

To Be or Not to Be? The Influence of Ambidextrous Leadership Behaviour on Ambidextrous Innovation: A Moderated Mediation Model

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Abstract: Based on the social information processing theory, this research constructed a process model of “ambidextrous leadership-goal orientation-ambidextrous innovation” and examined the moderating role of voice endorsement. An empirical test was conducted with the questionnaire data from 365 hospital staff. An empirical analysis of data from 365 hospital staff questionnaires revealed that: opening leadership behaviour positively affects employees’ exploratory innovation, and learning goal orientation mediates the relationship; while closing leadership behaviour positively affects employees’ exploitative innovation, and performance goal orientation mediates this relationship. Ambidextrous leadership positively influences exploratory innovation through learning goal orientation, and positively influences exploitative innovation through performance goal orientation. Voice endorsement positively moderates the relationship between opening leadership behaviour and learning goal orientation, and the relationship between closing leadership behaviour and performance goal orientation. Moreover, voice endorsement positively moderates the mediating role of learning goal orientation and performance goal orientation. This research provides insights to promote subordinates’ ambidextrous innovation behaviour and improve organizational management.

Keywords: Ambidextrous Leadership; Goal Orientation; Ambidextrous Innovation; Voice Endorsement; Social Information Processing Theory

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1. Introduction

Technological innovation in medicine is a crucial aspect for large comprehensive hospitals to lead the advancement of medical science and technology, and to promote significant progress in the field^[1]. It is an inevitable requirement for the high-quality development of medical institutions. Medical personnel, as the key subjects of healthcare institutions, serve as the primary driving force for medical technological innovation, and the level of their innovation significantly determines the overall innovation capacity of these institutions^[1]. To drive high-quality development in healthcare institutions through innovation, it is essential for medical professionals to not only acquire new knowledge, develop new skills, explore new opportunities, and experiment with new methods, known as exploratory innovation (exploration innovation)^[2,3], but also to leverage existing knowledge to create value, enhance work efficiency, and optimize processes, referred to as exploitative innovation (exploitation innovation)^[3,4]. Exploratory innovation and exploitative innovation constitute ambidextrous

innovation^[5]. How to promote employees' ambidextrous innovative behaviour has become one of the current hot topics in organizational behaviour research. Leadership is recognized as one of the key factors that influence employee behaviour^[6]. Research has found that transformational leadership and inclusive leadership can affect employees' ambidextrous innovation behaviours^[7]. However, the conclusions are inconsistent^[8,9]. According to the literature, transformational leadership negatively influence exploratory and exploitative employee innovation^[10]. There are also studies that show transformational leadership facilitates employees' exploratory and exploitative innovation^[9].

The reason for the inconsistent conclusions is that there is a contradiction between a singular leadership style and the necessity for ambidextrous innovation. Exploratory innovation and exploitative innovation entail different cognition, reasoning, and resources^[5]. Exploratory innovation requires employees to go beyond existing knowledge, use diverse cognitive support for significant and radical innovation, and attempt to adopt new methods in a long-term period^[11]. Pursuing exploratory innovation takes a significant investment of time and resources^[12,13]. Exploitative innovation requires employees to employ existing knowledge in order to reinforce current technologies through a more consistent cognitive approach^[14]. Exploitative innovation takes less time and resources for implementation since it adopts short-term goals and expands existing knowledge^[12,13]. Therefore, promoting ambidextrous innovation among employees requires a leadership style that can flexibly flip between different approaches. However, existing research primarily explores the impact of single leadership behaviour on employees' ambidextrous innovation and falls short of addressing the tensions in antecedents of ambidextrous innovation^[15]. Ambidextrous leadership is a paradoxical leadership model consisting of two complementary leadership behaviours and allows for flexible transitions between behavioural strategies^[16]. It embodies integrated reasoning logic and can co-develop employees' explorative and exploitative behaviours^[17]. However, literature on the relationship and mechanism between ambidextrous leadership and ambidextrous innovation remains notably limited^[10].

The Social Information Processing Theory indicates that leaders are pivotal information sources for organizations^[18]. They provide employees with not only general contextual information but also specific information through particular events^[19]. Employees' attention, construction, and interpretation towards the information will have a differentiated impact on their attitudes and behaviours. This provides us with a new theoretical perspective to explore the relationship between ambidextrous leadership and employees' ambidextrous innovative behaviour. On the one hand, employees can identify and perceive general social contextual information clues conveyed by leaders with different leadership styles^[20]. These contextual clues can affect employees' behaviours by influencing their attitudes, motivation, and goal^[21]. The goal orientation of employees, shaped by contextual cues in the work environment, is dynamic and adaptable^[22]. Employees' goal orientation can be affected by ambidextrous leadership and become antecedents of employees' innovative behaviour^[23,24]. Different goal orientations exert distinct effects on different innovative behaviours^[25]. Hence, this study introduces goal orientation as a mediator to investigate the effects of learning goal orientation and performance goal orientation in mediating the relationship between ambidextrous leadership and ambidextrous innovation. On the other hand, employees exhibit cognitive responses to specific information conveyed through particular events^[19,21]. Such information can influence the employee's attention and information processing, thus shaping their goal orientation and behaviour^[21].

