technological tools that provide cognitive support. This technology based learning culture may increase team members' potential to share leadership and develop creativity.

Finally, project team process interweaves task work with teamwork to achieve performance goals (Han & Beyerlein, 2016), which typically requires creative thinking. Our findings suggest that TOSL (formal structure) becomes more important as the number of members increase, but that ROSL (informal structure) is essential for creativity in any size teams. Perhaps, the tipping point where adding TOSL helps with creativity represents a micro-level version of what Brown and Eisenhardt (1998) call the edge – a place where structure and chaos meet so that creative solutions emerge.

Theoretical Implications

The present findings have several implications for future research. This study is the first one to empirically test TOSL and ROSL as separate dimensions of shared leadership, thus adding to arguments advocating for their distinctiveness. We found that the effects of the two shared leadership dimensions on team creativity were different. This finding may lead to the refinement of existing studies that treated shared leadership as a unified construct (Arnold, Arad, Rhoades, & Drasgow, 2000; Hon & Chan, 2013; Lee et al., 2015). Our model indicates that the question of "what is shared" matters. Little literature exists about which dimensions of shared leadership may be most potent in influencing

different indicators of team creativity. Future researchers can examine shared leadership with these questions: what is shared among teams and under what conditions shared leadership behavior is most or least effective on team creativity and why?

Our model of how ROSL enhances team creativity may be especially impactful in certain kinds of work or at certain points in the creative process. The level of creativity required for a job may change the level of shared leadership and its empowerment relationship (Unsworth, Wall, & Carter, 2005). For monotonous work low in task control, complexity, and significance (Ohly, Sonnentag, & Pluntke, 2006), it may not be apparent that people can work collaboratively to lead creative efforts. Therefore, scholars should further examine the effect of ROSL in different contextual settings.

Practical Implications

The present findings have several implications for educators and managers in terms of instructional design, coaching, training, and learning culture. Instructors or managers can coach each team member to practice effective shared leadership behaviors and teaming behaviors that can help increase team creativity. In addition, instructors and managers need to acknowledge that modern day learning systems are more flexible and adaptable to different levels of learning strategies. Therefore, empowering team members to manage their own learning and foster creative thinking and action by creating positive and supportive environments is important to supplement the effect of formal courses. A psychologically safe environment can be viewed as a prerequisite in order for team members to have shared leadership, which may increase team creativity and group learning. Therefore, we recommend instructors and managers design team activities by considering psychological safety so that team members can remove their fear of sharing creative ideas.

Limitations and Future Research Suggestions

We noted some limitations in this study. First, the generalizability of the results may be limited because the study used a sample of undergraduate and graduate students from one large Southwestern university in a single department. Second, the correlation between psychological safety and shared leadership was very high. Therefore, we cannot ignore the possibility of a suppression effect in the structural model. However, the result of confirmatory factor analysis showed that shared leadership consisted of two dimensions: ROSL and TOSL. The result of analysis of common methods bias and collinearity diagnostic also indicated that common methods bias and multicollinearity had not occurred. We recommend that future researchers study this model with a different sample and instruments. Third, we used a short time frame when measuring team creativity and other enabling variables. An early team climate of team members may be different from mature stages, which may occur at the end of a long semester (George & Zhou, 2007). We encourage future researchers to use a longer timeframe when measuring team climate and team creativity to examine change over time in these important relationships. Fourth, we relied on self-report surveys. Future researchers can also include other sources (e.g., scoring rubrics for final products from instructors or evaluations from clients of projects).

Conclusion

This study has shown strong connections between a psychologically safe team environment and team creativity via relation-oriented shared leadership (ROSL) among team members, all of which are critical in improving team learning and performance. Overall, we learned the importance of examining separate behavioral dimensions of shared leadership when specifying a process model for team creativity. In addition to theoretical implications, we suggest to practitioners that team member interactions serve as the key mechanism that explain the relationship between psychological safety and team creativity. In other words, socio-emotional relations among team members and a positive interpersonal environment may enhance team creativity. Relations among team members should be foundational when collaborating in a project to achieve creative goals.

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Table 1

Demographic Information.

