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Why Do Chinese Megaproject Employees Voice Their Opinions? An Analysis from the Perspective of Mindfulness

Jie Fan
Beijing Foreign Studies University
Luyao Jiao
Beijing Foreign Studies University
Zhen Chen
lunwen0002024@126.com

Beijing University of Civil Engineering and Architecture
Yimeng Han
Beijing Foreign Studies University

Article

Keywords: Mindfulness, Voice Behavior, Promotion Focus, Role Engagement, Megaproject, China

Posted Date: March 8th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-8078027/v1

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Additional Declarations: No competing interests reported.

Abstract

Mindfulness represents a critical construct in organizational behavior research, as it fosters a range of favorable workplace outcomes and strengthens interpersonal communication and cross-team collaboration among employees. This study investigates the impact of mindfulness on employee voice behavior within Chinese megaproject teams, with role engagement as a mediating variable and promotion focus as a moderating variable. Employing a conditional indirect effects model rooted in the Theory of Planned Behavior, the study combines a literature review, expert interviews, questionnaire surveys among employees of State Grid Jibei Electric Power Co., Ltd., CCCC Guangzhou Dredging Co., Ltd., and China State Construction Engineering Corporation Ltd. (CSCEC), regression analysis, and validation through interviews and case studies. Key findings include: (1) Mindfulness exerts a significant positive influence on employee voice behavior in megaproject teams; (2) Role engagement exerts a significant mediating effect on the relationship between mindfulness and voice behavior ; (3) Promotion focus moderates the mediating role of role engagement in this relationship. This study sheds light on the formation mechanism of employee voice behavior in construction projects from a mindfulness perspective and underscores the role of promotion focus in explaining mindfulness's influence on voice behavior. These insights aid megaproject managers in understanding the positive impact of mindfulness and promoting employee voice behavior, with implications for other behavioral performances in megaproject settings.

Introduction

In the cultural context of China, there exists a prevalent social phenomenon known as "one-man rule," wherein decisions and opinions tend to be centralized in the hands of authorities or senior leaders, while the voices of ordinary people are often overlooked or suppressed (Zhou, 2011). This phenomenon partly stems from the respect for authority and elders, the culture of saving face, and the emphasis of the educational system on rule compliance, leading to a relative scarcity of constructive criticism (Huang and Harris, 1974; Fei and Fei, 1980; Hwang, 1987). Yet, some individuals who adhere to righteousness, driven by strong mindfulness, believing that speaking the truth and providing beneficial advice are the right behaviors, even if they may face risks or challenges. These individuals stand by their beliefs, prioritizing the long-term interests of the organization over personal feelings (Kong, 2016). They believe that offering constructive criticism can achieve higher goals, even without easily compromising in the face of opposition or criticism (Nikolaou et al., 2008).

Mindfulness plays a significant role in organizational behavior (Daniel et al., 2023), positively associated with beneficial organizational outcomes such as more effective resource allocation and higher quality, safety, and reliability (Sutcliffe et al., 2016). It can motivate individuals to uphold moral and ethical principles, consider integrity as a core value (Pandey et al., 2018), and serve the long-term interests of the organization. Research indicates that mindfulness contributes to maintaining the reliability of individual actions and reducing the risk of failures (Barrett et al., 2006). Individuals with mindfulness can sensitively identify internal team issues, avoiding the escalation of unforeseen events into crises (Daniel et al., 2023).

Although mindfulness can inspire individuals to engage in proactive behaviors and facilitate organizational development, megaprojects come with significant challenges.

In the 1950s, the research initiative on investment in megaprojects in the United States marked the inception of a burgeoning field in the realm of construction engineering and management (Altshuler and Luberoff, 2004). Since the 1970s, municipal and infrastructure megaprojects have continued to burgeon in major developed countries, leading to an escalating scholarly interest in megaprojects (Merrovv, 1988). Subsequently, research by Flyvbjerg et al. (2003)

revealed that, akin to developed nations, developing countries also confront issues such as safety incidents, cost overruns, and quality deficiencies in their megaprojects. Managing megaprojects is a challenge faced by countries around the world, whether they are developed or developing.

Megaprojects differ significantly from ordinary engineering endeavors in terms of scale, complexity, and impact. Firstly, megaprojects are renowned for their immense scale and complexity (Hu et al., 2015). Compared to regular projects, they may involve larger investments, longer time spans, more stakeholders, and greater technical challenges (Brockmann and Girmscheid, 2007). According to the Federal Highway Administration (FHA) in the United States, megaprojects typically have budgets exceeding $1 billion or involve major infrastructure projects with significant costs (Capka, 2006). This scale and complexity result in significantly different roles for managers in megaprojects compared to ordinary engineering endeavors. Secondly, megaprojects often involve a broader and more diverse set of stakeholders compared to regular projects (De Bruijn and Leijten, 2008). These stakeholders may include government departments, international organizations, multinational corporations, and community organizations, among others. This implies that project success depends not only on technical achievements but also on coordination and collaboration among stakeholders, as well as balancing the interests of various parties. Lastly, megaprojects typically come with higher levels of risk and uncertainty (Hu et al., 2015). Due to their complexity and long-term nature, these projects may be influenced by political, economic, environmental, and other factors, leading to more challenges and variables (De Bruijn and Leijten, 2008). Compared to ordinary engineering endeavors, these projects require more flexible management and decision-making processes, as well as greater adaptability.

Feng and Trinh (2019) point out that despite extensive efforts to address the complexity of megaprojects in terms of tasks, technology, and organizational structure, the stringent requirements and inherent uncertainties of the construction project industry still impose significant stress on employees. Therefore, employee efficiency directly impacts the time, cost, and quality of megaprojects (Kazaz and Ulubeyli, 2007). Despite the effectiveness of project risk management procedures in identifying and managing safety risks, the accident rate in megaprojects remains considerably higher than the industry average. This is because traditional safety management methods often become outdated over time, exposing organizations to potential catastrophic failure modes and unforeseen safety risks (Leung et al., 2016). Megaproject teams, as temporary organizations, differ from permanent organizations in their high dynamic complexity and broad scope, necessitating continual resource reallocation (Wang et al., 2021). These characteristics require project team members to adapt their behavior based on collective consensus to ensure the smooth progress of the project.

Employee voice behavior has long been recognized as a key driver of high-quality decisions and organizational efficiency (Burris, 2012; Xue et al., 2020). Particularly in the complex context of megaprojects, voice behavior is not only about expressing opinions but also a manifestation of active participation and risk-taking (Zaman et al., 2021). However, employees are keenly aware that attempting to change the status quo can sometimes be futile, and speaking up may involve higher personal risks (Burris, 2012). Most employees both desire recognition of their suggestions by management and seek to avoid personal risks. Only mindful employees who prioritize collective interests over personal ones and actively engage in organizational roles are willing to offer advice to help megaproject teams effectively mitigate risks. This aligns with the findings of Arendt et al. (2019), indicating that mindfulness promotes higher levels of communication. Self-aware employees are more likely to identify issues or opportunities within the organization and express their views through voice behavior.

Therefore, this study aims to explore the impact of mindfulness on employee voice behavior in Chinese megaproject teams from a workplace perspective, as well as its underlying mechanisms through role engagement and promotive regulatory focus. A conditional indirect effects model was constructed based on the theory of planned behavior, role

engagement theory, and regulatory focus theory. The model thoroughly considers the influence of mindfulness on advisory behavior in the context of megaprojects, explaining this relationship through role engagement as a mediating variable and promotive regulatory focus. In megaprojects, mindfulness enhances individuals' self-regulatory abilities, fosters role engagement, thereby influences their advisory behavior, thus providing theoretical and practical support for project success. This study surveyed employees from megaproject enterprises (primarily including State Grid Jibei Electric Power Co., Ltd., CSCEC, and CCCC Guangzhou Dredging Co., Ltd.) and employed regression analysis to examine and specify the direct impact, mediating effects, and moderating effects of four factors on mindfulness in megaproject teams on employee voice behavior. The survey results were then combined with interviews, case studies, and on-site observations to propose relevant recommendations.

The study explains the mechanism of employee voice formation from a mindfulness perspective, suggesting that promotion focus helps explain the degree to which mindfulness affects voice behavior, which is the novelty of this paper. Theoretically, this research responds to the need for studies on the influence of mindfulness on various workgroups from a workplace perspective. The findings contribute to a better understanding and utilization of mindfulness's positive effects in the workplace, while providing new insights for promoting employee voice behavior. Practically, this study provides a reference for unpacking the mechanisms underlying other employee behaviors in the megaproject sector, helping megaproject units better identify management barriers within their teams and formulate targeted, effective response strategies. 1. Theoretical Foundation and Research Hypotheses

1.1 Theoretical Foundation

1.1.1 The Theory of Role Engagement

The Role Engagement Theory is utilized to explain individuals' level of involvement in societal and organizational roles (Dashuai and Bin, 2020). Kahn (1990) posits that vigour, dedication, and absorption are the three core characteristics of role engagement, where employees deeply invested in their job roles commit their physical, cognitive, emotional, and energy resources to their work. This high level of role engagement leads individuals to focus more on team development, encouraging them to actively suggest ideas, share insights, and advance team progress.

Drawing on Role Engagement Theory, this study suggests that individuals highly engaged in their roles within megaproject teams are more inclined to engage in voice behavior within the team. This inclination stems from their strong sense of responsibility towards achieving team objectives, which leads to increased involvement and attention to the project, motivating employees to share valuable suggestions to foster overall team development. Furthermore, Role Engagement Theory has been shown to not only influence the quality of employees' core task performance but also significantly impact their behavior outside the organization (Llorens et al., 2007). In megaproject teams, such role engagement may prompt employees to actively participate in activities beyond the team, such as collaboration and voice behavior both within and outside the organization.