Meanwhile, during the process of cultivating medical staff with individual innovative behaviors, frequent suggestions from these professionals enable leaders to respond swiftly and accurately to changes in the external environment, benefiting the long-term development of the industry^[26]. However, what pivotal role does voice endorsement, as an essential managerial response, play in the relationship between ambidextrous leadership and individual ambidextrous innovative behaviors? Voice endorsement indicates leaders paying attention to, supporting, or implementing employees' suggestions^[27]. This enables employees to perceive and interpret leaders' attitudes towards innovation based on their responses to suggestions. As a result, not only can leadership style influence employee goal orientation, but so can responses from leaders in specific situations^[28]. Therefore, this study investigates the boundary effect of voice endorsement as a response and source of information clues on the relationship between ambidextrous leadership and ambidextrous innovation.

Overall, based on social information processing theory, this study views ambidextrous leadership as a general source of social contextual cues, and we introduce learning goal orientation and performance goal orientation to construct a research

framework of “ambidextrous leadership - goal orientation - ambidextrous innovation”, and we verify the mediating effect of goal orientation. Furthermore, this study investigates the moderated mediation effect of leaders’ voice endorsement by incorporating the perspective of specific event-related information cues from ambidextrous leadership, thereby enriching the research perspective and theoretical framework of ambidextrous leadership and ambidextrous innovation. This study also provides insights for organizations on promoting ambidextrous innovation behaviour and organizational innovation capability.

2. Theory and Hypotheses

2.1 Ambidextrous Leadership and Ambidextrous Innovation

Ambidextrous leadership is an approach that integrates dualism theory and leadership theory, giving rise to a novel leadership behaviour that combines two complementary leadership styles^[29,30]. It embodies the cognitive perspective of ‘both/and’, and it involves the integration and coordination of contradictory activities, with the proposition of leaders’ transition between two distinct leadership behaviours according to different situations^[29,31,32]. Scholars primarily investigate ambidextrous leadership behaviour from four perspectives, the cognitive perspective (opening leadership and closing leadership)^[33], the convention perspective (transformational leadership and transactional leadership)^[32], the power perspective (empowering leadership and directive leadership)^[34], and the benevolence and authority perspective (benevolent leadership and authoritative leadership)^[35]. Excellent leaders demonstrate cognitive complexity, enabling them to shift cognitive modes when confronting complex environments^[17]. This is crucial for exerting leadership strategies on specific contextual demands. Therefore, we investigate the relationship between ambidextrous leadership and ambidextrous innovation from a cognitive perspective of ambidextrous leadership.

Opening leadership behaviour refers to a leadership style that enhances heterogeneous employee behaviours by encouraging them to engage in different activities, explore new approaches, and support them in challenging the status quo^[33,36]; closing leadership behaviour indicates a leadership style that reduces employee behavioural diversity through corrective measures, specific guidance, and goal supervision^[33]. The social information processing theory holds that leaders are information sources for employees, and employees shape their cognition and behaviour in response to leaders’ behaviour^[37]. On the one hand, opening leadership promote employees’ innovation willingness and information processing abilities by encouraging independent thinking and behaviour and trial-and-error^[33]. This is conducive to promoting exploratory innovation. The literature indicates that opening leadership encourages employees to view the constantly changing environment as an opportunity and helps create conditions to support explorative innovation^[38]. On the other hand, closing leadership signals employees that they are expected to follow established routines, ensuring that their behaviour aligns with organizational conventions^[10,38]. Therefore, under closing leadership behaviour, employees tend to focus on specific goals and responsibilities and prefer a stable and predictable work environment, which promotes exploitative innovation^[39,40]. Thus:

Hypothesis 1a: Opening leadership behaviour has a positive effect on employees’ exploratory innovation.

Hypothesis 1b: Closing leadership behaviour has a positive effect on employees’ exploitative innovation.

2.2 The Mediating Role of Goal Orientation

Goal orientation refers to an individual’s cognitive and behavioural pattern of pursuing goals^[41,42], including learning goal orientation and performance goal orientation. Learning goal orientation refers to setting goals to enhance their understanding and comprehension of new concepts^[43]. Performance goal orientation pertains to individuals striving to receive favorable evaluations of their abilities or to avoid negative evaluations^[42,43]. Individual goal orientation is dynamic and can be affected by external information, which leads to behavioural changes^[3]. Therefore, integrating with the social information processing theory, this study investigates the mechanism of ambidextrous leadership on ambidextrous innovation from a goal-orientation perspective.

