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In healthcare teams on hospital management, psychological safety, information exchange, and innovative performance

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Abstract

Background: In healthcare, creativity within multidisciplinary teams is critical for addressing complex challenges, especially in providing care for rare diseases. Psychological safety, characterized by a team climate that encourages interpersonal risk-taking, is believed to enhance team creativity. Knowledge sharing, particularly the exchange of explicit information ("know-what") and tacit expertise ("know-how"), plays a pivotal role in fostering innovation. This study examines the mechanisms linking psychological safety, knowledge sharing, and team creativity within healthcare teams on hospital management.

Methods: The study surveyed multidisciplinary healthcare teams on hospital management providing care to patients with rare diseases. Teams consisted of general practitioners, nurses, therapists, and specialized physicians. Data were collected using a multi-informant approach: healthcare professionals assessed psychological safety and knowledge sharing, while patients evaluated team creative performance. Knowledge sharing was analyzed through two dimensionsinformation and know-howproposed as mediators between psychological safety and creativity. Hypotheses were tested using structural equation modeling.

Results: Psychological safety significantly predicted team creative performance, both directly and indirectly through knowledge sharing. Explicit informationsharing mediated the relationship between psychological safety and creativity, enabling teams to pool codified knowledge. Additionally, tacit know-how sharing emerged as a stronger mediator, emphasizing the importance of practical expertise in innovative problem-solving. These findings demonstrate that psychological safety fosters an environment conducive to open communication and collaboration, which enhances creative outcomes.

Conclusion: Psychological safety is a critical enabler of creative performance in healthcare teams on hospital management , primarily by promoting knowledge sharing. Explicit and tacit knowledge sharing each play distinct roles in facilitating innovation. Healthcare organizations should prioritize creating psychologically safe environments to enhance team collaboration and creativity, particularly when addressing the unique challenges associated with rare diseases.

Introduction

In today's dynamic and multifaceted professional environments, the role of teams in fostering creative outcomes has gained significant attention (Griffin, 1997; Dym & Little, 2000; Leenders, van Engelen & Kratzer, 2007). Creativity has been a subject of extensive investigation across disciplines such as psychology and sociology, leading to a deeper understanding of its various dimensions. In recent years, research within organizations has identified multiple factors influencing creativity, with notable emphasis on how individual creativity is shaped by organizational settings and personal attitudes, skills, and behaviors (Feist, 1999; Tierney & Farmer, 2002; Dorenbosch, van Engen & Verhagen, 2005). However, as complex challenges increasingly require collaborative solutions, creativity is increasingly recognized as a collective process within teams (Hargadon &Bechky, 2006). The growing body of research in this area emphasizes team dynamics and highlights factors such as group interaction and motivation as critical to fostering team-based creativity (Kratzer, Leenders & van Engelen, 2006;

Hennessey & Amabile, 2010; Bissola&Imperatori, 2011). A central question remains: how can teams effectively leverage group processes to generate innovative ideas by drawing on their diverse pool of knowledge?

This study builds on prior research and examines the dynamics of team creativity in the context of healthcare services. Creativity is a vital asset in any role, even when it is not an explicit requirement (Madjar, Oldham & Pratt, 2002). Healthcare teams on hospital management , composed of professionals from various disciplines, must collaborate to deliver cohesive and tailored care (West & Wallace, 1991; Nembhard & Edmondson, 2006). The healthcare sector faces challenges such as rapid advancements in medical knowledge, increasing specialization, and the demand for more personalized care, all of which necessitate creative problem-solving. Proposing new ideas or adapting existing procedures often entails uncertainty and the risk of interpersonal conflict. In this setting, psychological safety mitigates concerns about potential embarrassment or negative reactions to innovative contributions (Edmondson, 1999). This research explores the role of psychological safety in promoting team creativity, a connection that has been alluded to in the literature through its association with mutual learning (Edmondson, 1999) but has not been systematically studied. This study investigates the mechanisms through which psychological safety impacts team creativity.

