

Influence of Leaders' Loneliness on Voice-Taking: The Role of Social Self-Efficacy and Performance Pressure

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Abstract: This paper attempts to unlock how and when leaders' loneliness influences their voice-taking behavior in the workplace by integrating the regulatory loop model of loneliness and the affect theory of social exchange. Through collecting a daily diary study of 87 paired leader-follower samples from two electronics industry companies based in Guangzhou, China, this study finds that (1) leaders' loneliness has a significant negative impact on social self-efficacy and voice-taking behavior; (2) leaders' social self-efficacy mediates the relationship between their loneliness and voice-taking behavior; (3) performance pressure moderates the relationship between leaders' loneliness and voice-taking behavior; and, (4) the indirect effect between leaders' loneliness and voice-taking behavior (through social self-efficacy) becomes stronger when performance pressure is higher. Therefore, this study provides some practical implications on: (1) how to provide a series of loneliness interventions to address loneliness in all areas of life; and, (2) how to establish an internal culture or atmosphere within the organization to encourage leaders to adopt followers' suggestions for improvement.

Keywords: Leader's loneliness; social self-efficacy; voice taking; performance pressure

1 Introduction

Loneliness is a complex emotion that occurs when emotional needs and social needs are not met, which is a frustrating state of mind [1]. Research has shown that loneliness can cause a series of negative consequences in terms of emotions, cognitions, attitudes and behaviors in lonely individuals [2,3]. For instance, lonely people tend to have a negative self-awareness and think that they are not able to establish effective social relationships with others; they also lack competence in dealing with others [4]. Specifically, loneliness is a common phenomenon among managers and leaders [5]. Those who are in high positions often show a tendency to reduce contact with others [6]. There is evidence that more than half of small business owners feel a sense of loneliness [7]. Also, leaders experience more loneliness than their followers do. However, within organizations, leaders have more opportunities to express their feelings [8], which makes it easier for lonely leaders to transmit negative emotions to followers and influence the performance of their followers. More critically, leaders are the critical decision-makers in organizations [9,10], and leaders' loneliness may also affect the exchange and integration with the opinions of followers. Thus, this kind of emotion may intentionally or unintentionally enter into organizational decision-making and then affect organizational development as a whole.

Past research has focused on the psychological and behavioral responses of followers' loneliness. Researchers have shown that individuals who experience high levels of loneliness related to more negative outcomes than those who are not alone or who have a low sense of loneliness. For instance, loneliness tends to bring about higher turnover intentions [11] and subsequent depression [12], while decrease subjective



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well-being [13], job performance [14], and organizational citizenship behavior [5]. In addition to studying employees' feelings of loneliness, research has examined loneliness as a concern for leaders [11]. However, whether and how leaders' loneliness would influence their attitude and behavior in the workplace is still unclear. Leaders and followers have significant differences in roles in organizations. For example, leaders, as representatives of the organization, have the power of various kinds that they wield. Thus, compared with followers, a leader's change may have greater impacts on organizational decision-making processes and performance development. Considering that voice is valuable as it enables people to overcome the limitations of their knowledge and experience by taking advantage of social resources [15]. In this case, voice-taking is a typical decision-making interaction behavior, which means that leaders accept the behaviors and suggestions of followers for changing the status of an organization [16]. This study thus tries to examine how leaders' loneliness influence their voice-taking process.

To better understand the relationship between leaders' loneliness and their voice-taking behavior, we draw from two theoretical traditions. The first is regulatory loop model of loneliness [17], which describes the psychological mechanisms within lonelier people. The second is the affect theory of social exchange [18,19], a sociological theory that takes into account the role of other people's thoughts about the lonely person [13]. Scholars assert that when lonely individuals fall into this negative cycle, they exhibit a series of withdrawal behaviors and negative social behaviors. Therefore, we speculate that the underlying process between leaders' loneliness and voice-taking in the workplace may be closely related to social self-efficacy [20]. When loneliness becomes a stable emotion, an individual produces negative cognitions and then abandons the interpersonal relationship, resulting in reduced social self-efficacy, which may hinder his/her voice taking behavior [21]. At the same time, loneliness is a unique emotion in the workplace, which coexists with certain characteristics of the work environment, such as a competitive atmosphere and a virtual team [5]. Under this circumstance, performance stress is one of the prevailing situations in organizational contexts. Many organizations force employees to continuously improve their job performance [22]. Meanwhile, employees might feel that failing to meet performance requirements would produce substantial consequences [22], which, to a certain extent, aggravates the negative emotions in the workplace. Similarly, when the perception of performance pressure on leaders is high, lonely leaders may have a negative emotion and then fall into a more negative cycle, the state of which may hinder their voice-taking behaviors.