The social information processing theory indicates that employees’ cognition and attitude are affected by assessing, processing, and interpreting general social contextual information in the work environment^[21], leading to different goal orientations^[44]. Opening leadership encourages employees to actively explore new methods and learn from mistakes and failures. This promotes independent and critical thinking in employees and helps deepen their understanding and

implementation of knowledge to gain further work experience^[6]. Moreover, opening leadership motivates employees to explore and overcome barriers and thus promotes employees' learning goal orientation^[23,38]. Literature indicates that opening leadership behaviour helps establish a climate of knowledge and information sharing in an organization, which can further nurture learning goal orientation^[45]. In contrast, closing leadership emphasizes following plans and controlling work progress through routines, which can improve employees' efficiency^[23,38]. Employees are more inclined to prove that they can complete tasks more quickly and effectively, thus forming a high-performance goal orientation. Moreover, closing leadership provides employees with norms and standards, requiring employees to comply with routines and transmitting signals of the significance of performance to employees^[46]. This will encourage employees to improve performance by reducing behavioural differences, thereby enhancing performance goal orientation.

As can be seen, ambidextrous leadership can effectively respond to complex and dynamic situations, motivating employees. Goal orientation, as a type of achievement motivation, is a significant predictor of individual behaviour and helps explain the differences in exploratory and exploitative behaviour in the workplace^[6]. The theory of social information processing theory also indicates that employees adjust their behaviour by interpreting different information^[21]. Employees with high learning goal orientation believe their abilities can be improved through efforts, so they focus on developing new skills and acquiring knowledge, fostering strong motivation^[47]. As a result, these employees are inclined to exhibit autonomous behaviours^[24], such as spontaneously engaging in exploratory innovation. Learning goal orientation enables individuals to embrace challenges as opportunities rather than threats^[42]. Therefore, employees with high learning goal orientations are willing to implement exploratory innovation with risks and uncertainties to achieve themselves. Employees with performance goal orientation focus on demonstrating their abilities and gaining recognition from others^[47]. These employees focus more on improving existing work to enhance performance and less on individual capacity development^[48]. Therefore, employees with performance goal orientation tend to do exploitative innovation rather than exploratory innovation.

In summary, opening leadership encourages experimentation and breakthroughs, which promotes learning activities and exploratory innovation in employees. Closing leadership prefers efficiency and standardisation, which motivates performance-oriented and exploitative innovation in employees. Thus:

Hypothesis 2a: The employee learning goal orientation mediates the relationship between opening leadership behaviour and employees' exploratory innovation.

Hypothesis 2b: The employee performance goal orientation mediates the relationship between closing leadership behaviour and employees' exploitative innovation.

The ambidextrous leadership reflects the coordination between the contradictions and tensions of different leadership behaviours, i.e. the "both/and" thinking logic rather than the "either/or" logic^[49,50]. Ambidextrous leadership encourages employees to constantly try new things and challenge the status quo through opening behaviour, stimulating their creative enthusiasm and innovative behaviour^[6]. Ambidextrous leadership can also alleviate the suppression of divergent thinking caused by closing behaviour^[51]. In addition, closing behaviour establishes norms and routines for employees to reduce the coordination problems raised by opening behaviour^[23]. Therefore, ambidextrous leadership generates synergies through flexibly switching between two complementary leadership behaviours. Employees are encouraged not only to adopt a learning goal orientation, fostering exploratory innovation but also to adopt a performance goal orientation, promoting exploitative innovation. Thus:

Hypothesis 3a: The employee learning goal orientation plays a mediating role between ambidextrous leadership behaviour and employees' exploratory innovation.

Hypothesis 3b: The employee performance goal orientation plays a mediating role between ambidextrous leadership behaviour and employees' exploitative innovation.

2.3 The Moderating Effect of Voice Endorsement

Voice endorsement is the extent to which leaders value and recognize suggestions made by employees to improve the organization^[52]. Voice endorsement provides employees with opportunities and supportive resources from leaders to develop the organization through suggestions^[53,54]. Hunton et al. (1996) found that compared with voice endorsement,

voice rejection results in a decrease of 41% in employees' output^[6,55]. This indicates that voice endorsement is significant in leaders influencing employees' work. According to the social information processing theory, leadership behaviour and voice endorsement are both crucial information clues in the workplace environment. Leadership behaviour is a general social contextual information clue directed towards employees^[19]. Voice endorsement is specific information based on the feedback from employees and leaders regarding specific advice events^[56]. Employees' goal orientation and information processing may be affected when they perceive particular information^[41]. Therefore, this study examines the moderating role of voice endorsement as a special information clue in the relationship between leadership behaviour and goal orientation.

As mentioned, opening leadership positively affect employees' learning goal orientation, as employees focus on ability enhancement due to the leader's encouragement. Research indicates that opening leadership inspire employees to generate innovative thoughts and initiatives^[6]. Employees who make learning and explorative suggestions are more likely to be noticed and recognized by opening leaders. Higher voice endorsement enhances employees' perception of leadership encouragement for learning and exploration, thereby strengthening employees' learning goals. Moreover, voice endorsement serves as positive feedback to make employees perceive appreciation and trust in leaders^[53,54,57]. This, in turn, strengthens employees' learning motivation and improves their learning goal orientation. Employees with lower voice endorsement may feel undervalued by leaders, which may trigger negative reactions such as a weakened learning goal orientation^[57].