In summary, role engagement is closely associated with employees' extra-role behaviors within megaproject teams. This study will delve into the specific manifestations of role engagement within teams, exploring its relationship with voice behavior.

1.1.2 Promotion Focus Regulatory Focus Theory

The Promotion Focus Regulatory Focus Theory suggests that individuals tend to focus on achieving positive outcomes and engage in positive regulation of gains (Higgins, 1998). This theory encompasses both intrinsic

behavioral motivation and creative thinking, providing an important perspective for understanding individual behavior and psychological attitudes.

Building upon the Promotion Focus Regulatory Focus Theory, this study views mindfulness as a psychological state and practice, considering its significant role in enhancing individual psychological well-being and happiness, and explores its positive impact on employee voice behavior. Research indicates that mindfulness contributes to improving employees' interpersonal skills by enhancing their awareness and processing of their own emotions (Brown and Ryan, 2003). This psychological state can stimulate employees' promotion focus, leading them to concentrate more on positive outcomes and personal growth.

Guided by the Regulatory Focus Theory, this paper incorporates the promotion focus as an important psychological mechanism into the model to explain and deepen the impact of mindfulness on employee voice behavior within megaproject teams. Specifically, this paper focuses on how mindfulness influences individual behavioral motivation to play a positive role in voicing. By considering the promotion focus as a moderating variable, it helps comprehensively understand how mindfulness affects employees' voice behavior through regulatory focus mechanisms, providing a deeper perspective and insight for research, and further exploring the impact of mindfulness on team behavior.

1.2 Theoretical Model of Mindfulness Impact on Employee Voice Behavior within Megaproject Teams

This study employs the Theory of Planned Behavior (TPB) to construct a research model for examining the influence of mindfulness on employee voice behavior within megaproject teams. The TPB framework is utilized as the foundational research framework, analyzing influencing factors from three dimensions: attitude, subjective norms, and perceived behavioral control. TPB is a social psychology theory aimed at explaining the decision-making process behind individuals' actions in specific contexts (Ajzen, 1985). Ajzen (1985) proposed the TPB model based on the Theory of Planned Behavior, positing that behavioral intentions are shaped by three core factors: attitudes, subjective norms, and perceived behavioral control.

In this study, mindfulness is conceptualized as a variable representing behavioral attitude. This is because mindfulness is typically associated with intrinsic states, focus, and emotional regulation, which may alter individuals' evaluations of certain behaviors, leading them towards more positive and affirmative attitudes, and consequently influencing their behavior. Additionally, role engagement is considered subjective norm. Individuals highly involved in a particular role may be more inclined to maintain consistency with behaviors associated with that role, thereby affecting their behavioral intentions. Finally, promotive focus is regarded as perceived behavioral control, correlated with preferences for positive outcomes and expectations of success. This orientation may enhance individuals' confidence in performing specific behaviors, as they believe such actions will yield favorable results—thereby strengthening their perceived behavioral control. The TPB model thus provides an effective framework for understanding how mindfulness, by influencing employee behavior, contributes to efficient management. The following sections introduce the research variables and hypotheses.

1.3 Hypotheses Development

First, this study synthesized the influencing factors proposed by the theories of role engagement, promotion focus, and planned behavior models. Relevant articles on mindfulness and voice behaviors were examined using the Web of Science database. Through theoretical analysis and the consolidation of similar factors, four main factors were ultimately identified (Kahn, 1990; Higgins, 1998; Brown and Ryan, 2003; Burris, 2012). Next, semi-structured expert

interviews were conducted with 10 experts, including two directors of substations and transmission departments at the State Grid Corporation, three engineers involved in primary and secondary substation projects, two managers from construction companies, and three university professors specializing in megaprojects. The influencing factors were refined and supplemented based on their input. All experts had more than five years of experience in megaproject work or research.

In the pilot study, a preliminary questionnaire was emailed to the experts to identify any issues with understanding the wording of the questionnaire and whether its implications were suitable for obtaining the necessary data. The questionnaire was also tested for potential ambiguities among different respondents. Ten experts participated in the pilot study and confirmed the validity and practicality of the four main factors by citing specific examples. Based on their feedback, the mindfulness scale was revised to better align with the context of megaprojects. Adjustments were made to the wording, comprehension, simplification, and ambiguity issues of the questionnaire based on expert suggestions. Finally, mindfulness was determined as the independent variable, role engagement as the mediating variable, promotion focus as the moderating variable, and voice behavior as the dependent variable.

Specifically, megaprojects typically involve multiple stakeholders, various resources and technological requirements, necessitating precise planning, coordination, and execution. This theoretical model accommodates the complexity demands of megaprojects.

Mindfulness, as an independent variable, plays a crucial role in performance management and effective communication, facilitating employees' ability to maintain focus, composure, and holistic thinking (Pandey et al., 2018). Employees in megaprojects often encounter high levels of pressure and challenges, including time constraints, resource limitations, and conflicts of interest (Wang et al., 2021). In such circumstances, mindfulness can assist employees in better coping with stress, maintaining goal orientation, and positivity, thereby enhancing project performance (Kao et al., 2021). This becomes particularly crucial when handling complex project tasks and communicating with multiple stakeholders, potentially involving early issue detection, innovative proposals, and solution improvements (Wang et al., 2018). Through mindfulness practices, employees can navigate challenges and pressures more effectively, thus enhancing job performance.

In megaprojects, role engagement serves as a mediating variable due to the collaborative nature of these projects, often spanning across different functions and organizations (Wang et al., 2020). Therefore, individual role engagement involves not only completing one's own tasks but also closely collaborating with other team members to achieve project objectives (Chen et al., 2021). Such cross-functional and cross-organizational collaboration necessitates high levels of role engagement to ensure that all parties understand their roles and actively fulfill their responsibilities. Additionally, in megaprojects, information sharing and communication are paramount (Burris, 2012). Role engagement encompasses not only individuals' role-based responsibilities and task commitments in megaprojects but also involves information sharing and effective communication among team members (Chen et al., 2021). Only when everyone is actively engaged in the project, willing to share information, and collaborate with others can the project proceed smoothly.

Promotive regulatory focus serves as a regulatory variable primarily because the success of Megaprojects often requires participants to possess a high level of adaptability, enabling them to flexibly respond to evolving environments and challenges (De Bruijn and Leijten, 2008). Emphasizing focus and effort towards goals, promotive regulatory focus helps participants concentrate their efforts to tackle challenges and enhance project adaptability (Lin and Johnson, 2015). Furthermore, Megaprojects typically involve substantial resource allocation and complex task assignments (Capka, 2006). Promotive regulatory focus aids participants in better prioritizing tasks and

allocating resources, thereby improving project execution efficiency and outcome quality (Van Dijk and Kluger, 2011). Lastly, Megaprojects often require interdepartmental or interteam collaboration and communication (De Bruijn and Leijten, 2008). The concentrated nature of promotive regulatory focus facilitates effective communication and collaboration among team members, reducing information loss and misunderstandings, and enhancing overall project collaboration efficiency (Lin and Johnson, 2015).

In the context of megaprojects, advisory behavior serves as a crucial dependent variable in adapting to complex and dynamic environments and challenges. Considering the complexity and scale of megaprojects, advisory behavior facilitates information sharing, problem-solving, and decision optimization, thereby aiding in addressing project complexity and scale (Ekrot et al., 2016). From a risk management perspective, megaprojects often entail high risks (Irimia-Diéguez et al., 2014), and advisory behavior can facilitate the identification, assessment, and mitigation of potential risk factors—thereby reducing the risk of project failure. In terms of teamwork, advisory behavior promotes communication and understanding among teams, enhancing the efficiency and effectiveness of teamwork (Yang et al., 2018). Regarding innovation and sustainable development, advisory behavior sparks innovative thinking, encouraging teams to continuously explore new methods and solutions (Guzman and Espejo, 2019). An open communication atmosphere and constructive feedback facilitate team members in collectively discussing and experimenting with new ideas (Jiang et al., 2023), driving the continuous development and progress of megaprojects.

The model has brought new theoretical perspectives, behavioral mechanism explanations, and practical guidance to the field of project management. Firstly, traditional project management research has primarily focused on aspects such as task execution and team collaboration (Belout and Gauvreau, 2004; Kerzner, 2017; Meredith et al., 2017), whereas this study's model emphasizes the influence of individual psychological factors on project performance. This expands the theoretical perspectives in project management research. Secondly, the model can help explain the behavioral mechanisms of individuals in project management environments. By influencing role engagement through mindfulness it further affects voice behavior, thus impacting employee behavior in project management processes. This aids in understanding why some project team members are more inclined to voice their opinions and the impact of such voice behavior on project performance. Lastly, managers can promote role engagement by cultivating mindfulness levels among megaproject employees, thereby increasing the frequency of voice behavior. This offers a new intervention approach for managers and provides guidance for project management practices.