Variable	n	%	Variable	n	%
Ethnicity			***Gender***		
White	156	60.0	Male	87	33.5
African American	19	7.3	Female	173	66.5
Hispanic	61	23.5	***Course type***		
Asian	18	6.9	Online	86	33.1
Native American	1	0.4	Offline	174	66.9
Other	5	1.9	***Members***		
Education level			Three	21	8.1
Freshman	9	3.5	Four	124	47.7
Sophomore	34	13.1	Five	21	8.1
Junior	76	29.2	Six	32	12.3
Senior	63	24.2	Seven	11	4.2
M.S. student	74	28.5	Eight	51	19.6
Ph.D. student	4	1.5	***Total***	260	100.0

Table 2

Means, Standard Deviations, Skewness, Kurtosis, and Correlations of Study Variables

	1	2	3	4	5	6	7	8	9	10
Control Variables										
1. Age	1									
2. Gender	.205**	1								
3. Team size	-.305**	-.275**	1							
4. Course type	.622**	.048	-.430**	1						
5. Richness	-.462**	-.044	.586**	-.677**	1					
6. Education level	.660**	.016	-.485**	.842**	-.630**	1				
Independent & Dependent Variables										
7. Psychological Safety	-.284**	-.084	.062	-.270**	.221**	-.210**	1			
8. TOSL	-.115	-.093	.097	-.090	.108	-.032	.506**	1		
9. ROSL	-.216**	-.096	.143*	-.225**	.193**	-.170**	.549**	.773**	1	
10. Creativity	-.163**	-.122*	.084	-.107	.105	-.123*	.376**	.429**	.478**	1
M	24.57		3.16				3.98	3.87	3.90	3.62
SD	7.11		1.69				.56	.68	.64	.67
Skewness							-.363	-.615	-.346	-.365
Kurtosis							-.145	1.117	1.131	.836

Note: TOSL: Task-oriented Shared Leadership; ROSL: Relation-oriented Shared Leadership
*** $p < .001$*

Table 3

Fit Indices for Models

	χ^2	df	TLI	CFI	RMSEA (CI)	SRMR
Criteria			>.900	>.900	<.08	<.08
Model 1	323.263***	164	.926	.936	.061 (.051, .071)	.0510
Model 2	467.125***	260	.923	.938	.055 (.047, .063)	.0518

Note: As Model 1 and Model 2 (with and without control variables) are saturated models, each model has the same model fit indices with its measurement model.
***$p < .001$

Table 4

Results of Research Models

			Model 1			Model 2		
			b	*β*	S.E.	B	*β*	S.E.
Age	→	TOSL				.000	-.001	.007
		ROSL				.000	.004	.007
		Creativity				-.003	-.041	.006
Gender	→	TOSL				.024	.018	..085
		ROSL				-.014	-.010	.085
		Creativity				-.065	-.058	.072
Team size	→	TOSL				.067	.178*	.029
		ROSL				.046	.121	.029
		Creativity				-.001	-.004	.025
Course type	→	TOSL				.046	.034	.158
		ROSL				-.040	-.030	.158
		Creativity				.201	.177	.133
Media richness	→	TOSL				.000	.004	.001
		ROSL				.000	-.019	.001
		Creativity				.000	-.005	.001
Education level	→	TOSL				.253	.184	.160
		ROSL				.081	.058	.158
		Creativity				-.197	-.169	.136
Psychological safety	→	TOSL	.834	.664***	.124	.919	.705***	.142
Psychological safety	→	ROSL	.898	.700***	.124	.923	.698***	.137
Psychological safety	→	Creativity	.175	.163	.117	.175	.158	.129
Task leadership	→	Creativity	-.010	-.012	.140	.003	.004	.148
Relation leadership	→	Creativity	.364	.435*	.150	.353	.422*	.152

*$p < .05$, *** $p < .001$

Table 5

Results of Research Models

			TSMM			RSMM		
			b	*β*	S.E.	B	*β*	S.E.
Age	→	Shared leadership	.000	-.003	.007	.000	.002	.007
		Creativity	-.003	-.038	.006	-.003	-.041	.006
Gender	→	Shared leadership	.022	.016	.087	-.012	-.009	.085
		Creativity	-.077	-.068	.073	-.065	-.058	.071
Team size	→	Shared leadership	.069	.182*	.030	.045	.119	.029
		Creativity	-.003	-.010	.026	-.001	-.004	.024
Course type	→	Shared leadership	.051	.038	.161	-.040	-.029	.158
		Creativity	.172	.151	.136	.201	.177	.132
Media richness	→	Shared leadership	.000	.006	.001	.000	-.021	.001
		Creativity	.000	-.016	.001	.000	-.004	.001
Education level	→	Shared leadership	.258	.185	.163	.079	.056	.158
		Creativity	-.238	-.203	.138	-.195	-.167	.133
Psychological safety	→	Shared leadership	.955	.702***	.149	.924	.700***	.137
Psychological safety	→	Creativity	.257	.226	.133	.175	.159	.126
Shared leadership	→	Creativity	.271	.325**	.086	.354	.425***	.089

Note: TSMM: Task-oriented Shared Leadership-Mediating Model; RSMM: Relation-oriented Shared Leadership-Mediating Model
**p < .05, **p < .01, *** p < .001*