Correspondingly, closing leadership positively affect employees' performance goal orientation by emphasizing task completion. Research has shown that closing leadership focuses on responsibility awareness and facilitates employees to provide preventive suggestions on issues that impede productivity^[6]. Therefore, closing leaders prioritize performance improvement and utilization suggestions proposed by employees. Higher voice endorsement reflects the recognition and appreciation of closing leadership towards the ideas and suggestions of employees^[53]. This empowers employees to focus more on responsibilities and tasks and enhances their performance goal orientation^[6]. Lower voice endorsement leads to negative self-assessments, causing employees to doubt their abilities to accomplish tasks or solve problems and weakening performance goal orientation^[58]. Thus:

Hypothesis 4a: Voice endorsement positively moderates the relationship between opening leadership behaviour and employees' learning goal orientation.

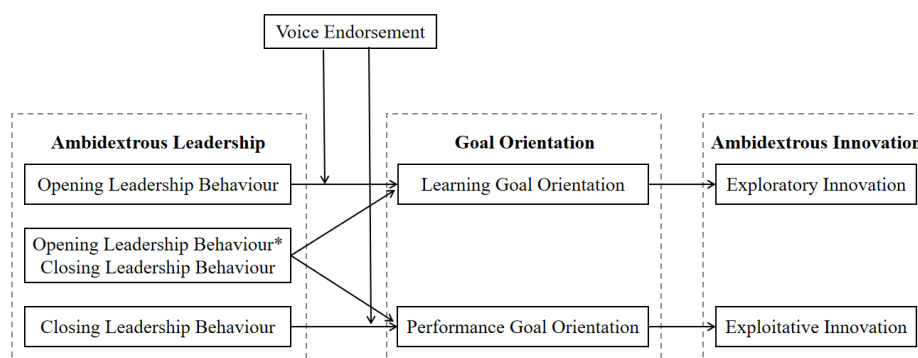
Hypothesis 4b: Voice endorsement positively moderates the relationship between closing leadership behaviour and employees' performance goal orientation.

In conclusion, under higher voice endorsement, the signal of opening leadership explicitly encourages employees to learn and explore, which enhances employees' learning goal orientation and promotes exploration; closed leadership signals a straightforward emphasis on efficiency and routines, which enhances the performance goal orientation and exploitative innovation in employees. Thus:

Hypothesis 5a: Voice endorsement positively moderates the mediating role of employees' learning goal orientation between opening leadership behaviour and employees' exploratory innovation.

Hypothesis 5b: Voice endorsement positively moderates the mediating role of employees' performance goal orientation between closing leadership behaviour and employees' exploitative innovation.

Figure 1. Presents the conceptual model.



3. Method

3.1 Sample and Procedure

We collect data from doctors, medical technicians, and nurses in hospitals in Sichuan, Chongqing, Shaanxi, and other areas in China. Individuals in medical technology services and health management specialize in technology R&D and service improvement, and they are more likely to take exploration and exploitation innovation activities. Literature has studied the impact of different leadership styles on individual innovation behaviour among the healthcare community in public hospitals^[59]. Therefore, focusing on the medical staff and investigating their ambidextrous innovation is consistent with this study's theoretical requirements. We first entered the questionnaire items into the Credamo platform and generated the electronic link, then we communicated with and asked the target hospital's managers to assist us in sending the questionnaire to their staff. We collected 388 questionnaires, and we got 365 valid questionnaires with a 93.83% response rate after data washing (i.e., we washed the questionnaires that were filled out for a particularly short time and those that were filled with patterns to guarantee data quality). Of these valid questionnaires, 28.22% were male and 71.78% were female; regarding age, 22-31-year-olds accounted for 31.78%, while 32-41-year-olds accounted for 27.12%, accounting for more than half of all respondents; those with a bachelor's degree accounted for the largest proportion of respondents (60.55%); 50.41% of respondents had worked for more than ten years, 18.90% for 6-10 years, and 30.69% had worked for less than or equal to five years.

3.2 Measures

The questionnaire was developed using established scales that have been widely used in existing research. A standard back-translation procedure was performed to ensure not only the accuracy of the translation but also the adaptation of items to the Chinese context. The scales were measured on a five-point Likert scale, with "1" representing "strongly disagree" and "5" representing "strongly agree".

Ambidextrous Leadership. Ambidextrous leadership is the product of opening and closing leadership^[6]. Opening and closing leadership are measured by Rosing et al.(2011)^[60]. The opening leadership behaviour scale has five items, such as "My immediate superior allows me to present different ideas," while the closing leadership behaviour scale consists of five items, such as "My immediate superior establishes standards for completing tasks".

Goal Orientation. The measurement of learning goal orientation and performance goal orientation originates from Vandewalle(1997)^[61]. An example of an item of learning goal orientation is "I am willing to choose challenging tasks so that I can learn a lot from them". An example of an item of performance goal orientation is "I work hard to find ways to prove my abilities to others in my job".