1.3.1 Mindfulness and Employee Advocacy in the Megaproject Team

Mindfulness, as a specific state of consciousness, emphasizes the ability to consciously attend to and experience one's psychological state or perceptions in the present moment (Brown and Ryan, 2003). Its four core features include Intention, Present Moment, Non-judgmental, and Non-reactive, highlighting the practice of attentiveness and acceptance of present experiences in an open and non-evaluative manner (Kabat-Zinn, 2003). Existing research indicates that employees with mindfulness tend to exhibit voluntary and extra-role behaviors (Rohmawati et al., 2023). Mindfulness is closely related to individual self-awareness; individuals with mindfulness can more clearly identify their thoughts, emotions, and behaviors, facilitating the more effective expression of their viewpoints and ideas (Brown and Ryan, 2003). Despite continuous advancements in science and technology, megaprojects, as labour-intensive industries, are characterized by their massive scale and high complexity (Wang et al., 2021). They require employees' collaborative efforts to address challenges such as technical execution, time and cost pressures, and change management (Kazaz and Ulubeyli, 2007), with employees' performance directly impacting project

progress and quality. Hülsheger and Alberts (2021) proposed in a work environment context that mindfulness helps reduce stress, anxiety, and emotional fluctuations, thereby fostering a more proactive stance in individuals. Furthermore, they suggest that mindfulness may enhance relationships and trust among individuals by fostering a non-judgmental, respectful attitude toward others' viewpoints. Given the complexity of megaproject tasks, employees need to collaborate and rely on each other (Kazaz and Ulubeyli, 2007), fostering a mindset that promotes a more open, cooperative, and positively constructive environment. As voluntary extra-role behaviors, suggestions are expected to be positively influenced by mindfulness. Based on these premises, this study hypothesizes:

H1: Positive impact of mindfulness in megaproject teams on employee voice behavior.

1.3.2 The Mediating Role of Role Engagement

Role engagement refers to an individual's psychological cognition and attention towards a specific domain, leading to difficulties in fulfilling obligations and needs in other areas (Kahn, 1990). Role engagement can be influenced by stressors such as anxiety and depression, and the dynamism and complexity of the megaproject environment can impose significant pressure on employees (Leung et al., 2016). Mindfulness has been demonstrated to help alleviate stress (Leung et al., 2016), and can assist employees in recognizing the value of their work roles (Leroy et al., 2013). When individuals perceive their work roles as "worthwhile, useful, and valuable," they subconsciously identify with their work tasks, expand their perceived potential for behavioral involvement, and aid in establishing the cognitive resources and energy needed to sustain engagement (Kahn, 1990; Fletcher et al., 2018). Mindfulness also triggers an affective cognitive process, reducing the impact of negative emotions and enabling individuals to focus more on their work (Fletcher, Bailey, & Gilman, 2018). Research by Amabile and Kramer (2011) suggests that individuals experience greater happiness and motivation to engage in their work when they subconsciously recognize progress in their tasks. However, in high-risk environments like megaprojects involving tasks such as working at heights, operating heavy machinery, and handling chemicals, employees consistently face significant accident risks (Leung et al., 2016). Due to factors such as fear, tension, and other psychological burdens, employees are prone to cognitive impairments that affect their engagement in work tasks. Zhang and Wu (2014) investigated mindfulness among nuclear power plant workers and found that it can prevent cognitive impairments, thus positively influencing employees' ability to engage effectively in their roles. Based on this, this study hypothesizes that employees with mindfulness are more likely to demonstrate higher levels of engagement. Accordingly, this study posits:

H2: Mindfulness within megaproject teams positively influences employee engagement in their roles.

According to the TPB theory, role engagement influences the attitudes of employees in megaprojects, thus affecting their extra-role behaviors in specific environments. Kahn (1990) suggests that role engagement comprises three core dimensions: psychological meaningfulness, availability, and safety. For megaprojects involving significant investments, high costs, and extensive resource allocation, employees' deep understanding and focus on their work roles are crucial (Chen et al., 2021). Research indicates that when individuals identify with their work or tasks and perceive them as meaningful and valuable, they are more willing to share viewpoints and suggestions, believing their perspectives are beneficial to the team (Kahn, 1990). Additionally, when megaproject practitioners feel that their involvement and contributions are understood and accepted, they are more inclined to engage in project development and improvement. They are also willing to propose suggestions to enhance workflow or project operations to help achieve project goals (Wang et al., 2018). Furthermore, Xue et al. (2020) argue that a safe, inclusive work environment enhances employees' trust in the team, making individuals more inclined to share viewpoints, offer suggestions, and take risks, as they feel encouraged and respected to express their opinions in such an environment. Based on this, this study hypothesizes:

H3: Role engagement positively influences employee voice behaviors.

Taking into account hypotheses H2 and H3, this study speculates that employees' role engagement may serve as a crucial bridge linking mindfulness to their voice behavior. Mindfulness influences megaproject employees' perceptions of directly relevant job matters (Leung et al., 2016). Individual high levels of mindfulness contribute to increased levels of positive emotions, making employees more willing to undertake role-extrinsic performance (Leroy et al., 2013). Role engagement can enhance individuals' awareness of organizational goals, prompting them to focus more on role tasks and expectations, thus enabling mindful employees to exhibit more organizational citizenship behaviors under the influence of role engagement (Brown and Ryan, 2003). This facilitates providing more proactive suggestions for achieving team goals (Wang et al., 2018). Based on this, the present study hypothesizes:

H4: Role engagement mediates the relationship between mindfulness in megaproject teams and employee voice behavior.

1.3.3 Regulating the Effects of Promotion Focus

Promotion focus is a malleable psychological state triggered by situational cues, representing a proximal motivational process that emphasizes individuals' focus on actions and resources required to achieve goals, rather than excessive attention to problems or obstacles (Higgins, 1998). This focus facilitates individuals to propose constructive opinions and solutions more effectively. In environments like megaprojects, which typically involve multiple public and private stakeholders (G. Wang, He, Xia, Meng, & Wu, 2018), employees may express concerns about the reception of critical feedback by managers who hold reward and sanction powers, fearing personal repercussions for unsolicited comments from subordinates (Detert and Burris, 2007). Zaman et al. (2021) exemplified this with state-owned megaproject leaders holding absolute control, suggesting that employees might refrain from speaking up. This situation leads to most employees lacking the courage to confront managers unwilling to accept feedback. However, under the influence of a promotion focus, employees with strong convictions are more focused on practical action steps towards work goals, contributing more to proposing problem-solving suggestions and opinions (Lin and Johnson, 2015). Therefore, this study hypothesizes that a promotion focus helps cultivate and sustain mindfulness, enabling employees to regulate decision-making about expressing opinions when confronted with external stimuli challenges provided by managers. Specifically, this study posits:

H5: Promotion focus plays a moderating role in the relationship between mindfulness and employee voice behavior in megaproject teams.

The lifecycle of megaprojects is characterized by dynamic uncertainty, encompassing uncertainties in construction sites, organizational environments, and behaviors of other participants (Wang et al., 2020). Promotion focus plays a crucial role in addressing such uncertainties and threats, providing opportunities to achieve the ultimate goals (Wang et al., 2020). Research shows that individuals with a promotion focus are more likely to engage in their job roles and demonstrate organizational citizenship behavior, especially under task incentives oriented towards benefits (Van Dijk and Kluger, 2011). Individuals with a promotion focus tend to have positive cognitive perceptions and involvement in their roles and are more willing to engage in proactive voice behaviors to meet role expectations (Lin and Johnson, 2015). Additionally, they are more self-aware of their responsibilities and involvement in specific roles, which motivates them to exert greater effort in performing role-required behaviors and to view voice behavior as a means of achieving goals (Neubert et al., 2013). Megaprojects, unlike ordinary construction projects, entail higher social complexity and a complex network of stakeholders due to their massive investment and scale, leading to incomplete and asymmetric information (Wang et al., 2020). Individuals with a promotion focus are better able to concentrate on the process of goal achievement, stimulating more extra-role behaviors (Van Dijk and Kluger, 2011), which helps

megaprojects avoid many future troubles and conflicts. Therefore, this study posits that promotion focus plays a regulatory role by shaping individuals' cognitive and emotional investment in roles and their perceptions and expectations of voice behaviors, thereby establishing a positive association between the two. Based on this, our study hypothesizes:

H6: Promotion focus moderates the relationship between role engagement and employee voice behavior.

Research Methods

2.1 Study 1: Structural Research on the Mindfulness Questionnaire Scale for Megaprojects in the Chinese Context

2.1.1 Preliminary Research

In the complex environment of megaprojects, traditional mindfulness measurement tools such as FFMQ, MAAS, and KIMS, which are typically used in general contexts, may have limitations. Although some mindfulness measurement scales tailored for work environments like MAAS-W and MIW have emerged in recent years, they may not comprehensively cover the complexities of megaproject situations due to the large scale, long time, and high risks involved. The complexity of megaprojects triggers changes in the individual competition and collaboration mechanisms within project organizations, leading to potential differences in individual behaviors and judgments compared to typical projects (Chen et al., 2016). For instance, within megaproject teams, individuals must cope with higher risks, more complex decision-making environments, and diverse team collaboration patterns, requiring them to maintain focus and flexibility under pressure (Wang et al., 2020). Traditional mindfulness scales may thus fail to accurately capture the emotions, stress, and coping mechanisms of employees in megaprojects.

Therefore, mindfulness measurement tools tailored for megaproject environments need to focus more on their specific challenges and coping requirements, including considerations of team dynamics, decision complexity, and project deadlines within megaprojects, and incorporate these factors into the design of mindfulness measurement tools to more comprehensively and accurately assess individual mindfulness levels and adaptability in megaprojects.

In this regard, this paper identifies specific indicators applicable to megaprojects by integrating existing research and the dimensions of established indicators, and conducting interviews with megaproject employees. Firstly, by conducting in-depth interviews with employees involved in megaprojects, we seek to understand the challenges and needs they face in the project, exploring special dimensions related to megaproject environments that traditional mindfulness indicators fail to cover. Subsequently, with the professional insights of megaproject domain experts, several dimensions with applicability and validity are derived from the interviews. Finally, based on the determination and refinement of each dimension and item, exploratory factor analysis and confirmatory factor analysis are utilized to verify the feasibility and effectiveness of the new scale. Exploratory factor analysis will reveal the underlying indicator structure and correlations, while confirmatory factor analysis will further confirm the reliability and validity of the new scale, ensuring its applicability and accuracy in megaproject environments. This questionnaire-based measurement tool is designed to examine the impact of mindfulness on employee voice behavior in megaprojects.