Our research seeks to make the following contributions. First, we shift the literature's predominant focus on the effects of loneliness from followers to leaders and explore the impact of leaders' loneliness on their voice-taking behavior. Most previous research focused on the impact of follower loneliness [2] and rarely noticed leaders' loneliness in the workplace. As lonely people tend to have deficiencies in relationship building, and are also reported to have poor social networks [23], which means that the effect of leader loneliness could have effects on their interpersonal behavior towards the followers' voices. Second, it takes an initial step to examine an important boundary condition (i.e., performance pressure), which is an important issue in the reality of business that not only predicts the behavior of members of an organization but also puts psychological pressure on individuals [24]. We propose that performance pressure explains the relationship between leaders' loneliness and their voice-taking behaviors, and we gain a deep understanding of the relationship between the two. Finally, previous research on cross-cultural comparison of American and Chinese students have found that Chinese students accounted for much of their relatively higher scores on depression and loneliness [25]. Based on regulatory loop model of loneliness and the affect theory of social exchange, this study emphasizes the importance of culture difference (i.e., China is a relatively more interdependent culture) in loneliness research, and examine the effects of loneliness on leaders' attitudes and behaviors. A depiction of our hypothesized model is shown in Fig. 1.

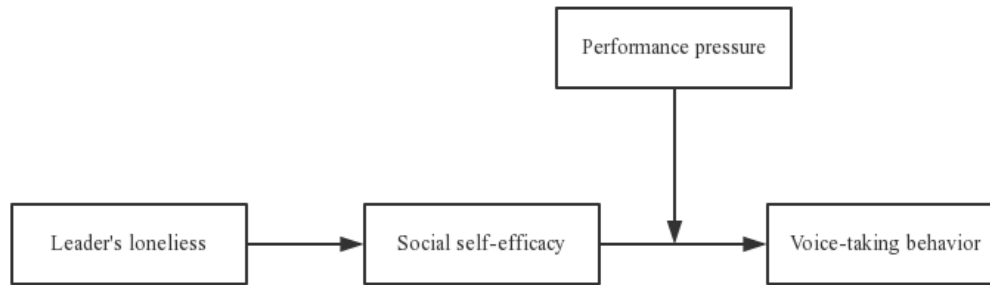


Figure 1: Hypothesized model

2 Theory and Hypotheses

2.1 Leader's Loneliness and Voice-Taking Behavior

Voice involves discretionary expression of suggestions, ideas, and concerns regarding work issues with the intent to positively contribute to the organization or work unit [26,27]. Recognizing the importance of voice, research has devoted extensive efforts to understanding the situational and psychological factors that promote or impede voice behaviors [26,28]. Leaders are the main receivers of followers' voices and they play a vital role in followers' voices because they are the key factors in determining whether followers' voice can be adopted [10].

In literature on voice-taking, leadership is usually viewed as one of the predictors of followers' voice. For example, humble leaders are good at detecting problems and actively seeking solutions to the problems, so they are good at listening to followers' ideas [29]. Emotional leaders prefer to encourage followers to give opinions and then respond to their suggestions [30]. Accordingly, recipients with positive emotional control are more willing to adopt other people's suggestions; whilst recipients in negative emotional states tend to reject suggestions [24]. In addition, individuals who experience high levels of loneliness always have a low sense of self-esteem, fear and inferiority because they feel that they are not qualified for their current jobs and do not meet the expectations of the organization [31]. As a result, they are unwilling to conduct interpersonal interactions, exchange ideas and cooperate with others [13]. Therefore, when faced with followers' suggestions, lonely leaders are more likely to choose not to respond to the followers' suggestions. Risk-related decision-making research also points out that positive or negative emotions affect the decision-making process and evaluation of recipients. For example, Ortega et al. [32] assert that individuals with positive emotions are more optimistic and confident about results while making decisions, hence they are more willing to take risks; whilst individuals with negative emotions are more pessimistic, are unwilling to take risks, hence, they are more conservative in their decision-making. In this case, lonely leaders will be more cautious and try to reduce their voice-taking behavior when facing followers' voices. Furthermore, in the process of social interaction, individuals do not receive feedback and rewards immediately, which means this kind of reciprocal behavior is more likely to occur in the future and participants need to take certain risks [5]. Also, individuals with high levels of loneliness tend to have a lower sense of trust in others and often adopt a negative avoidance approach to deal with risks [33]. Given that the voice from followers might challenge the status quo and leaders may perceive it as an unknown and uncertain process, even a deliberate attack on them [9,34]. Thus, lonely leaders may hesitate to accept followers' voice because they hold levels of low trust towards the followers and are afraid of potential risks. Based on above argument, we hypothesize it as follows:

H1: Leaders' loneliness has a negative impact on voice taking behavior.