Ambidextrous Innovation. Ambidextrous innovation is measured by exploratory innovation and exploitative innovation based on the study of Mom et al.(2009)^[62]. We use five items to measure the exploratory innovation. An example of an item is "In my work, the innovation I make requires seeking new opportunities in technology/process/service"; We use four items to measure the exploitative innovation. An example of an item is "In my work, the innovation I make can be completed using existing knowledge".

Voice Endorsement. Following the research of Burris (2012)^[63], we measure voice endorsement using a five-item scale. An example of an item is "My immediate supervisor considers my job suggestions or opinions valuable".

Control Variables. The control variables in this study include organizational size, job position, gender, and age.

4. Results

4.1 Reliability and Validity Test

We conducted several tests to ensure the reliability and validity of the data. Regarding reliability, the Cronbach's alpha values for opening leadership (0.915), closing leadership (0.870), learning goal orientation (0.894), performance goal orientation (0.852), exploratory innovation (0.935), exploitative innovation (0.839), and voice endorsement (0.910) were analysed using SPSS 24.0. The results show that the Cronbach's alpha values of all constructs were greater than 0.7, which exhibits good reliability.

Regarding validity, we conducted the KMO value and Bartlett's sphericity test in SPSS 24.0 and tested the convergent validity and discriminant validity by AMOS 24.0. Convergent validity results show that the factor loadings of all the items were greater than 0.6. The average extracted variances (AVE) of the constructs were 0.686 (opening leadership), 0.578 (closing leadership), 0.693 (learning goal orientation), 0.600 (performance goal orientation), 0.786 (exploratory innovation), 0.637 (exploitative innovation), and 0.673 (voice endorsement), the AVEs were above 0.5, indicating a high discriminant validity. The constructs' composite reliabilities (CR) were 0.916, 0.872, 0.900, 0.856, 0.936, 0.840, and 0.911, all greater than 0.7, indicating a good convergent validity. Table 1 presents the confirmatory factor analysis, which indicates that the seven-factor model is best-fitting and our constructs have good discriminant validity.

Table 1. Results of the Confirmatory Factor Analysis.

Model	χ^2	df	χ^2/df	RMSEA	RMR	CFI	TLI	IFI
seven-factor	1005.579	384	2.619	0.067	0.038	0.927	0.917	0.927
six-factor	1129.776	390	2.897	0.072	0.041	0.913	0.903	0.913
five-factor	1519.835	395	3.848	0.088	0.058	0.868	0.854	0.868
four-factor	1681.229	399	4.214	0.094	0.06	0.849	0.836	0.850
three-factor	2628.022	402	6.537	0.123	0.09	0.738	0.717	0.739
two-factor	3074.075	404	7.609	0.135	0.096	0.686	0.662	0.687
single-factor	3844.130	405	9.492	0.153	0.101	0.596	0.566	0.597

Note: N=365. The seven-factor model is a hypothetical model; the six-factor model combines exploratory innovation and exploitative innovation into one factor; the five-factor model combines learning goal orientation and performance goal orientation into one factor; the four-factor model combines opening leadership and closing leadership into one factor; the three-factor model combines exploratory innovation, exploitative innovation, and voice endorsement into one factor; the two-factor model combines exploratory innovation, exploitative innovation, voice endorsement, learning goal orientation, and performance goal orientation into one factor; and the single-factor model combines all seven variables into one factor.

4.2 Common Method Biases

This study employed a method of controlling for unmeasured latent method factors to examine the common method biases. We added a common method factor to the seven-factor model (Table 1) to make an eight-factor comparative model. We compared the fit indices of the two models, and the changes in each index were below 0.03 (Δ CFI=0.014, Δ TLI=0.010, Δ ILI=0.014; Δ RMSEA=0.004, Δ RMR=0.006), indicating that adding a common method factor did not improve the model. Therefore, the common method variance is not a concern in our study.

4.3 Descriptive Statistics and Correlation Analysis

Table 2 presents the descriptive statistical analysis. As shown in Table 2, opening leadership demonstrates a positive correlation with learning goal orientation ($r=0.521$, $p<0.01$), while closing leadership shows a positive correlation with performance goal orientation ($r=0.353$, $p<0.01$). Additionally, learning goal orientation is positively correlated with exploratory innovation ($r=0.654$, $p<0.01$), and performance goal orientation is positively correlated with exploitative innovation ($r=0.473$, $p<0.01$). These findings provide preliminary support for the research.

Table 2. Descriptive statistical analysis.