2.1.2 Survey Design and Data Collection

Based on semi-structured interviews with experts, a mindfulness scale was developed, summarized by Hülsheger and Alberts (2021) and drawing on the dimensions of mindfulness scales as delineated by Leung et al. (2016). This scale was informed by the content of the FFMQ scale by Baer et al. (2006). Multiple experts in psychology and

organizational behavior engaged in iterative discussions to refine each item, resulting in the final selection of 14 items comprising the initial mindfulness questionnaire. Employees participating in the study rated their mindfulness on a five-point Likert scale (1= "completely disagree", 5= "completely agree"). Before the formal large-scale survey, 245 preliminary questionnaires were distributed to employees of the Wangjialou 220 kV Transmission and Transformation Project Team in Zhangjiakou, Hebei Electric Power Company of State Grid Corporation of China, with 213 questionnaires returned. Following the theoretical framework proposed by Churchill Jr (1979), an exploratory research process was refined and purified. All 14 items demonstrated reliability and validity, as indicated in Table 1. This paved the way for the commencement of the formal survey and subsequent data analysis.

Table 1
Reliability and Validity Analysis (N = 213)

Variables	Dimensions	Cronbach's α	KMO	Factor loadings
Mindfulness	Attention	0.844	0.833	0.620–0.783
	Honesty	0.868	0.816	0.698–0.818
	Conviction	0.742	0.721	0.641–0.821

The data is derived from State Grid Jibei Power Company, CCCC, and CSCEC. A total of 402 questionnaires were distributed, with 378 valid questionnaires collected, resulting in an effective response rate of 94.03%. Among the respondents, the ratio of males to females is 6.16:1. The surveyed employees' ages are evenly distributed across various stages above 25 years old. The majority of construction project team members hold undergraduate and college degrees, accounting for 88.1% of the personnel. Among the respondents' positions, engineering management and technical quality positions are prominent. The majority of the surveyed team sizes are below 15 people or above 35 people, with team durations mostly exceeding 3 years, accounting for 59.4%. Overall, the respondents have extensive work experience, a deep understanding of construction projects, a good awareness of their personality traits, and are capable of providing thorough responses to this questionnaire.

2.1.3 Validation of Mindfulness Questionnaire Scales

1. Exploratory Factor Analysis

The feasibility test results of the factor analysis for this questionnaire indicate a KMO value of 0.874, and Bartlett’s sphericity test reaches a significant level ($p < 0.001$), suggesting that the sample data are suitable for exploratory factor analysis.

Using the method of principal component analysis and analyzing the correlation matrix, common factors are extracted. Factors with eigenvalues greater than 1 are chosen as extraction factors, followed by using the maximum variance method in orthogonal rotation to complete the factor rotation. Based on the three dimensions identified through exploratory factor analysis, the mindfulness scale is divided into three parts: attention, honesty, and conviction. Following the requirements in the field of multivariate data analysis (Hair, 2009), the criterion for factor loading is set at greater than 0.5 to ensure a meaningful relationship between factors and observed variables. Ultimately, no items were deleted, and 14 items were retained. Three factors were extracted, contributing to a cumulative variance of 61.269%, as shown in Table 2.

Table 2
Exploratory Factor Analysis Results (N = 378)

Category	Indicators	Factor 1	Factor 2	Factor 3
	Attention			
a1	When interacting with others at work, I remain fully focused on the other person and actively listen.	0.785		
a2	In the workplace, I am quick to notice when my mind starts to wander, and I can consciously redirect my thoughts to focus effectively on the task at hand.	0.781		
a3	While working, I maintain an unwavering focus on the task at hand without allowing distractions to interfere.	0.748		
a4	I acknowledge and accept my thoughts and feelings at work without generating internal conflict.	0.739		
a5	I consistently reflect on my thoughts and remind myself that my perspective on work may be biased, allowing for more accurate judgments.	0.641		
a6	In the workplace, I am adept at articulating my viewpoints, expressing my emotional state, and conveying my expectations for problem-solving outcomes.	0.530		
	Honesty			
b1	My inner integrity and moral principles significantly influence my behavior and decision-making in the workplace.		0.800	
b2	When faced with ethical dilemmas at work, I typically opt for actions that align with ethical standards rather than sacrificing moral principles.		0.798	
b3	I can accept and understand others' viewpoints and beliefs in a non-judgmental manner at work, without hastily passing judgment on right or wrong.		0.751	
b4	I possess a resilient will to maintain inner integrity, enabling me to effectively handle challenges and resist temptation in the workplace.		0.718	
	Conviction			
c1	In a tense work environment, I lack composure and fail to "think twice before acting."			0.803
c2	I tend to have a quick temper and am easily influenced by my own negative emotions in the workplace.			0.784
c3	While I meet deadlines for tasks at work, I merely scratch the surface and lack a personal understanding of the tasks.			0.743
c4	When encountering unpleasant situations at work, I am adept at disguising my feelings and keeping them hidden.			0.660

2. Confirmatory Factor Analysis

Validation of the three-factor structure model of mindfulness was conducted using Amos 26.0 for confirmatory factor analysis. Figure 3 depicts the standardized path diagram, confirming the validity of the three-factor structure

model of mindfulness.

As shown in Table 3, all indicators meet the requirements satisfactorily ($\chi 2/df = 2.596$, $p < 0.05$; TLI = 0.932, IFI = 0.945, CFI = 0.945, RMSEA = 0.065). This indicates that the three-factor structure model of mindfulness derived from exploratory factor analysis demonstrates a good fit.

Table 3
Fitting Index (N = 378)

	χ2 /df	TLI	CFI	RMSEA	RMR
Measured value	2.596	0.932	0.945	0.065	0.041
Fitted value	< 3	≥ 0.9	≥ 0.9	≤ 0.08	< 0.05

3. Analysis of Reliability and Validity

First, the reliability of the scale was assessed. Table 4 shows that Cronbach's α coefficients for the three dimensions of megaproject mindfulness are all greater than 0.7, and the CR values are all greater than 0.75, meeting the requirements for internal consistency and reliability (Qiu and Lin, 2009). Therefore, it is considered that the internal consistency of the measurement items in this study is good, and the measurement model has good reliability.

Existing research indicates that when the factor loading values and AVE values of each dimension are both greater than 0.5, they meet the convergence validity criteria. (Bagozzi and Yi, 1988). In factor analysis, due to the requirement to select indicators based on factor loadings greater than 0.5, except for "Attention" and "Conviction," where AVE values are approximately equal to 0.5, and "Honesty," where the AVE value is significantly greater than 0.5, the convergent validity of the scale developed in this study is acceptable. At the same time, the square root of the AVE values for each dimension of the scale is greater than the correlation coefficients between this dimension and other dimensions, indicating that the scale has good discriminant validity (Fornell and Larcker, 1981).

Table 4
Internal Consistency Reliability and Discriminant Validity Test of Each Dimension and Total Scale (N = 378)

Category	Dimensions	Estimate	Cronbach's α	AVE	CR	Attention	Honesty	Conviction
a1	Attention	0.748	0.848	0.49	0.85	0.70		
a2		0.750						
a3		0.738						
a4		0.749						
a5		0.605						
a6		0.579						
b1	Honesty	0.767	0.853	0.59	0.85	0.26	0.77	
b2		0.681						
b3		0.753						
b4		0.864						
c1	Conviction	0.825	0.749	0.45	0.76	0.18	0.16	0.67
c2		0.591						
c3		0.501						
c4		0.703						
Note: The values on the diagonal represent the square root of AVE								

2.2 Study 2: The Impact of Mindfulness on Employee Voice Behavior in Megaprojects

2.2.1 Research Subject

The sample consists of employees from eight projects under State Grid Jibei Electric Power Co., Ltd., CSCEC, and CCCC Guangzhou Dredging Co., Ltd., including the Wangjialou 220kV Substation and Transmission Project in Zhangjiakou; the Xizeyuan 110kV Substation and Transmission Project; the Zhanqianlu and Equipment Area 220kV Substation and Transmission Project in Tangshan; the Commercial Business Space Project of Plot No. 80 in Hangzhou; the New Campus Project of Hangzhou First People's Hospital; the Dredging and Reclamation, and Foundation Treatment Project for International General Terminals in the Nansha Port Area of Guangzhou Port; and the Maintenance Project of the Southern Section of the Outbound Fairway of Guangzhou Port (2022–2023) Phase II. This study employed a literature review method and semi-structured interviews with three State Grid management personnel, two construction company management personnel, and two professional researchers in the field, conducting practical interviews, drafting questionnaires, and soliciting feedback on survey projects and questionnaire design. To ensure the questionnaire effectively reflects the research objectives, a preliminary survey was conducted on 247 megaproject team employees. After conducting reliability and validity analyses using SPSS 22.0, the pilot survey data were confirmed to be valid and reliable, which informed the development of the final questionnaire.

A total of 436 questionnaires were received, with 396 valid questionnaires remaining after excluding invalid ones. The demographic characteristics of the respondents are shown in Table 5. Their educational attainment, age, and tenure are highly consistent with the actual demographic profile of megaproject employees, indicating that respondents possess a thorough understanding of their roles and the megaproject context. This ensures the representativeness of the sample, thereby supporting the credibility of the survey results.