2.2 Mediating Effects of Social Self-Efficacy

Social self-efficacy refers to the confidence of members in their abilities to participate in social work [35]. Social skills include work-related social interaction tasks and the ability to build and maintain effective relationships with other employees in the organization [36]. Studies have shown that social self-efficacy is influenced by individual emotions [37]. Specifically, when individuals evaluate their abilities, they often rely on psychological and emotional feelings. A positive emotional state can enhance social self-efficacy, while negative emotions can weaken social self-efficacy [38]. Loneliness is a subjective experience that can cause pain, which, in turn, affects individual self-esteem, self-confidence and social self-identity [39]. Research finds that when loneliness becomes a stable emotion, it produces a kind of value assessment and feelings for specific groups and environments [40]. For example, loneliness promotes false cognition and negative emotions in individuals [3]. Therefore, when negative emotions from loneliness occur, a leader doubts his or her own ability, psychological pressure is heightened. Then fear, vigilance and subjective rejection are generated, which further influences the leaders' judgment of his or her social ability.

Regulatory loop model of loneliness suggests that when the current emotional and social environment cannot meet an individual's needs, workplace loneliness occurs, and this negative emotion causes lonely individuals to fall into a cycle of negative psychological states [17]. In specific, loneliness individuals doubt their ability, and this psychological burden increases their perception of pressure, which further affects their feelings of social self-efficacy. Besides, evidence from behavioral studies suggests that loneliness in humans affects early attentional processes to negative social stimuli (e.g., social threats) [21]. Therefore, lonely individuals often lack security [41] and avoid social opportunities [35]. Based on above argument, we hypothesize that when leaders experience loneliness in the workplace, their confidence is inevitably defeated, which, in turn, leads to lower levels of social self-efficacy.

H2: Leaders' loneliness has a negative impact on social self-efficacy.

Although the regulatory loop model of loneliness can effectively explain the negative circle adaptability of loneliness in individuals, it does not focus on the interpersonal interaction level of work—that is, the expectation of interaction of members in the workplace. To fill these gaps, we draw upon the affect theory of social exchange that is based on a wider range of social situations such as work situations, using emotion as a core feature of social exchange and providing interpersonal and situational orientation [19]. This theory enables us to explore how positive and negative emotions generated in social exchanges affect an individual's perception of the next exchange relationship and promote subsequent behaviors. Therefore, we integrate the affect theory of social exchange with the regulatory loop model of loneliness, which were based on emotion point, to more clearly understand individual psychological cycle patterns and behavioral performances in social contexts—namely, the relationship among leaders' loneliness, social self-efficacy and voice taking.

The affect theory of social exchange explains that emotions in social interactions are the primary factor in establishing connections with groups and social networks [35], indicating that social interactions will produce positive or negative emotions, which then affect an individual's assessment of others (such as their work team members) [42]. In a social environment, social self-efficacy represents the expectation of an individual's ability to manipulate behavior in a particular context [43]. High social self-efficacy affects the subject and stimulates human potential [44]. When an individual is confident in his or her social ability, he or she tends to choose the more challenging work, set a higher level for his or her goals, and be willing to change the status through social contact [45]. Thus, in the face of the followers' suggestions, leaders will have more confidence in addressing relevant issues and take more voices. On the contrary, when an individual think that his/her social self-efficacy is low, he/she will narrow the circle of social interaction, reduce interaction with others, and then generate a series of negative social behaviors. Notably, loneliness causes leaders to reduce effective communication and interaction with their followers. Leaders are hence not willing to accept followers' voices. Based on the above argument, we hypothesize it as follows:

H3: Social self-efficacy has a positive impact on voice-taking behavior.