Variables Results of the Confirmatory Factor Analysis	1	2	3	4	5	6	7	8	9	10	11
1. Size of organization	1										
2. Job positions	0.021	1									
3. Gender	0.059	-0.105*	1								
4. Age	-0.114*	-0.001	-0.202**	1							
5. Opening leadership behaviour	-0.043	-0.022	0.069	0.149**	1						
6. Closing leadership behaviour	-0.033	0.023	0.055	0.096	0.727**	1					
7. Learning goal orientation	-0.081	0.106*	-0.050	0.082	0.521**	0.481**	1				
8. Performance goal orientation	-0.115*	0.030	-0.045	0.130*	0.323**	0.353**	0.527**	1			
9. Exploratory innovation	-0.078	0.210**	0.024	0.033	0.555**	0.512**	0.654**	0.443**	1		
10. Exploitative innovation	-0.063	0.110*	0.023	0.058	0.484**	0.502**	0.563**	0.473**	0.750**	1	
11. Voice endorsement	-0.077	0.051	-0.015	0.165**	0.704**	0.607**	0.468**	0.260**	0.505**	0.423**	1
Mean	3.230	2.403	1.718	3.093	3.993	4.031	4.047	3.702	3.956	3.972	3.815
S D	1.009	1.305	0.451	0.976	0.804	0.719	0.785	0.908	0.806	0.761	0.752

Note: N = 365; * p < 0.05; ** p < 0.01; *** p < 0.001 (two-tailed), the same below.

4.4 Test of Main Effect and Mediation Effect

Figure 2 shows the main and mediation effects testing by AMOS 24.0 (model fit: 2/df=2.301, RMSEA=0.060, CFI=0.923, TLI=0.914, IFI=0.923). The results indicate that opening leadership behaviour is significantly positively correlated with exploratory innovation (b=0.428, p<0.001), and closing leadership behaviour is significantly positively correlated with exploitative innovation (b=0.489, p<0.001). Thus, Hypothesis 1a and Hypothesis 1b are supported. Furthermore, there is a significant positive correlation between open leadership and learning goal orientation (b=0.661, p<0.001), and a significant positive correlation between closed leadership and performance goal orientation (b=0.547, p<0.001). Additionally, learning goal orientation is significantly positively correlated with exploratory innovation (b=0.353, p<0.001), and performance goal orientation is significantly positively correlated with exploitative innovation (b=0.309, p<0.001).

Figure 2. Path analysis result.

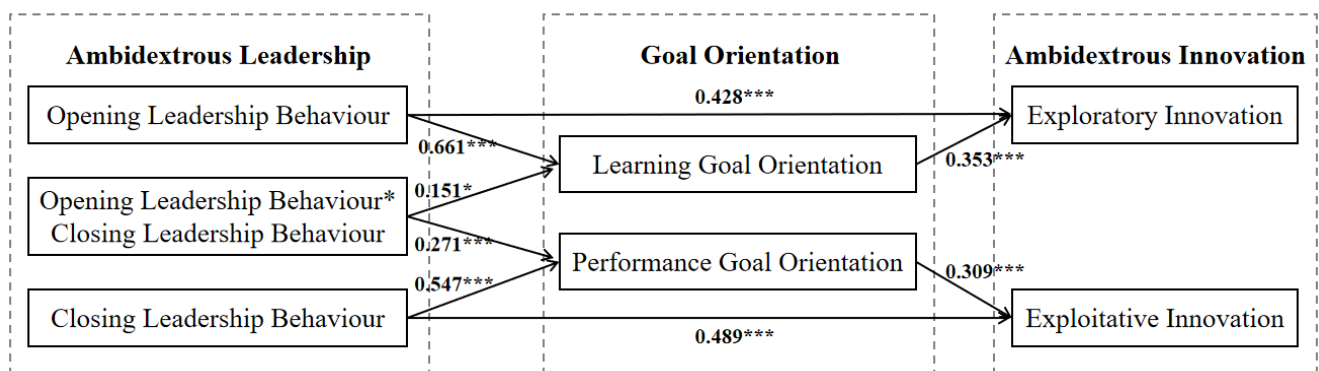


Table 3 presents the results of the indirect effect analysis. We adopted the Bootstrapping method (Table 3) with 5000 Bootstrap sample sizes and a 95% confidence level for the confidence interval. The value between BootLLCI and BootULCI excluding 0 indicates that the mediation effect is significant. Opening leadership positively influences exploratory innovation through goal orientation learning with an indirect effect value of 0.251 and a 95% confidence interval of [0.159, 0.388], supporting Hypothesis 2a. Closing leadership positively influences exploitative innovation through performance goal orientation with an indirect effect value of 0.176 and a 95% confidence interval of [0.093, 0.300], supporting Hypothesis 2b. Ambidextrous leadership exerts a positive impact on exploratory innovation through learning goal orientation, with an indirect effect value of 0.051 and a 95% confidence interval of [0.007, 0.805], supporting Hypothesis 3a. Ambidextrous leadership also positively influences exploitative innovation through performance goal orientation with an indirect effect value of 0.068 and a 95% confidence interval of [0.026, 0.507], supporting Hypothesis 3b.

Table 3. Results of the mediation effects.