Table 5
Demographic information of the questionnaire survey

Characteristics	Category	Frequency Percent(%)
Gender	Male	86.03
	Female	13.97
Age	25 years old and younger	8.48
	26 to 35 years old	25.19
	36 to 45 years old	32.17
	46 years old and older	34.16
Educational attainment	Diploma and below	40.90
	Bachelor's degree	47.13
	Master's degree and above	11.97
Position	Engineering Management Position	54.36
	Technical Quality Position	28.68
	Business Contract Position	0.25
	Safety Management Position	9.23
	Material Management Position	1.00
	General Office Position	4.99
	Finance Position	1.50
Team size	15 people or fewer	48.13
	16 to 25 people	14.21
	26 to 35 people	12.47
	More than 35 people	25.19
Length of employment	6 months or less	12.97
	6 to 12 months	12.72
	1 to 3 years	14.96
	Over 3 years	59.35

2.2.2 Variable Measurement

Independent Variable - Mindfulness: Employing a three-dimensional mindfulness questionnaire developed for this study, comprising 14 items. For example: " When interacting with others at work, I remain fully focused on the other person and actively listen."

Mediating Variable - Role Engagement: Utilizing a shortened version of the scale developed by May et al. (2004), selecting three dimensions of personal role engagement consistent with the concepts outlined by Rich et al. (2010): emotional involvement, cognitive participation, and physical perception. Consists of 5 items. For example: "I invest a lot of energy in my work."

Moderating Variable - Promotion Focus: Employing a scale developed by Lockwood et al. (2002), comprising 6 items. For example: "I often contemplate my career and opportunities for professional development."

Dependent Variable - Voice Behavior: Utilizing the dimensions outlined in the scale by Duan and Ling (2011) and incorporating content from the scale developed by Burris (2012), comprising 12 items. For example: "I am capable of suggesting new ideas and approaches to enhance project progress and improve everyone's productivity."

Data analysis and results

3.1 Analysis of Reliability and Validity

Using SPSS 22.0, the reliability and validity of the measurement methods in the questionnaire were tested. As shown in Table 6, Cronbach's α coefficients for each variable were 0.970, 0.959, 0.908, and 0.901 respectively, all exceeding 0.9. The KMO values were all greater than 0.8, indicating that each variable in the given dataset has good adequacy and correlation. Bartlett’s sphericity test yielded a p-value of 0.000, indicating statistical significance in the factor analysis results.

Herman's single-factor test was conducted on the survey data using SPSS 22.0. Several eigenvalues larger than 1 were found, with the largest factor explaining 39.005% of the variance, which is less than 50% of the total variance. Therefore, there is no significant common method bias in this study, allowing for subsequent data analysis.

Table 6
Exploratory Factor Analysis Results (N = 396)

Variables	Item	Cronbach's α	KMO	Factor Loadings
Mindfulness	14	0.970	0.963	0.774–0.855
Voice Behavior	12	0.959	0.958	0.748–0.832
Role Engagement	5	0.908	0.881	0.798–0.847
Promotion Focus	6	0.901	0.880	0.787–0.857

The model, composed of four variables: mindfulness, voice behavior, role engagement, and promotion focus, was subjected to confirmatory factor analysis. The results, as presented in Table 7, indicate that the four-factor model demonstrates a satisfactory fit and possesses strong structural validity.

Table 7
Fit Indices (N = 396)

	χ2 /df	IFI	TLI	CFI	RMSEA	RMR
Measured value	1.701	0.965	0.962	0.965	0.042	0.030
Fitted value	< 3	≥ 0.9	≥ 0.9	≥ 0.9	≤ 0.08	< 0.05

As shown in Table 8, the CR value is greater than 0.9, indicating internal consistency and reliability. The factor loadings for each dimension are significantly greater than 0.5, and the AVE value exceeds 0.5, meeting the criteria for convergent validity.

Further analysis of the discriminant validity of the scale is conducted through the square root of the AVE values. Table 8 demonstrates that the square root of the AVE for each dimension exceeds the correlation coefficients between this dimension and other dimensions, indicating satisfactory discriminant validity.

Table 8
Internal Consistency Reliability and Discriminant Validity Test of Each Dimension and the Total Scale (N = 396)

Category	Dimensions	Estimate	AVE	CR	Mindfulness	Voice Behavior	Role Engagement	Promotion Focus
a1	Mindfulness	0.840	0.703	0.971	**0.838**			
a2		0.829						
a3		0.819						
a4		0.784						
a5		0.837						
a6		0.846						
a7		0.821						
a8		0.860						
a9		0.855						
a10		0.856						
a11		0.850						
a12		0.853						
a13		0.810						
a14		0.872						
b1	Voice Behavior	0.783	0.661	0.959	0.498	**0.813**		
b2		0.795						
b3		0.813						
b4		0.804						
b5		0.816						
b6		0.844						
b7		0.822						
b8		0.814						
b9		0.831						
b10		0.809						
b11		0.847						
b12		0.771						
c1	Role Engagement	0.811	0.666	0.909	0.343	0.358	**0.816**	
c2		0.785						
c3		0.807						

Note: The values on the diagonal represent the square root of AVE

Category	Dimensions	Estimate	AVE	CR	Mindfulness	Voice Behavior	Role Engagement	Promotion Focus
c4		0.856						
c5		0.819						
d1	Promotion Focus	0.796	0.604	0.901	0.072	0.091	-0.017	**0.777**
d2		0.744						
d3		0.811						
d4		0.748						
d5		0.826						
d6		0.733						
Note: The values on the diagonal represent the square root of AVE								

3.2 Descriptive Statistical Analysis

Descriptive statistical analysis was conducted using SPSS 22.0, reflecting the average responses of respondents on a five-point Likert scale. Analysis results from Table 9 indicate that the mean values of all variables fall between 2.8 and 3.5, suggesting that respondents hold a "neutral" or "somewhat disagree" attitude towards the statements in the questionnaire items. The absolute values of skewness and kurtosis for the sample data of each variable are less than 1, indicating that the sample data follow a normal distribution.

Table 9
Descriptive statistical analysis of research variable sample data (N = 396)

Variables	Mean	Standard deviation	Items	Mean	Standard deviation	Skewness	Peakedness
Mindfulness	3.196	0.878	a1	3.139	1.059	0.041	-0.589
			a2	3.275	1.035	-0.157	-0.607
			a3	3.086	1.025	0.054	-0.603
			a4	3.429	1.032	-0.364	-0.341
			a5	3.202	1.019	-0.081	-0.492
			a6	3.205	1.056	-0.079	-0.609
			a7	2.949	1.040	0.006	-0.537
			a8	3.240	1.009	-0.005	-0.498
			a9	3.356	1.010	-0.047	-0.770
			a10	3.341	1.018	-0.215	-0.410
			a11	2.854	1.038	0.119	-0.547
			a12	3.177	1.033	-0.152	-0.467
			a13	3.275	1.069	-0.079	-0.722
			a14	3.210	1.006	-0.130	-0.445
Voice Behavior	3.052	0.825	b1	3.376	1.030	-0.077	-0.571
			b2	3.106	1.006	-0.004	-0.446
			b3	2.843	0.994	0.147	-0.290
			b4	3.199	0.990	-0.141	-0.378
			b5	3.028	1.005	-0.026	-0.323
			b6	3.328	0.993	-0.134	-0.474
			b7	2.836	0.963	-0.025	-0.406
			b8	2.821	0.968	0.012	-0.383
			b9	3.091	0.971	-0.066	-0.407
			b10	3.010	0.983	-0.020	-0.257
			b11	3.048	1.029	0.016	-0.591
			b12	2.934	0.999	0.071	-0.399
Role Engagement	3.161	0.843	c1	3.465	0.981	-0.426	-0.141
			c2	3.321	0.989	-0.268	-0.435
			c3	2.965	0.990	-0.102	-0.503
			c4	3.091	0.961	-0.166	-0.204

Variables	Mean	Standard deviation	Items	Mean	Standard deviation	Skewness	Peakedness
			c5	2.965	1.003	-0.126	-0.485
Promotion Focus	3.308	0.763	d1	3.394	0.942	-0.148	-0.371
			d2	3.470	0.926	-0.257	-0.291
			d3	3.199	0.946	0.025	-0.435
			d4	3.326	0.901	-0.022	-0.242
			d5	3.520	0.921	-0.197	-0.380
			d6	2.939	0.966	0.088	-0.444

3.3 Regression Analysis

The hypotheses were tested using regression analysis in SPSS 22.0 software. As shown in Table 10, both mindfulness and role engagement have significant positive effects on constructive behavior ($\beta = 0.482$, $p < 0.001$; $\beta = 0.335$, $p < 0.001$) respectively. After adding mindfulness and role engagement, the model's explanatory power significantly increased. Hypotheses H1, H2, and H3 are all supported.

Table 10
Primary Effects Analysis

Variables	Voice behavior		Role engagement
Mindfulness	0.482***	-	0.326***
Role engagement	-	0.335***	-
F	119.556***	49.860***	46.703***
Note: *** indicates p < 0.001			

The intermediate effect analysis of role engagement was examined using Process in SPSS 22.0. Model 15 was selected based on the research model, and the Bootstrap method was applied. The study set the number of samples at 5000 times with a confidence level of 95%. This choice balanced computational efficiency and research resources. Additionally, Preacher and Hayes (2008) suggested that this sample size is sufficient to provide stable and reliable estimates for this study.

As shown in Table 11, the total effect estimate is 0.453 with a corresponding standard error (SE) of 0.042. This indicates that the independent variable has an overall impact of 0.453 on the dependent variable, and this effect estimate is significant ($p < 0.001$). The direct effect estimate is 0.393 with a se of 0.043, suggesting a direct influence of 0.393 from the independent variable on the dependent variable, and the result is significant ($p < 0.001$). The indirect effect estimate is 0.061 with a se of 0.017, and the interval estimate for the indirect effect is between 0.029 and 0.097 (95% confidence interval). Notably, 0 is not included in this confidence interval, indicating significance. Therefore, it can be concluded that mindfulness, as the independent variable, has a significant direct effect and a significant indirect effect through the mediating variable on voice behavior, the dependent variable. This suggests that role engagement partially mediates the influence of mindfulness on voice behavior, supporting Hypothesis 4.