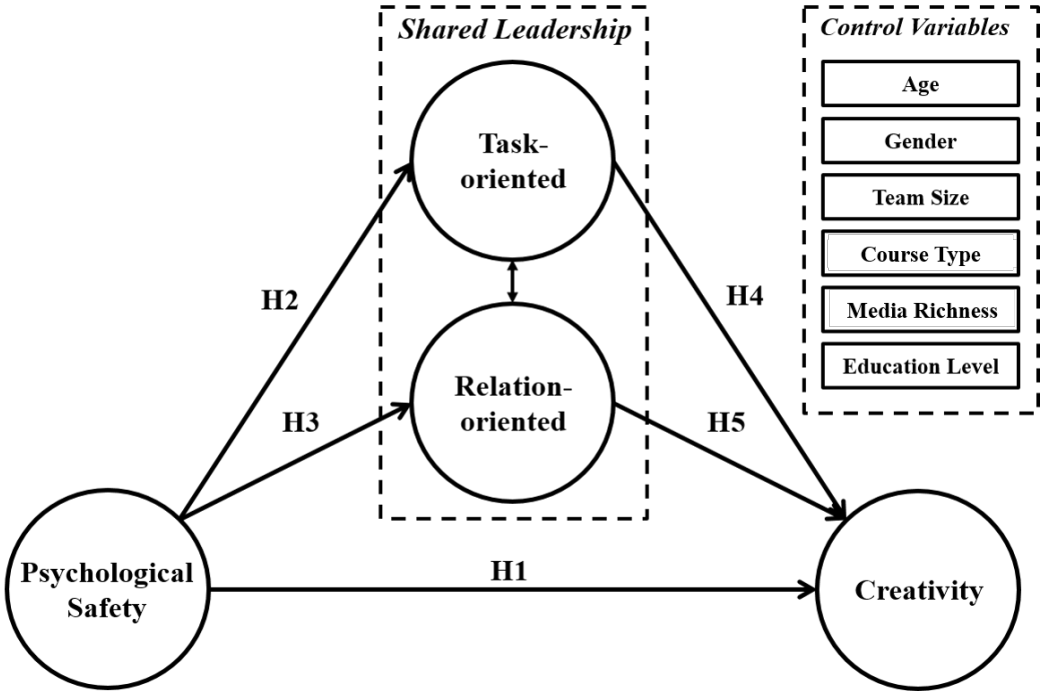

Figure 1. Hypothesized research model

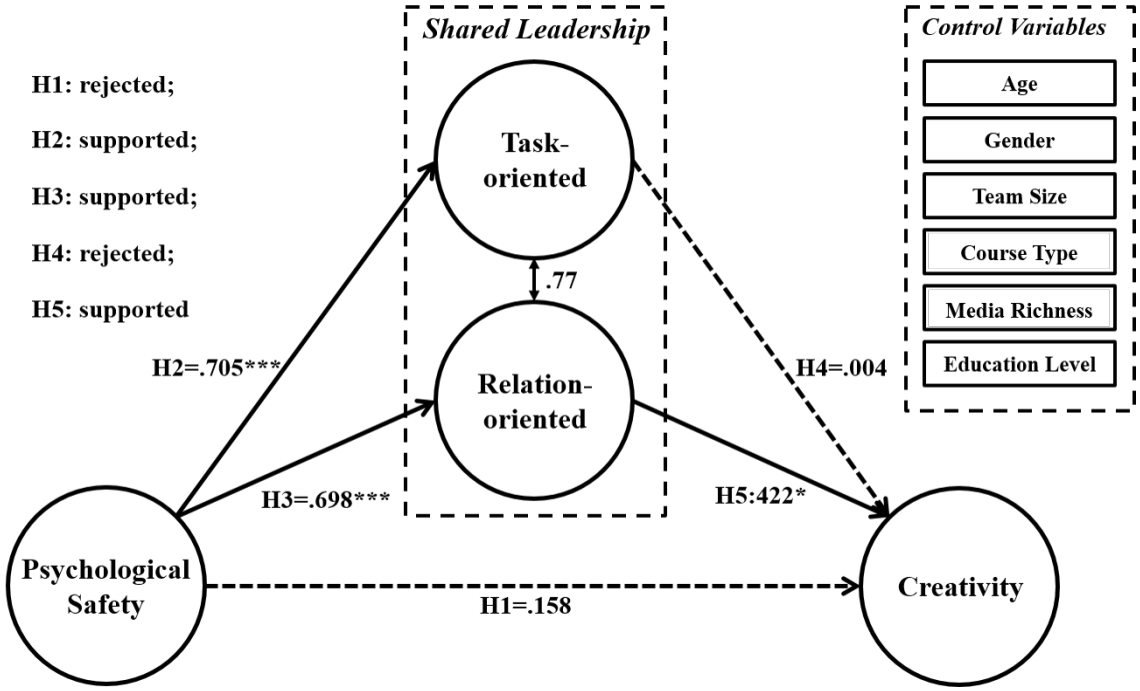

Figure 2. The structural model with testing results with standardized coefficients