In interpersonal communication, positive emotions brought by interaction are closely related to a sense

of belonging and are further transformed into emotional communication and helpful behavior [48]. On the country, negative emotions, such as loneliness, are associated with weak relationships and distance [49], resulting in less emotional communication behaviors. The affect theory of social exchange and regulatory loop model of loneliness indicate that emotions, in the process of communication, are the key factors in assessing personal social behaviors. As loneliness often creates a stable cycle of negative interactions—that is, loneliness causes individuals to treat others and social relationships negatively and makes them lack of confidence in their social skills, thereby affecting their ability to judge social skills and generate low social self-efficacy [17]. In interpersonal communications, negative emotions make individuals think that maintaining interpersonal relationships is not worth the effort, which results in a series of negative social behaviors. Therefore, when leaders experience loneliness in the workplace, they evaluate their abilities, view the future negatively, and then choose to retreat during later interactions [50]. When followers' voice to leaders that challenge the existing organizational system, lonely leaders are more likely to develop low levels of social self-efficacy and ignore the problems in the workplace. Based on the above argument, we hypothesize it as follows:

H4: Social self-efficacy has a mediating effect between leaders' loneliness and voice taking behavior.

2.3 Moderating Effects of Performance Pressure

This paper predicted that whether loneliness leaders accept voice from the followers may depend on the external force imposed on the organizations, such as stress. Stress is an adaptive response to an external situation that leads to changes in physical, mental and behavior [49]. Performance stress is a specific type of stress that refers to the psychological and behavioral responses of participants pursuing high performance while working towards established organizational or personal goals [22,50]. High performance pressures can pose a threat to members of the organization for a variety of reasons [22]. First, high performance requirements may highlight job inadequacies [51], which requires members to break their previous habits by questioning prevailing work processes. By doing so, members reframe problems and tasks to meet performance requirements. However, it is not easy to change habits. Second, members understand that their efforts are related to the conductive results [22]. Failing to meet performance requirements can lead to negative consequences, which raises individuals' concerns about maintaining current job rankings and their acceptance on the team [22]. Therefore, high performance requirements bring a sense of urgency and crisis awareness to members of an organization.

The principle of self-interest and self-protection suggests that when individuals feel threatened by themselves, they will stimulate self-protection needs and take measures to improve their sense of security [52]. In this case, when high performance pressures threaten leaders' well-being, their self-protection awareness is inspired, and they tend to look for ways to improve their performance [51]. Taking voice is a form of self-protection behavior for leaders because the voice of followers normally has a positive impact on the operation of an organization [53]. Besides, as followers often propose new ideas and methods that can guide leaders to pay attention to and correct existing problems in the workplace [54], leaders can focus on important issues in the organization and improve performance by taking voice. In summary, leaders who face high performance pressure are more willing to exchange ideas with colleagues and their followers to achieve high performance requirements. In contrast, low performance pressure does not create a large psychological burden on the members of an organization, which leads to less negative emotions such as nervousness, complaints, and the feeling of being threatened. Therefore, low performance pressure does not stimulate an individual's strong sense of self-protection. Also, studies have shown that when the performance adaptability of organizational members and the performance requirements of an organization are equal, an individual's status is relaxed, resulting in mitigated and released performance pressures [55]. Based on the above argument, we hypothesize the following:

H5: Performance stress moderates the positive effect of social self-efficacy on voice-taking behavior. As the performance pressure of leaders' perception becomes greater, the positive relationship between social self-efficacy and leaders' voice-taking behavior is stronger.

As previously discussed, leaders' loneliness will cause them to attribute negative emotions to the

affiliated organization. As well as put them into a negative stable cycle, which in turn, arise negative judgment toward the followers. For example, lonely individuals are not confident in their interpersonal skills, thus having low social self-efficacy. The low level of social self-efficacy may reduce their interactions with others and produce withdrawal behaviors. In this process, performance pressure brings additional load to leaders [50]. When the performance indicators set by an organization bring greater time pressure, a leader gains a sense of urgency [56], which requires him/her to complete performance indicators within the stipulated time. The sense of urgency undoubtedly increases the negative relationship between negative emotions and behaviors. Therefore, the above hypothesis proposes a mediated moderation model in which leaders' loneliness affects voice-taking behaviors through social self-efficacy, which depends on the level of performance pressure perceived by the leader. Based on the above argument, we hypothesize the following:

H6: Performance stress moderates the indirect effect of leaders' loneliness on voice-taking behavior through social self-efficacy. When performance pressure is higher, the intermediary has a stronger effect.