Table 11
Process Examination of Role Engagement Mediation Effect

Pathway	Effect	SE	t	p	LLCI	ULCI
Total Effect	0.453	0.042	10.934	0.000	0.372	0.535
Direct Effect	0.393	0.043	9.152	0.000	0.308	0.477
Indirect Effect	0.061	0.017	-	-	0.029	0.097

The moderation effect of promotion focus on promotion focus was examined using the Process tool in SPSS 22.0 software, with 5000 bootstrapping samples and a 95% confidence interval. The results are presented in Table 12. According to the constant, when all independent and moderating variables are set to zero, the predicted value of voice behavior is 3.043. Mindfulness and role engagement have regression coefficients of 0.359 and 0.211, respectively, both showing significance ($p < 0.001$) in predicting voice behavior. The regression coefficient for promotion focus on voice behavior is 0.044, with a significance level of 0.025. The interaction term regression coefficients between mindfulness and promotion focus, as well as between role engagement and promotion focus, are 0.214 and 0.178, respectively, both significant at $p = 0.001$.

The significance of the moderation effects indicates a significant positive moderation effect of promotion focus on the relationship between mindfulness, role engagement, and voice behavior, implying that the presence of promotion focus affects the association and impact between these variables. Additionally, plotting the moderation effect slopes reveals that a higher level of promotion focus strengthens the positive impact of mindfulness and role engagement on employee voice behavior, as illustrated in Figs. 4 and 5. Therefore, hypotheses H5 and H6 are supported.

Table 12
Results of hypothesized moderating effect

Variables	Voice Behavior						
	Regression coefficient	SE	LLCI	ULCI	p	ΔR2	F
constant	3.043	0.034	2.976	3.110	0.000	-	-
Mindfulness	0.359	0.041	0.278	0.440	0.000	-	-
Role Engagement	0.211	0.043	0.126	0.296	0.000	-	-
Promotion Focus	0.044	0.045	-0.044	0.132	0.025	-	-
Mindfulness× Promotion Focus	0.214	0.049	0.117	0.311	0.000	0.032	18.929
Role Engagement× Promotion Focus	0.178	0.055	0.070	0.286	0.001	0.018	10.453

Discussion

This study, set against the backdrop of Chinese megaprojects, examines how mindfulness influences employees' voice behavior based on the TPB model. A Conditional Indirect Effects Model was developed and tested to explore the impact of mindfulness on voice behavior. The results indicate that mindfulness positively affects employees' voice behavior through the moderating role of promotion focus, and role engagement strengthens this mediation

process. This paper contributes further evidence to existing research, emphasizing the significance of mindfulness in eliciting voice behavior among employees in megaprojects, and proposes several falsifiable hypotheses.

To begin with, this study reveals that mindfulness significantly enhances voice behavior among employees in megaprojects. In Chinese culture, mindfulness is closely linked to traditional philosophical thoughts such as Daoism, Confucianism, and Buddhism (Purser, 2015). The Daoist concept of "wu wei" or non-action aligns with mindfulness' emphasis on accepting the present moment, Confucianism emphasizes social responsibility and benevolence, while Buddhism underscores mindfulness and compassion. Influenced by these traditional cultural values, mindfulness is perceived as an effective means to improve personal cultivation, concentration, and emotional regulation (Brown and Ryan, 2003; Kabat-Zinn, 2003). Individuals with mindfulness are more inclined to prioritize collective interests and social responsibilities, thus offering suggestions conducive to team development. In China, megaprojects often exhibit characteristics of lengthy implementation cycles, high resource demands, and complex management, coupled with considerable uncertainty (Wang et al., 2020). This necessitates close collaboration among organizational members to encourage heuristic exploration of potential improvement opportunities within project teams, such as promoting employees' proactive voice behavior. Traditionally, voice behavior has been regarded as an important means of conveying constructive opinions, concerns, and ideas in the workplace, contributing to organizational efficiency (Xue et al., 2020). However, China's cultural background and management system may impose constraints on employees' voice behavior (Huang and Harris, 1974). The traditional authoritarian culture and values emphasizing collective interests and teamwork may lead individuals to be more cautious in proposing suggestions, avoiding conflicts with the overall consensus of the team. This cultural context may incline employees towards a conservative attitude regarding voice behavior, choosing silence over making suggestions, particularly when issues concerning leadership or the overall team interests are involved.

Feng and Trinh (2019) found that most megaproject accidents occur due to the inability to predict, identify, and address project risks, thereby limiting the ability of megaproject management to establish safety controls and affect employee safety. A project manager in the East China region stated that only employees truly engaged in the project's practical aspects can deeply understand its operational phases. By obtaining their opinions and suggestions, potential hazards can be identified in advance, aiding in the establishment of safety controls. However, constrained by the cultural background of Chinese authoritarianism, employees choose to remain silent due to fear of offending superiors or preserving others' self-esteem (Huang and Harris, 1974). This cultural tradition poses a barrier to employee voice behavior. Only individuals with a strong sense of mindfulness can overcome this cultural barrier, persisting in providing feedback for personal and organizational goals (Kong, 2016), supporting hypothesis H1. Mindfulness is often conceptualized as a personal trait closely linked to humility and integrity (Pandey et al., 2018). This study found that in megaprojects, an employee with mindfulness can better understand their needs and emotions, swiftly adjust themselves, and create a psychologically safe environment (Yang et al., 2018). Driven by a strong moral sense, they freely express their opinions and concerns about the organization, contributing to mitigating uncertain risks. This aligns with the findings of Good et al. (2016). Managers express that no one can afford any failures in megaprojects, and all participants should exert maximum effort to ensure project success, necessitating broader feedback channels.

Next, this study found that role engagement plays a significant mediating role in the relationship between mindfulness in Chinese megaprojects and employee voice behavior. Role engagement is considered a crucial prerequisite for workplace voice behavior (Kahn, 1990). Two management personnel from the State Grid Corporation of China in the JiBei region affirmed hypotheses H2 and H3. They noted that in China, younger employees are typically more focused, but older employees outperform new employees in terms of both work efficiency and completion rate. In Chinese culture, older and younger individuals are positioned differently in social roles. Elderly

individuals are respected for their accumulated wisdom and traditionally play guiding and supportive roles, while young people are encouraged to focus on learning to lay the foundation for future growth and development. Therefore, older employees are better at utilizing their rich experience and sense of responsibility to offer valuable suggestions for projects. This finding echoes Li et al. (2024) study, which explores how construction workers concentrate their attention on construction sites. They found that experienced construction workers, compared to their less experienced peers, excel in broadly attending to various events at the construction site, such as environmental changes, material transportation, and safety conditions. These experienced workers can swiftly identify potential issues and hazards, promptly taking effective measures to address them, thus ensuring smooth progress and improved quality in construction. This may be due to older employees having longer work experience and higher levels of role engagement, enabling them to better adjust the influence of mindfulness on their external role behaviors (Fletcher, Bailey, & Gilman, 2018).

During interviews, a substation engineer cited tower assembly and wiring during the construction process of a certain project in China as an example. He pointed out that transmission line workers operate in a dynamic work environment where tasks are repetitive, uncomplicated, and efficiency-oriented. Employees with low role engagement only focus on task completion, while those with higher role engagement have a broader attention span and can focus on complex information from both external and internal environments. These employees can timely provide constructive ideas because they are aware of the importance of improving the organizational work environment, and their suggestions sometimes help organizations avoid potential risks and enhance overall project efficiency (Chen et al., 2021). The emphasis on interpersonal relationships in Chinese culture deepens contractual relationships. In megaprojects, the relationship between leaders and employees not only focuses on economic benefits but also emphasizes interpersonal connections, a sense of responsibility, and the pursuit of overall team objectives (Du and Vantilborgh, 2020). Role engagement, as a mediating variable, helps employees experience mindfulness more deeply, strengthens their connection to work tasks, and promotes their involvement and commitment to the megaproject. Furthermore, mindfulness mediated by role engagement helps employees maintain focus and emotional stability in megaprojects, making them more willing to share their opinions. This aligns with the concept of "blended contracts" in traditional Chinese thought, which combine responsibility with personal goals and thus supports hypothesis H4.

Lastly, recent research has shown that a promotion focus can significantly moderate the relationship between mindfulness and employee voice behavior in megaproject teams, acting as a mediator (Lin and Johnson, 2015). Specifically, mindfulness has a stronger impact on employee voice behavior among those who are more focused on achieving goals and obtaining positive outcomes. Employees with a promotion focus tend to pursue open and dynamic work environments, reflecting values that shape their behavior and effectively manage uncertainty in megaprojects (Wang et al., 2020), supporting the development of hypothesis H5.

In the megaproject workplace, voice behavior is considered crucial for identifying and managing unexpected failures to prevent workplace accidents (Zaman et al., 2021). An engineer from State Grid Corporation in the JiBei region mentioned a major accident: during the second phase of piping work in the third stage of a power plant, the end plate of the silencer cracked and fell off, causing high-temperature, high-pressure steam to blow into the chemical laboratory and control room, resulting in 11 casualties. The engineer stated that the existence of design flaws in the silencer led to severe consequences, but the main reason was the blocked channels for employee feedback, which failed to promptly detect and address potential issues. Voice behavior is not just about offering opinions and suggestions but also about actively participating, sharing information, and problem-solving (Zaman et al., 2021). If employees are inclined to express their views and discoveries, tragedies like this could potentially be avoided. However, in reality, cumbersome procedures and concerns about workload and resource loss weaken the enthusiasm for employee feedback.