Path	Estimate	SE	[BootLLCI, BootULCI]
Opening leadership behaviour→Learning goal orientation→Exploratory innovation	0.251	0.064	[0.159,0.388]
Closing Leadership behaviour→Performance goal orientation→Exploitative innovation	0.176	0.055	[0.093,0.300]
Ambidextrous leadership→Learning goal orientation→Exploratory innovation	0.051	0.284	[0.007,0.805]
Ambidextrous leadership→Performance goal orientation→Exploitative innovation	0.068	0.142	[0.026,0.507]

Bootstrapping sample size is 5000; 95% confidence intervals presented

4.5 Test of Moderating Effects and Moderated Mediating Effects

This study used PROCESS v3.3 to test the moderated mediation effect of voice endorsement with the Bootstrapping technique (Table 4). Firstly, voice endorsement positively moderates the relationship between opening leadership and learning goal orientation, and the results indicate a significant indirect effect ($b=0.101$, $p<0.05$) with a 95% confidence interval of [0.012,0.190]. Thus, Hypothesis 4a is supported, as shown in Fig. 3. Secondly, voice endorsement positively moderates the relationship between opening leadership and learning goal orientation ($b=0.213$, $p<0.01$) with a 95% confidence interval of [0.093,0.333], supporting Hypothesis 4b, as shown in Fig. 4.

Table 4. Results of the moderating effects and moderating mediating effects.

Path	Effect	Standard error	95% CI	
			Lower limit	Upper limit
Opening leadership behaviour →Learning goal orientation	0.101	0.045	0.012	0.190
Closing Leadership behaviour →Performance goal orientation	0.213	0.061	0.093	0.333
Opening leadership behaviour →Learning goal orientation →Exploratory innovation	0.050	0.031	0.001	0.120
Closing Leadership behaviour →Performance goal orientation →Exploitative innovation	0.061	0.021	0.020	0.102

Bootstrapping sample size is 5000; 95% confidence intervals presented.

Figure 3. The moderating effect of voice endorsement between opening leadership behaviour and learning goal orientation.

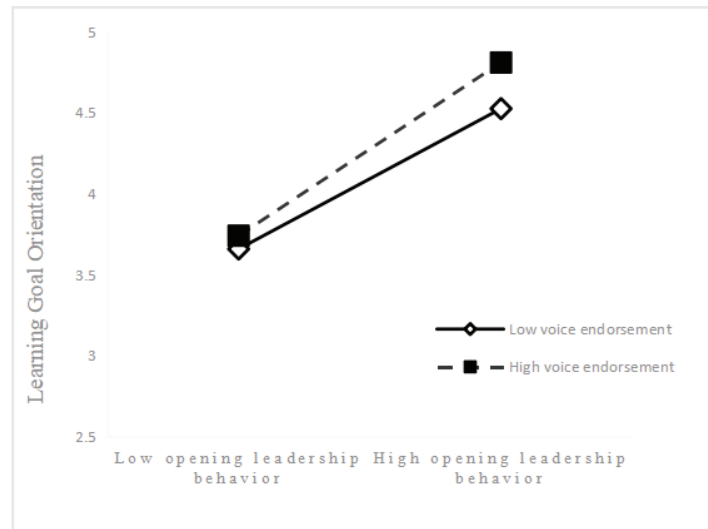
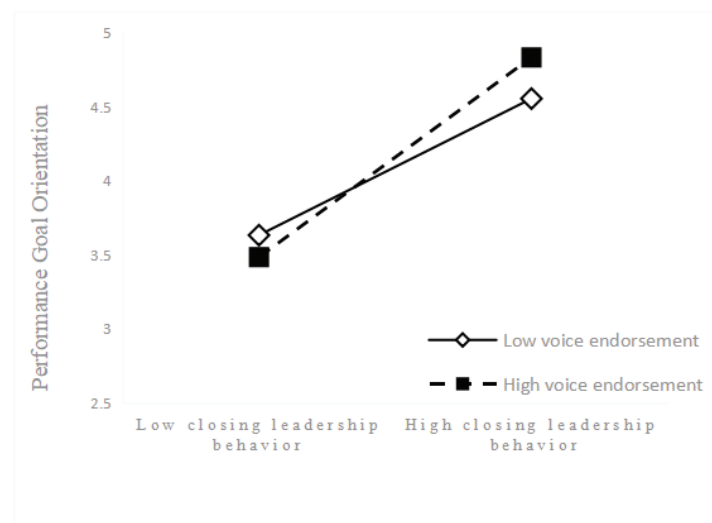


Figure 4. The moderating effect of voice endorsement between closing leadership behaviour and performance goal orientation.



Moreover, we applied PROCESS v3.3 to investigate the moderated mediating effect of voice endorsement on goal orientation between ambidextrous leadership and ambidextrous innovation (Table 4). The mediating role of learning goal orientation between opening leadership and exploratory innovation is positively moderated by voice endorsement, with an indirect effect value of 0.050 and a 95% confidence interval of [0.001, 0.120]. Thus, Hypothesis 5a is supported. In addition, voice endorsement positively moderates the mediating role of performance goal orientation between closing leadership and exploitative innovation, with an indirect effect value of 0.061 and a 95% confidence interval of [0.020, 0.102]. Thus, Hypothesis 5b is supported.