3 Theory and Hypotheses

3.1 Sample

We collected data from 87 pairs of leaders and followers who were employed in two electronics companies in Guangzhou, China. Before selecting the sample, we conducted a simple survey of the two electronic companies and found that their organizational culture is relatively open (i.e., the effectiveness of feedback, supports democracy in word and deed, information and news of the company are open). Besides, managers in organizations encourage employees to make their voices heard by leaders, so the leaders' voice-taking behavior occurs every day. Data collection was performed in cooperation with the human resource management department. Before the survey, a list of managers and their e-mails was provided by the human resource management departments. The leaders were at different levels including general managers, project managers and team leaders. In this study, a daily diary study was used to conduct a survey of five working days of the subjects. We distributed 435 questionnaires, and 375 were recovered, reflecting a recovery rate of 86.21%. We excluded invalid questionnaires (including those with missing values and those that were arbitrarily answered) and the final number of questionnaires is 332. The demographic characteristics of the leaders are shown in Tab. 1.

Table1: Characteristics of the sample

	Category	Frequency	(%)
<i>Characteristics of the leaders (N = 87)</i>			
Gender	Man	48	55.2
	Woman	39	44.8
Age	Under 20	8	9.10
	21-30	21	24.2
	31-40	22	25.4
	over 41	36	41.3
Job rank	General staff	11	12.7
	Junior management	23	26.5
	Middle management	34	39.0
	Senior management	19	21.8
Job tenure	Less than a year	13	14.9
	1-4	24	27.6
	5-9	19	21.8
Nature of the job	Over 10	31	35.7
	Marketing	11	12.5

	Administrative	41	47.1
	Manufacturing	8	9.30
	Technology research and development	1	1.10
	Financial	11	12.6
	Others	15	17.4
	Junior college and below	19	21.9
Education	Bachelor degree	55	63.5
	Master degree	10	11.5
	PhD degree	3	3.10

3.2 Procedures

To examine the influence mechanism of leaders' loneliness on their voice-taking behavior, we used a diary study. First, we sent an email to each participant to inform the participants of the purpose of the study and the survey process. These leaders and their followers volunteered to participate in the research. We informed them before conducting the survey that, all their responses would be confidential and would not be released to anyone else in their companies. The responses were for research purposes only. Before the formal survey, we pulled the participants into a WeChat group, compiled the numbers for leaders and their followers, and set up the schedule for the release of the questionnaire.

We collected all data via online surveys. First, we sent a baseline survey to leaders and followers one week before the diary study phase. Both surveys included demographic measures, and the leader survey also included a measure of performance pressure. The follower survey included a measure of the supervisor-subordinate relationship. Next, in the diary study phase, both leaders and followers were sent a survey at the end of each day for five working days. The group administrators sent the questionnaires for participants to fill out daily. Leaders measured their feelings of loneliness in the morning, measured the social self-efficacy at noon, and followers measured the voice-taking behavior of their leaders in the afternoon. At each set time, to ensure accuracy, management reminded participants about the questionnaire in the WeChat group and stipulated that the response time should not exceed 30 minutes. After five days of daily surveys, the researchers paid incentives to participants who effectively completed all the questionnaires.

3.3 Measures

Following Brislin's [57] translation/back-translation procedure, a Chinese version of all measures based on original scales published in the English language was created.

Leaders' loneliness. We used the LAWS (loneliness at work scale) to measure workplace loneliness of leaders [35]. The 16-item scale including questions on emotional deprivation and a lack of social companionship. The emotional deprivation subscale had nine questions, which mainly measured the quality of interpersonal relationships in the workplace—that is, the intimacy of and satisfaction with the relationships. For example, one item was “I often feel alienated from my coworkers”. The social companionship subscale had seven questions, mainly measuring the number of interpersonal relationships in the workplace—that is, the adequacy of relationships, and included items such as “I feel included in the social aspects of work”. Participants responded to the items described above using a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree) (averaged α days = 0.90).

Social self-efficacy. We adopted from Sherer et al.'s 6-item self-efficacy scale [58]. The items included “It is very difficult for me to make new friends”, “If I see someone I would like to meet, I go to that person instead of waiting for him or her to come to me”, “I do not handle myself well in social gatherings”, and “If I see someone interesting who is hard to make friends with, I will soon stop trying to make friends with that person”. The scale used a 7-point Likert scale (ranging from 1 = strongly agree to 7 = strongly disagree) (averaged α days = 0.736).

Voice-taking behavior. We measured voice-taking behavior using 5 items from Burriss [9]. Each

follower assessed his/her leaders' behaviors over the day. Example items include the following "My direct leader will convey my opinion to his/her superiors", "When talking with his/her superiors, my leader will support my opinion", "My direct leader will implement my suggestion", "My direct leader agrees with my opinion", and "My opinion is valuable to my direct leader". Participants responded to the items described above using a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree) (averaged α days = 0.87).