Communication within teams is frequently cited as a critical factor influencing creative performance (Leenders, van Engelen & Kratzer, 2003), as it facilitates the exchange of knowledge. Drawing on organizational learning theories, we propose that knowledge sharing forms the basis for mutual learning (Cohen & Levinthal, 1990; Kogut & Zander, 1992; Tsai & Ghoshal, 1998). Healthcare teams on hospital management , comprising diverse professionals, must exchange information and expertise to enhance existing knowledge and develop innovative solutions. However, knowledge sharing is often hindered by challenges such as distrust and uncooperative environments (Szulanski, 1996; Argote et al., 2000; Tsai & Ghoshal, 1998; Andrews & Delahaye, 2000; Bakker et al., 2006). We propose that a climate of psychological safety can overcome these barriers, facilitating knowledge exchange and enhancing creative performance.

The interplay between psychological safety and team creativity remains underexplored, particularly concerning the mechanisms linking the two. This study contributes to existing knowledge by examining these mechanisms, focusing on two types of knowledge: informational and procedural ("know-how"). Additionally, much of the existing research on creativity has centered on industries where innovation is a competitive necessity, such as research and development. This study shifts focus to healthcare teams on hospital management , where the primary motivation is a sense of social responsibility rather than profit. By exploring the intersection of socially responsible behavior and creativity, this research addresses a significant gap in the literature (Fisscher, Nijhof& Steensma, 2003).

Creativity is widely recognized as the process of generating new and potentially useful ideas, solutions, or methods (Amabile, 1988; Shalley, 1995; Oldham & Cummings, 1996). In response to the growing complexity of tasks and the rapid expansion of knowledge, many workplaces have transitioned to team-based structures to harness collective creativity (Mohrman, Cohen & Mohrman Jr., 1995). Building on Amabile's (1988) definition, team creativity can be described as the collective effort of team members to generate innovative and practical ideas that did not previously exist. Pirola-Merlo and Mann (2004) suggest that team creativity can be viewed as an aggregate of individual creativity, which evolves into a team-level construct through group dynamics.

Psychological safety has emerged as a critical factor in team processes, contributing to enhanced performance outcomes. It refers to the shared belief among team members that interpersonal risks, such as speaking up or expressing differing opinions, will not lead to embarrassment, rejection, or a diminished self-image (Edmondson, 1999). This belief is rooted in mutual trust and support within the group, fostering an environment where members feel secure. Although psychological safety is linked to trust, it goes beyond individual relationships to describe a collective climate where trust and mutual protection prevail, even in the face of external challenges. This perception stems from team members' cognitive appraisal of their shared work environment (James, Joyce & Slocum, 1988). When psychological safety is low, team members may hesitate to take risks, such as proposing innovative ideas or asking questions, due to fear of negative consequences.

Research suggests that psychological safety positively influences creativity-related outcomes. Edmondson (1999) found that psychological safety encourages teams to engage in behaviors that support learning, such as openly addressing mistakes and seeking new solutions. Teams operating in a non-threatening environment are more likely to innovate because members feel less anxious about potential judgment (West, 1990; West & Anderson, 1996; Edmondson, 1999). A safe climate helps individuals overcome their anxiety, enabling them to contribute new ideas (Schein, 1985). Evidence also shows that psychological safety at the organizational level promotes process innovation and firm performance (Baer & Frese, 2003), particularly in collaborative settings where safety fosters innovation adoption and implementation. Similarly, Kark and Carmeli (2009) demonstrated a link between psychological safety and individual creativity in a study involving professionals from various industries.

Based on these findings, this study hypothesizes that team psychological safety is a key driver of team creativity.Beyond identifying the direct effect of psychological safety, this study examines the mechanisms through which it influences team creativity. Two primary perspectives provide insight into this relationship.