In Chinese society, the respect for authority is considered a significant social norm, implying that employees tend to avoid directly challenging the opinions or decisions of superiors or authority figures (Hwang, 1987). Additionally, the closed Confucian family structure in China restricts the dissemination of knowledge beyond kinship networks, resulting in a certain degree of knowledge concealment (Chen et al., 2022). Within this cultural context, even if employees are aware of issues or potential risks in the workplace, they may choose to remain silent rather than express their personal views directly (Pinder and Harlos, 2001). This cultural value may lead to a blockage in channels for offering suggestions, causing employees to be reluctant to actively voice opinions or provide recommendations when facing problems. They may fear that expressing their views directly could lead to conflicts with superiors or even adverse consequences for themselves (Pinder and Harlos, 2001), thereby limiting the initiative and freedom of employees in offering advice to some extent. However, for complex systems like the power grid, maintaining a high level of reliability is a challenge (Sullivan and Beach, 2009). On the one hand, it requires skilled operators, complex computer and communication systems, and careful planning and design (Sullivan and Beach, 2009). On the other hand, it also requires the ability to reduce specific operational risks. A promotion focus enables individuals to accept a certain level of conflict, which in turn enhances their level of role engagement (Van Dijk and Kluger, 2011). Mindful employees who can provide timely feedback to project teams can avoid potential risks and challenges, and those with a promotion focus are more likely to propose beneficial suggestions for the team because they can focus on problem-solving rather than merely emphasizing potential negative consequences, placing more emphasis on teamwork and information sharing (Neubert et al., 2013). This supports the establishment of hypothesis H6.

Conclusions

This study examines the moderating role of mindfulness influenced by traditional Chinese culture on employee voice behavior in Chinese megaprojects. The findings reveal a significant positive correlation between mindfulness and employee voice behavior. Role engagement partially mediates this relationship. The study results demonstrate that promotion focuses positively moderate the impact of mindfulness on employee voice behavior.

This research contributes partial theoretical insights into the field of organizational behavior in construction projects. Grounded in the mindfulness perspective, the study elucidates a potential formation pathway of employee voice behavior under megaproject contexts and confirms the bridging role of role engagement between mindfulness and employee voice behavior. Employees with a higher promotion focus are more likely to recognize and adopt mindfulness, thereby facilitating the occurrence of voice behavior. These findings provide new insights into megaproject management practices. On a practical level, the research results and recommendations not only enhance attention to voice behavior in construction projects but also aid in understanding the mechanisms and facilitative measures influencing employee voice behavior performance in the megaproject domain, thereby providing theoretical support for fostering voice behavior in major engineering projects.

However, the study has some limitations: it is based on the backdrop of traditional Chinese culture, and future research could explore its applicability to other countries and regions, which calls for further examination of its generalizability and feasibility. Lastly, the research sample is primarily concentrated in the North China and Yangtze River Delta regions, lacking nationally stratified sampling, thus necessitating cautious generalization of the research conclusions.

Declarations

Competing interests

The authors declare no competing interests.

Ethical approval

The study's ethical approval was obtained from the Anonymous Committee (specific committee in a cover letter). All research was performed by the 1964 Helsinki Declaration.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Data availability

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy.

Funding Declaration

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.