Performance pressure. We measured performance pressure using 4 items from the Mitchell et al. [55] Each follower assessed his/her leaders' behaviors over the day. Example items include "I feel tremendous pressure to produce results", "The pressures for performance in my workplace are high", "If I don't produce at high levels, my job will be at risk", and "I would characterize my workplace as being a results-driven environment". Participants responded to the items described above using a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree) (averaged α days = 0.908).

Control variables. Following previous studies [5,13], we included the following control variables: gender (1 = male, 2 = female), age (1 = under 20, 2 = 21–30, 3 = 31–40, 4 = over 41), job rank (1 = general staff, 2 = junior management, 3 = middle management, 4 = senior management), job tenure (1 = less than a year, 2 = 1–4 years, 3 = 5–9 years, 4 = over 10 years), nature of the job (1 = marketing, 2 = administrative, 3 = financial, 4 = manufacturing, 5 = technology research and development, 6 = others), education level (1 = junior college and below, 2 = bachelor degree, 3 = master degree, 4 = PhD degree). We also controlled supervisor-subordinate relationship (averaged α days = 0.738), measured by the scale of Law et al., [59] (10 items, ranging from 1 = strongly disagree to 5 = strongly agree), and type of voice (averaged α days = 0.928), measured by Liang et al.'s [34] scale (6 items, ranging from 1 = strongly disagree to 7 = strongly agree).

3.4 Results

We conduct null models partitioning the amount of variance in our level-1 variables with Mplus [60] and the results are shown in Tab. 2. It reveals that the percentage of variance at the within-person level ranges from 43%-59%, which means a considerable proportion of variance existed at the within-person level, suggesting that multilevel modeling was appropriate.

Table 2: Percentage of variance in at the within-person level of variables

Variables	Within-variance	Between-variance	Percentage of variance at the within-person level
Leader's workplace loneliness	0.110	0.124	47%
Social self-efficacy	0.362	0.469	43%
Voice taking	0.408	0.279	59%

Prior to hypothesis testing, we conducted a within-person and between-person confirmatory factor analysis (CFA) to assess the fit of the measurement model. The hypothesized four-factor model showed acceptable fit to the data: $\chi^2/df = 4.06$; RMSEA = 0.096; TLI = 0.779; CFI = 0.804; SRME (within-person level) = 0.056; SRME (between-person level) = 0.071. These findings demonstrate the discriminant validity of the measures of our focal constructs [61].

Tab. 3 shows the descriptive statistics and correlations. It indicated that the data distribution of the mean and standard deviation responses of each variable is in good agreement with the normal distribution characteristics. Specifically, there was a significant negative correlation between leaders' loneliness and social self-efficacy ($r = -0.218$, $p < 0.01$), leaders' loneliness and voice-taking behaviors ($r = -0.470$, $p < 0.01$). At the same time, social self-efficacy was significantly negatively correlated with voice-taking behaviors ($r = -0.181$, $p < 0.01$).

Table 3: Descriptive statistics and correlations

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender	1											
2. Age	0.025	1										
3. Rank	0.192**	-0.223**	1									
4. Tenure	-0.094	0.099	0.288**	1								
5. Nature of job	0.085	0.445**	-0.252**	-0.076	1							
6. Education	-0.128*	0.105	0.112*	-0.089	-0.041	1						
7. Supervisor-subordinate relationship	-0.003	-0.012	0.133*	-0.040	0.018	0.084	1					
8. Type of voice	0.054	-0.061	0.097	0.092	-0.154**	-0.164**	0.079	1				
9. Leaders' loneliness	-0.033	0.055	-0.050	-0.178**	0.005	0.099	-0.176**	-0.080	1			
10. Social self-efficacy	-0.020	-0.003	-0.068	0.104	0.027	-0.092	0.071	0.054	-0.218**	1		
11. Voice taking	0.025	0.068	0.033	0.157**	0.105	-0.063	0.493**	0.026	-0.470**	0.181**	1	
12. Performance pressure	-0.071	-0.167**	0.168**	-0.001	-0.075	-0.017	-0.053	-0.162**	0.090	-0.220**	-0.094	1
Mean	1.40	3.01	1.96	2.71	2.77	3.03	3.59	1.88	3.97	3.27	2.75	2.83
SD	0.480	1.011	0.692	0.943	1.092	1.734	1.172	0.589	0.484	0.917	0.832	1.155

Notes: ** $p < 0.01$, * $p < 0.05$ (two-tailed); Below the diagonal is the correlation within the variables ($N = 87$), above the diagonal is the correlation between the variables ($N = 332$).