First, the social network perspective highlights the role of communication in facilitating knowledge exchange (Uzzi, 1996; Hansen, 1999; Tsai, 2001). Creativity relies on generating new knowledge, which emerges from the exchange of existing knowledge bases through interaction (Csikszentmihalyi & Sawyer, 1995; Nahapiet& Ghoshal, 1998). While weak social ties may bring novel perspectives to the team (Granovetter, 1973), individuals often feel more comfortable sharing knowledge in close-knit groups characterized by strong social ties (Perry-Smith & Shalley, 2003; Levin & Cross, 2004). Psychological safety can strengthen social bonds within teams, even when geographical dispersion weakens them (Gibson & Gibbs, 2006), potentially enhancing creative performance.

The second perspective, team adaptation theory (Burke et al., 2006), emphasizes that psychological safety promotes behaviors critical to creativity. It encourages members to voice ideas, engage in reflective discussions, and collaboratively explore alternative viewpoints (Edmondson, 1999). These interactive processes, often categorized under the umbrella of knowledge sharing, form the foundation for creative performance.

Knowledge, defined as "a fluid mix of framed experience, values, contextual information, and expert insights" (Davenport & Prusak, 1998, p. 5), serves as the basis for knowledge sharing. Knowledge sharing involves interactive communication among team members, enabling them to pool their resources to achieve shared goals. This process facilitates mutual learning, enhances the collective knowledge base, and supports the development of novel ideas (Kogut & Zander, 1992; Nonaka, 1994; Tsai & Ghoshal, 1998). Numerous studies have demonstrated a positive association between organizational knowledge transfer and innovation (Powell, Koput& Smith-Doerr, 1996; Tsai, 2001; MacCurtain et al., 2010).

Two forms of knowledge—explicit and tacit—play distinct roles in creativity. Explicit knowledge, which is easily codified, contrasts with tacit knowledge, which is embedded in actions, processes, and skills and is more challenging to articulate (Polanyi, 1966; Nonaka & von Krogh, 2009). Both types of knowledge are essential for innovation, as creativity often involves the interplay between explicit and tacit knowledge. For this study, knowledge is further categorized into information (know-what) and know-how (practical expertise) (Kogut & Zander, 1992; Von Hippel, 1988). While information represents codified knowledge, know-how encompasses skills and practices that are less easily documented. Within teams, the exchange of both information and know-how is crucial for developing innovative solutions and enhancing creative outcomes (Argote, 1999).

Methods

This research focused on healthcare services, specifically examining teams providing treatment and care to individuals with rare diseasesand hospital management. The context of rare diseases was chosen due to its inherent need for innovative problem-solving, as the limited prevalence of such conditions often results in insufficient knowledge and a lack of established solutions. Data were collected from both patients and their healthcare providers. Patients qualified for inclusion if their care involved a team of at least three members. Recruitment was facilitated by self-help organizations, which provided lists of patients who had consented to participate. These patients identified the members of their healthcare teams on hospital management and shared their names and contact details with the researchers. Both patients and healthcare providers received standardized questionnaires and a data privacy agreement via mail. Participation in the study was entirely voluntary.

The average size of the healthcare teams on hospital management was 5.0 members (SD = 1.9), with 49.3% of the team members being women. Each team was multidisciplinary, typically comprising general practitioners, nurses, therapists, and specialized physicians working in hospital or outpatient settings.

To mitigate common-method bias, a multi-informant approach was employed following Podsakoff et al. (2003). Healthcare professionals provided data on internal team dynamics such as psychological safety and knowledge sharing, while patients assessed the team's performance in terms of creativity. Since the teams were patient-centered and self-managed, patients were considered the most suitable external evaluators of overall team performance. However, using patient assessments introduces a potential response bias, as prior studies (e.g., Mazor et al., 2002) have shown that patients may find it challenging to evaluate the medical quality or their satisfaction with the care provided. Despite this limitation, the response rate among patients in this study was relatively high (72.3%), reducing the potential for selection bias.