5. Discussion

5.1 Conclusion

Based on the social information processing theory, this study examines the mechanism of ambidextrous leadership on ambidextrous innovation from the goal orientation perspective. The results indicate that: (1) Opening leadership behaviour positively influences exploratory innovation, whereas closed leadership behaviour positively influences exploitative innovation. (2) Learning goal orientation partially mediates the relationship between opening leadership behaviour and exploratory innovation, whereas performance goal orientation partially mediates the relationship between closing leadership behaviour and exploitative innovation. Moreover, ambidextrous leadership, resulting from the product of open and closed leadership, has a positive impact on exploratory innovation through learning goal orientation and a positive influence on

exploitative innovation through performance goal orientation. (3) This study examines the positive moderated effect of voice endorsement on the indirect relationship between leadership behaviour and ambidextrous innovation through goal orientation.

5.2 Theoretical Contributions

Our study makes three contributions to existing research on this topic. First, based on the social information processing theory, this study reveals the mechanism of ambidextrous leadership on employees' ambidextrous innovation, which expands the theoretical research perspective of ambidextrous leadership. Prior studies have primarily focused on the effect of ambidextrous leadership behaviour on team innovation, team creativity, and employee innovative behaviour from the perspectives of emotional cognitive theory^[6], interactive cognitive theory^[17], dual-factor theory^[23,64], and social cognitive theory^[64]. However, most of these studies have explored the impact of ambidextrous leadership behaviour as a general social contextual cue on outcomes. This study integrates ambidextrous leadership and voice endorsement into a comprehensive information framework from the perspective of social information processing. We analyze the role of general social contextual cues conveyed by leadership behaviour and elucidate the role of specific informational cues from leaders' voice endorsement. Our study thus not only provides theoretical support for a comprehensive process of ambidextrous innovation behaviour but also supplements the research of the social information processing theory.

Second, this study reveals the influence and mechanism of ambidextrous leadership on ambidextrous innovation. The findings not only furnish empirical evidence for investigating the antecedents of ambidextrous innovation but also establish a connection between voice endorsement and goal orientation within ambidextrous leadership and innovation research. Existing research has predominantly examined the relationship between ambidextrous leadership and innovation through the perspectives of team interaction and dyadic learning^[6,51]. This study explores how ambidextrous leadership influences employees' ambidextrous innovation, examining the mediating effects of learning and performance goal orientations. Our study introduces a novel perspective to examine the impact of ambidextrous leadership on ambidextrous innovation, contributing to a comprehensive understanding of its underlying processes.

Third, this study reveals the moderating role of voice endorsement in the relationship between ambidextrous leadership and ambidextrous innovation. This advances research on the boundary conditions governing how ambidextrous leadership influences ambidextrous innovation. While existing literature predominantly focuses on the factors influencing or the outcomes of voice endorsement, this study considers leaders' voice endorsement as a specific form of social information. We incorporate voice endorsement into the research framework of "ambidextrous leadership - goal orientation - ambidextrous innovation" based on the social information processing theory. By revealing the moderating and moderated mediating effect of voice endorsement, we supplement the boundary research on the relationship between ambidextrous leadership and ambidextrous innovation. Moreover, it extends the research on voice endorsement.

5.3 Practical Contributions

Our study offers several significant practical implications, helping illuminate how leaders achieve employees' ambidextrous innovation. First, managers can nurture and develop ambidextrous thinking and leadership abilities to stimulate employees to participate in ambidextrous innovation activities. Ambidextrous leadership thinking allows for the flexible handling of contradictions that may arise during the innovation process. Therefore, leaders should attempt to switch between opening and closing leadership styles in different situations to achieve the synergy effect of ambidextrous leadership.

Second, managers can help employees develop different goal orientations to cultivate ambidextrous innovation behaviours. Learning goal orientation can motivate employees to gain new knowledge and abilities. Performance goal orientation can improve employees' performance and efficiency. For example, managers can encourage employees to try new approaches to complete tasks or inspire employees' work enthusiasm through role division and task allocation. Moreover, managers can offer rewards to stimulate employees' achievement motivation.

Third, managers should consider valuable suggestions from employees. Organizations cannot thrive without members' voices; therefore, managers should encourage employees to offer suggestions and refine the mechanism for endorsing those suggestions. Moreover, it is critical to acknowledge employees' voices and provide feedback, which promotes an awareness of recognition and value in employees, strengthening their connection with leaders and the organization.

5.4 Limitations and Future Directions

Despite its contributions, this study also has limitations. First, this study used the cross-sectional design of questionnaires, which limits our ability to assess causality relationships. Future research can further examine the relationship through longitudinal data. Second, this study used a multiplication of opening and closing leadership behaviour to represent ambidextrous leadership. Although this is a general measurement of “ambidextrous” leadership^[6,51], there have also been studies using “difference” or “sum” to measure “ambidextrous” leadership. Future research can try alternative scales for ambidextrous leadership and validate our conclusions. Third, this study revealed the boundary effects of voice endorsement, while not distinguishing the contents of voice endorsement. Previous research has found that leaders react differently to different types of suggestion content^[63]. Therefore, future research can further explore the effect of different voice endorsement content on the relationship between ambidextrous leadership behaviours and goal orientation.

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