We used the method of hierarchical regression to test hypotheses, which puts the control variables first (i.e., gender, age, nature of the job, tenure, education level, and supervisor-subordinate relationship) at the within-person level. The results in Tab. 4 show that there is a significant negative correlation between leaders' loneliness and voice-taking behavior (Model 2, $B = -0.638$, $SE = 0.076$, $p < 0.001$), thus supporting Hypothesis 1. Besides, leaders' loneliness and social self-efficacy have a significant negative correlation (Model 1, $B = -0.353$, $SE = 0.122$, $p < 0.01$), thus supporting Hypothesis 2. Moreover, social self-efficacy was significantly positively correlated with voice-taking behavior (Model 3, $B = 0.106$, $SE = 0.044$, $p < 0.05$), thus supporting Hypothesis 3. To verify Hypothesis 4, a multilevel analysis method is used for testing. Statistical analysis using the Monte Carlo method with 2,000 replications shows that the social self-efficacy is estimated to be -0.061 for the relationship between leaders' loneliness and voice-taking behavior, and the 95% confidence interval is [-0.118, -0.003], thus supporting Hypothesis 4.

Table 4: Multilevel path analysis results

Variables	Social self-efficacy		Voice-taking behavior	
	Model 1	Model 2	Model 3	Model 4
Intercept	4.561*** (0.692)	3.797*** (0.449)	0.628 (0.359)	3.445*** (0.463)
Gender	0.023 (0.041)	-0.031 (0.033)	-0.024 (0.034)	-0.015 (0.037)
Age	-0.008 (0.103)	0.041 (0.080)	0.073 (0.088)	0.025 (0.101)
Rank	-0.028 (0.050)	0.035 (0.039)	0.012 (0.042)	0.033 (0.054)

Tenure	-0.148 (0.058)	-0.060 (0.060)	-0.067 (0.065)	-0.012 (0.072)
Nature of job	0.100 (0.054)	0.110* (0.040)	0.164*** (0.043)	0.101 (0.055)
Education	0.020 (0.049)	0.049 (0.038)	0.056 (0.044)	0.061 (0.054)
Supervisor-subordinate Relationship				
Type of voice	0.090 (0.087)	0.631*** (0.089)	0.717** (0.092)	0.384* (0.059)
Leaders' workplace loneliness	-0.353** (0.122)	-0.638*** (0.076)		-0.467*** (0.100)
Social self-efficacy			0.106* (0.044)	0.384*** (0.059)
Residual variances (within)	0.780*** (0.070)	0.396*** (0.036)	0.474*** (0.043)	0.353*** (0.047)
Residual variances (between)	0.930 (0.030)	0.574 (0.074)	0.688 (0.088)	0.071 (0.040)

Notes: Unstandardized estimates and their associated standard errors in parentheses are reported; *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Tab. 5 shows the results of our cross-level moderation. To test the moderating effects of performance stress between social self-efficacy and voice-taking behaviors, we conducted a cross-level moderating effect test and used performance pressure as a prediction of social self-efficacy and the slope of the relationship. The results show that performance pressure is significantly positively correlated with this slope ($B = 0.158$, $SE = 0.043$, $p < 0.001$). Furthermore, this paper conducts a simple slope analysis based on the study by Preacher et al. [62]. The results in Tab. 6 show that when performance pressure is high, the effect of social self-efficacy on voice-taking is -0.130 , and the 95% confidence interval is $[-0.360, 0.100]$. When performance pressure is low, the effect of social self-efficacy on voice-taking is -0.381 , and the 95% confidence interval is $[-0.732, -0.030]$. Besides, the difference between high and low groups is significant, and the 95% confidence interval is $[0.118, 0.384]$. Then, we graphed the interaction figure following the method suggested by Aiken and West [63]. As shown in Fig. 2, the positive relationship between social self-efficacy and voice-taking was strengthened for high performance pressure (one standard deviation above the mean). Thus, Hypothesis 5 is supported.

Table 5: Moderating effects of performance pressure

Variables	Voice-taking behavior
	Model
Intercepts	1.670**(0.527)
Control variables	
Gender	0.049 (0.041)
Age	0.083 (0.130)
Rank	-0.015 (0.068)
Tenure	-0.008 (0.082)
Nature of job	0.103 (0.071)
Education	0.039 (0.068)
Supervisor-subordinate relationship	-0.039 (0.040)
Type of voice	0.047 (0.121)
Social self-efficacy	-0.256 (0.148)
Performance pressure	
Intercept	1.670** (0.527)
Slope	0.158*** (0.043)
Residual variances (within)	0.362*** (0.051)
Residual variances (between)	0.480 (0.731)

Notes: Unstandardized estimates and their associated standard errors in parentheses are reported; ***p < 0.001, ** p < 0.01, * p < 0.05.