The study aggregated responses at the team level, assuming that the ratings reflected a shared team experience. To ensure inter-rater agreement before aggregation, standard deviations across respondents were assessed, with an acceptable threshold set at SD = 1.5, based on Schmidt and Hunter (1989). Teams exceeding this threshold were excluded from the analysis. The average standard deviations were 0.48 for information sharing, 0.43 for know-how sharing, and 0.76 for psychological safety. Among healthcare professionals, the response rate was 34.0%. After excluding incomplete responses and removing teams with low agreement, the final sample included 73 teams consisting of 149 healthcare professionals, each team linked to one patient.

Measures

All measures in this study utilized a seven-point Likert scale, ranging from 1 ("strongly disagree") to 7 ("strongly agree").

Measuring team-level creative performance is challenging due to a lack of universally accepted methodologies. This study focused on creativity as a performance metric, assessed externally to avoid biases associated with self-reported measures (Locke, Latham & Erez, 1988). Patients evaluated team creativity using a three-item scale developed by Zhou and George (2001), which included items such as, "My healthcare professionals generate new and practical ideas to enhance their performance." A weighted mean, based on the number of team members, served as a proxy for the team's overall creative performance (Pirola-Merlo & Mann, 2004). The scale demonstrated strong reliability ($\alpha = 0.93$), with items loading on a single factor (eigenvalue = 2.96, loadings ranging from 0.92 to 0.97).

Psychological safety within the teams was assessed using an adapted version of Edmondson's (1999) four-item scale. A sample item was, "No one on this team would intentionally act in a way that undermines my work." As psychological safety is conceptualized as a shared belief, individual responses were aggregated to the team level (Kenny &LaVoie, 1985). The reliability of the scale was $\alpha = 0.81$, with factor loadings ranging from 0.78 to 0.90 (eigenvalue = 2.23).

Knowledge sharing among team members was measured using a scale adapted from Bakker et al. (2006). Healthcare professionals reported how frequently they exchanged information (e.g., about diagnoses, symptoms, or therapies) and procedural knowledge (e.g., healthcare processes). Responses ranged from "never" (0) to "weekly" (3), and a matrix was used to capture the intensity of knowledge-sharing interactions within each team. Aggregated mean scores described the overall knowledge-sharing levels.

Control Variables

To account for unobserved variability, several control variables were included. Given that team size and tenure can influence internal communication (Ancona & Caldwell, 1992), these variables were controlled for. Team tenure was measured as the average duration each healthcare professional had worked within their team. Functional diversity was assessed using Blau's Index (1977), as prior research has linked diversity to various performance outcomes (van Knippenberg & Schippers, 2007). Additionally, the study controlled for team dispersion, acknowledging that geographically dispersed teams might experience weaker interpersonal connections (Gibson & Gibbs, 2006).

Results

To evaluate our hypotheses, we employed latent class regression for data analysis. This approach was selected due to its advantages compared to conventional regression methods (Vermunt& Magidson, 2002; Bouwmeester, Sijtsma&Vermunt, 2004). Latent class regression is advantageous because it imposes fewer restrictions on the distribution of random effects compared to generalized linear models (Vermunt& van Dijk, 2001). The method interprets the distribution as non-parametric, based on the number of latent classes required for the optimal model fit (Laird, 1978; Rabe-Hesketh, Pickles &Skrondal, 2001). Traditional statistical models often assume homogeneity, whereas latent class regression estimates parameters by accounting for population heterogeneity, assuming a finite number of latent groups (Erichsen & Brockhoff, 2004).