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Figures

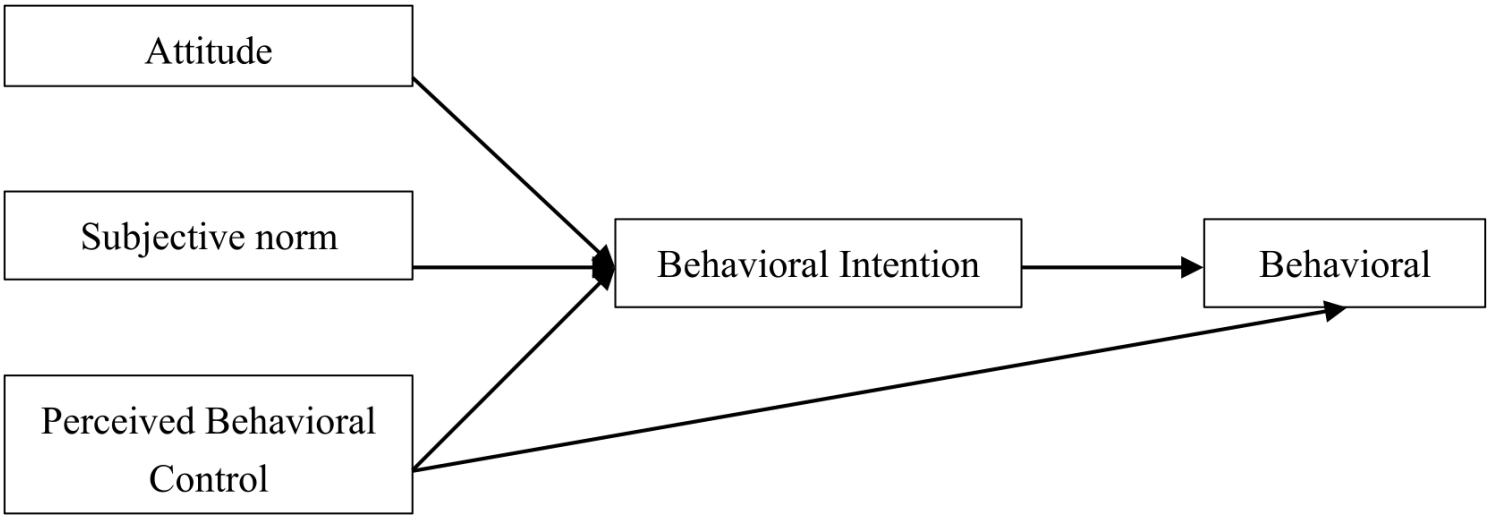


Figure 1

Theory of Planned Behavior (TPB) Model

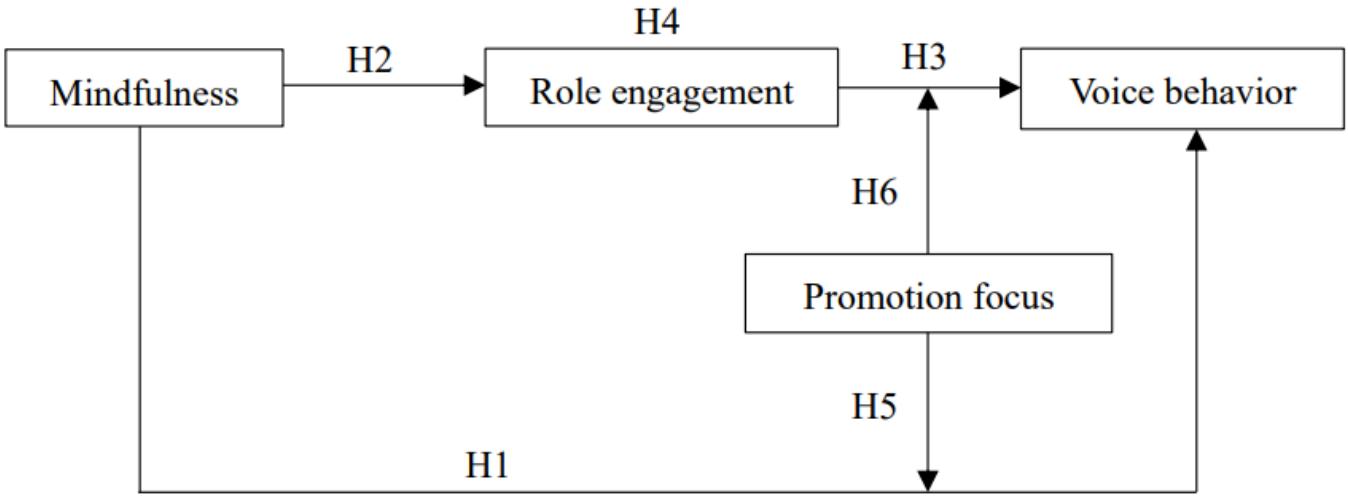


Figure 2

Process Model of Mindfulness Influence on Employee Voice Behavior

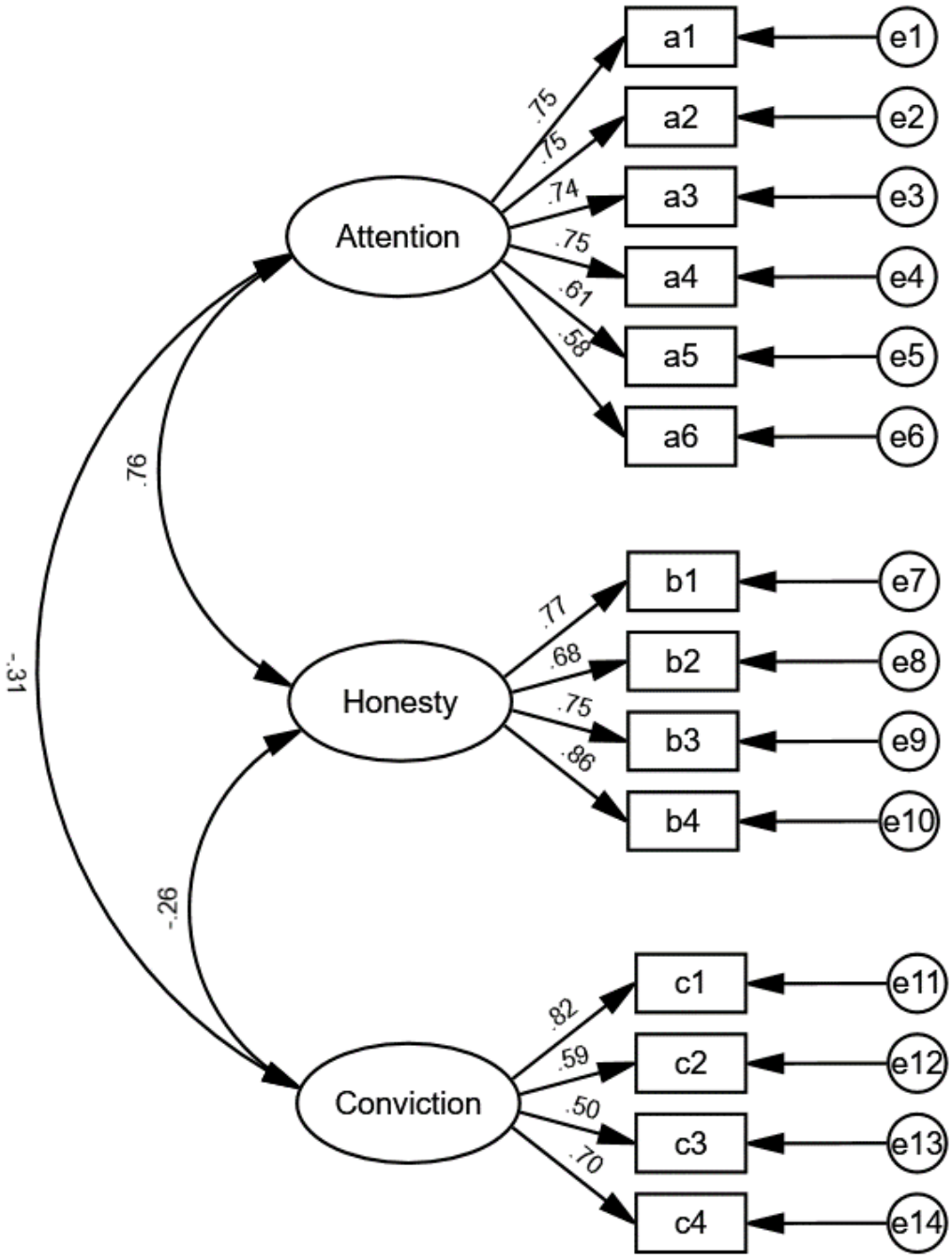


Figure 3

Standardized Path Diagram of the Three Components of Mindfulness Structure

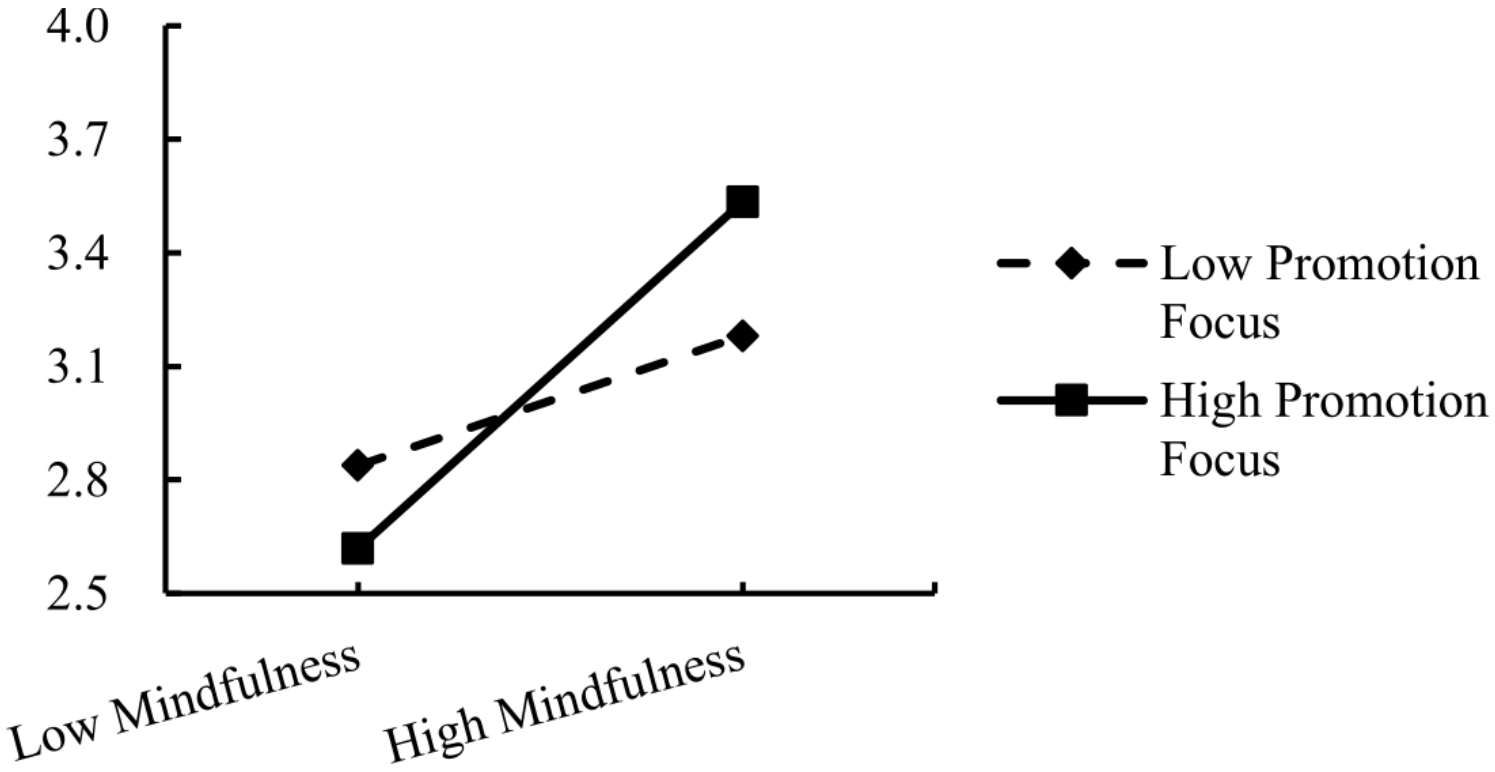


Figure 4

Graphical illustration of the moderating effect of Mindfulness

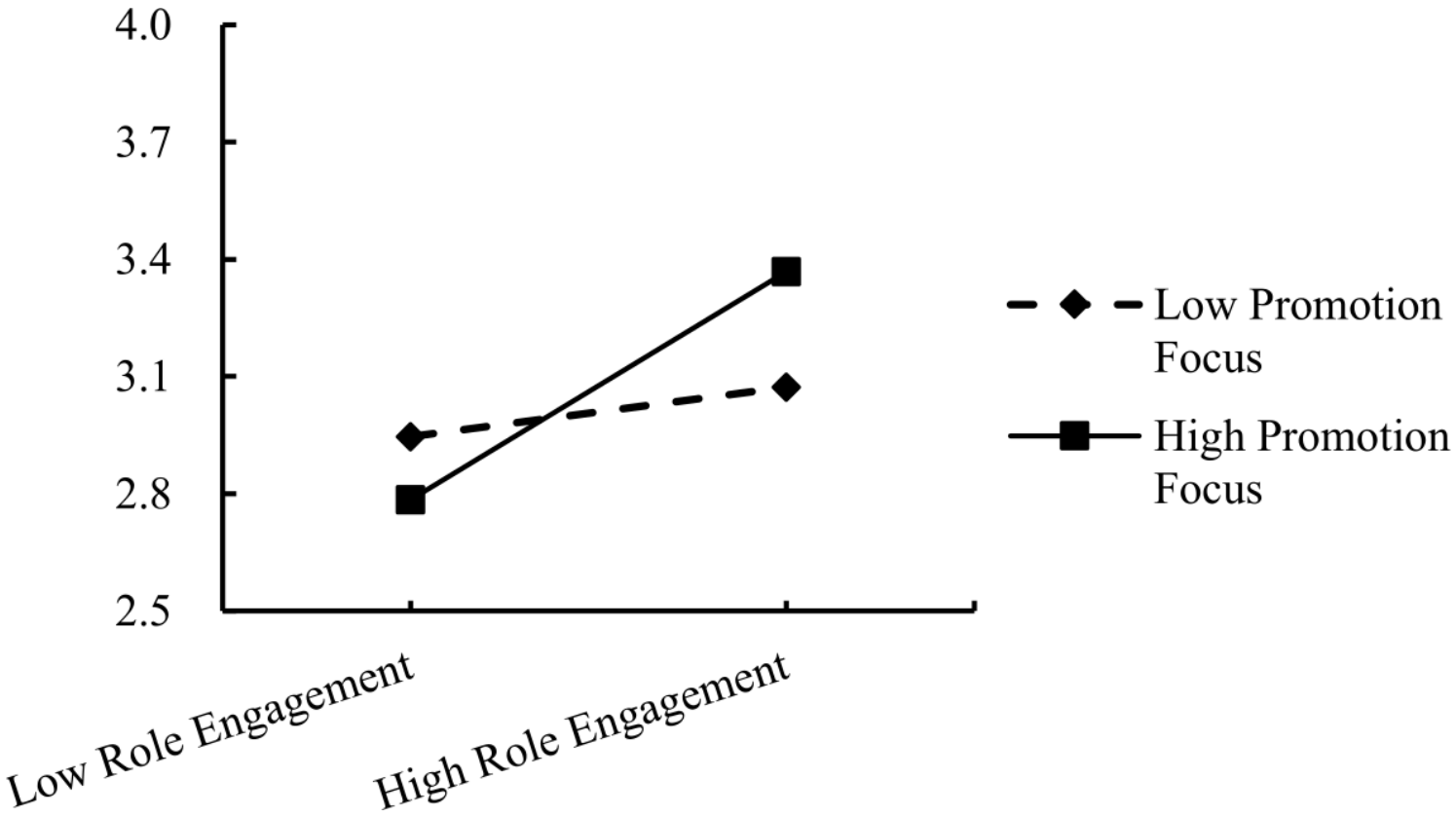


Figure 5

Graphical illustration of the moderating effect of Role Engagement

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