The teams in our study dealt with patients suffering from various diseases, differing in prevalence and affected organs. This variability in team tasks, influenced by differing disease patterns, suggests significant heterogeneity in the sample. Due to the lack of homogeneity and the skewed distribution of predictor variables, latent class regression was deemed appropriate. The estimation of the latent class model was performed using maximum likelihood. Model selection was based on the Akaike Information Criterion (AIC), derived from the log-likelihood values, with models having lower AIC values considered superior.

To examine the mediation model, we applied Baron and Kenny's (1986) four-step criteria: (1) the predictor variable must show a significant relationship with the outcome, (2) the predictor variable must significantly influence the mediator, (3) the mediator must significantly impact the outcome, and (4) when the mediator is included in the full model, the predictor's direct effect on the outcome should no longer be significant.

Descriptive Statistics and Multicollinearity Testing

To assess multicollinearity, we calculated variance inflation factors (VIFs). The VIF values for information and psychological safety were 1.10 and 1.12, respectively, while those for know-how and psychological safety were 1.20 and 1.17. These values are below the stringent threshold of 2.50, indicating no multicollinearity issues (Neter et al., 1996). Additionally, regression assumptions were validated through residual plot examinations.

Analysis of Mediation Effects

This research explored the role of psychological safety as a mediator between knowledge sharing and creative performance. Initially, we used a baseline model without predictors to control for the effects of team size, diversity, dispersion, and tenure on creative performance. Next, psychological safety (predictor) and knowledge sharing (mediator) were included in separate models. The mediation effect was assessed by incorporating all variables into a comprehensive model, with separate evaluations conducted for two types of knowledge. Table 2 summarizes the regression results.

Model 2 highlights a positive association between psychological safety and creative performance (Wald = 4.75, $p < 0.05$), fulfilling the first criterion of Baron and Kenny (1986). The second criterion, concerning the

predictor's influence on the mediator, was also met, as psychological safety showed a positive relationship with knowledge sharing (know-how sharing: Wald = 5.32, $p < 0.05$; information sharing: Wald = 2.64, $p < 0.10$).
The third condition was evaluated by including knowledge sharing in Models 3a and 3b, which predicted creative performance. The results showed significant contributions of the mediators to creative performance (know-how sharing: Wald = 6.66, $p < 0.01$; information sharing: Wald = 5.25, $p < 0.05$). Finally, Models 4a and 4b tested the last condition. When controlling for know-how sharing, the effect of psychological safety became non-significant (Wald = 2.09, n.s.), indicating full mediation. Conversely, controlling for information sharing resulted in a reduced but still significant effect of psychological safety (Wald = 2.09, $p < 0.10$), suggesting partial mediation.
In both cases, the full models had the lowest AIC values, indicating a better fit. Furthermore, team diversity significantly influenced know-how sharing (Wald = 3.63, $p < 0.05$), highlighting its role as a control variable.

Discussion

Research has consistently shown that team creativity plays a vital role in enhancing team performance (Bain, Mann &Pirola-Merlo, 2001). In environments that demand adaptability, creativity becomes an integral aspect of overall team success. Our findings confirm that a sense of psychological safety within teams significantly enhances their creative output. This aligns with existing literature on the connection between psychological safety and outcomes related to creativity. However, this study uniquely establishes the relationship between psychological safety and creativity as a collective team process rather than emphasizing general innovation.
Furthermore, the study explored two key aspects: (1) the influence of knowledge-sharing activities on team creativity and (2) the extent to which knowledge sharing mediates the link between psychological safety and creative performance. As previous research has suggested, we identified a strong relationship between knowledge sharing and creativity. However, our study provides fresh insights by highlighting distinct types of knowledge involved in the sharing process. Specifically, it was found that sharing procedural knowledge, or "know-how," contributed more significantly to team creativity compared to the exchange of informational content. Notably, this study is the first to empirically demonstrate that knowledge sharing serves as a mediating factor in the relationship between psychological safety and creativity. Procedural knowledge fully mediated this relationship, whereas informational knowledge acted as a partial mediator. These findings are consistent with theories suggesting that procedural knowledge, though challenging to codify, is deeply embedded in the creative process (Nonaka & von Krogh, 2009). By contrast, informational knowledge can often be sourced externally without requiring interactive team processes. This distinction implies that a psychologically safe environment is less critical for sharing externally acquired information than for collaborative ideation and problem-solving.
The research did not equate creative performance with roles traditionally associated with creativity but instead examined routine teamwork in healthcare contexts. Creativity, particularly in handling unique challenges like rare conditions, is vital in developing tailored care plans. In preliminary interviews, many individuals shared difficulties in finding healthcare teams on hospital management willing to deviate from standard practices to craft personalized solutions. This lack of flexibility highlights the importance of socially responsible behavior among team members. Social responsibility here refers to the expectation that individuals will act in the team's best interest, voicing concerns, sharing expertise, and seeking better approaches. In psychologically safe environments, this behavior may naturally emerge through robust knowledge exchange. Given that informational knowledge only partially mediates the connection between psychological safety and creativity, further research is needed to examine how individual team members' proactive social responsibility influences outcomes. This inquiry could expand upon existing studies linking psychological safety to behaviors like error reporting, especially in healthcare settings.
Interestingly, the results revealed a negative correlation between team tenure and creative performance, supporting the idea that weak ties, introduced by new members, can enhance creativity through fresh perspectives (Granovetter, 1973). While this study controlled for team tenure's impact, future research could delve into the moderating effects of psychological safety on team creativity in the context of team longevity and member turnover. Another notable finding was the positive relationship between team diversity and knowledge sharing, which corroborates prior studies emphasizing the benefits of diverse knowledge bases in teams (e.g., Williams & O'Reilly, 1998; van Knippenberg & Schippers, 2007). While this study focused on healthcare teams on hospital management , the results are broadly applicable to other fields and suggest that theoretical frameworks developed in industrial sectors can be effectively extended to service industries.
Despite these contributions, the study has several limitations. First, while we posit that psychological safety fosters knowledge sharing, which in turn enhances team creativity, the study's non-experimental, cross-sectional design cannot definitively establish causality. It remains plausible that knowledge sharing itself influences psychological safety, as it often reflects the quality of team relationships (Carmeli &Gittell, 2009). Future longitudinal or experimental studies are needed to explore these bidirectional dynamics.
Second, the multi-informant design may have introduced response bias, as external observers (such as patients) can only evaluate team creativity based on observable actions. These observers lack insight into behind-the-

scenes creative efforts, which may limit their assessments. However, in contexts involving complex challenges requiring extensive professional collaboration, such as rare medical conditions, patients' ability to compare multiple experiences may mitigate this limitation (Hannemann-Weber, Kessel & Schultz, 2011).

Third, the analysis focused on aggregate data, which overlooks individual factors influencing the creative process. For instance, prior research suggests that hierarchical differences can affect perceptions of psychological safety (Nembhard & Edmondson, 2006). Future studies should incorporate multi-level analyses to evaluate the interplay of team processes and individual factors.

Despite these limitations, the findings have significant practical implications for fostering creativity in uncertain environments. In high-stakes settings like healthcare, encouraging psychological safety can reduce barriers to engaging in creative behaviors, such as sharing unrefined ideas and experimenting with new approaches. Leaders should prioritize cultivating such climates within teams to support creative endeavors. Self-managed teams, meanwhile, may benefit from clear guidelines or codes of conduct that encourage open collaboration. Additionally, strategies that promote knowledge sharing are crucial for generating innovative solutions. Examples from knowledge management practices, such as evidence-based decision-making and collaborative care networks (Gallupe, 2002), demonstrate their effectiveness. However, the study highlights the need for approaches that leverage the intellectual capital inherent in teams, particularly those with hierarchical structures. Ultimately, fostering socially responsible behavior among all members is essential for enhancing knowledge exchange and generating creative outcomes.

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