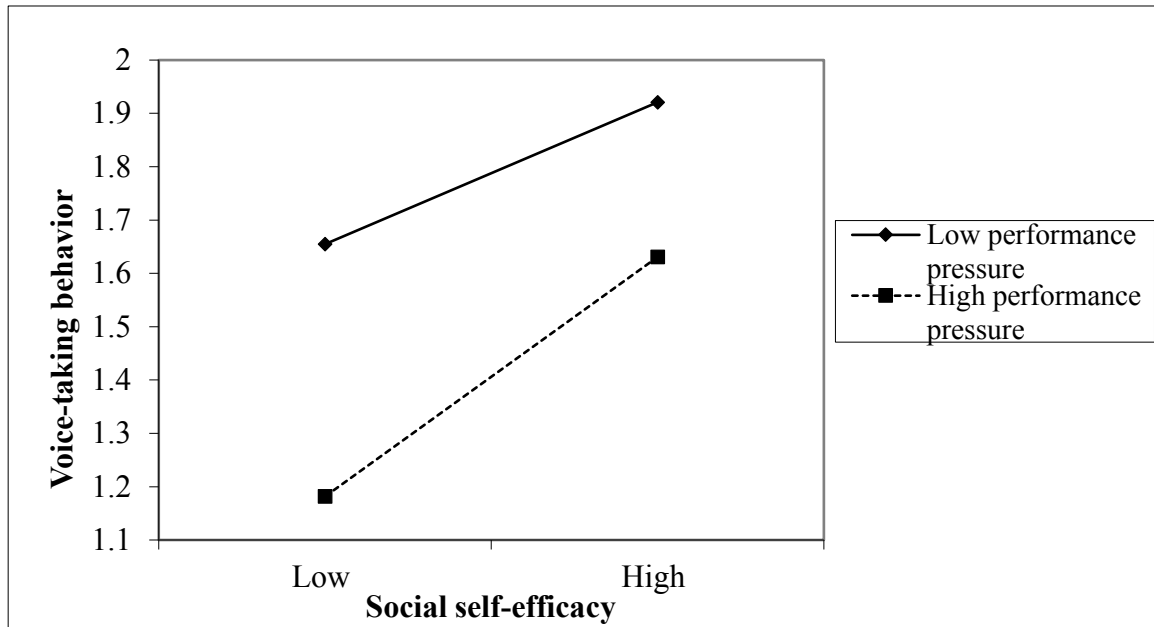


Figure 2: Moderating effect of performance pressure on social self-efficacy and voice-taking behavior

For Hypothesis 6, the results in Tab. 6 show that with high-performance pressure, the indirect effect of leaders' loneliness on voice-taking (through social self-efficacy) is 0.025, and the 95% confidence interval is [-0.095, 0.146]. Under low performance pressure, the indirect effect value was 0.108, and the 95% confidence interval is [-0.067, 0.283]. Besides, the difference between the high and low groups was significant, and the 95% confidence interval is [-0.155, -0.011], thus supporting Hypothesis 6.

Table 6: Results for simple moderation model and mediated moderation model

Model	Estimate	SE	95% CI
<i>Simple moderation model</i>			
Low (-1SD)	-0.381	0.179	[-0.732, -0.030]
High (+1SD)	-0.130	0.117	[-0.360, 0.100]
Difference	0.251	0.068	[0.118, 0.384]
<i>Mediated moderation model (mediator social self-efficacy)</i>			
Low (-1SD)	0.108	0.089	[-0.067, 0.283]
High (+1SD)	0.025	0.061	[-0.095, 0.146]
Difference	-0.083	0.037	[-0.155, -0.011]

Notes: Unstandardized estimates and their associated standard errors (SE) are reported, which were used to calculate the direct and indirect effect and their bootstrapped confidence intervals (CIs).

4 Discussion

4.1 Theoretical Implications

This study examines the relationship between leaders' loneliness and voice-taking using regulatory loop model of loneliness (focusing on the psychological retreat level of lonely individuals) and the affect theory of social exchange (focusing on context and interpersonal interaction). The empirical method is used to verify the difference in the effect of social self-efficacy on voice-taking behavior under different performance pressures. The main conclusions of this paper are detailed as below.

First, the existing research on workplace loneliness often focuses on followers and normally explores the impact of such emotions on followers' psychology and behavior [64], whilst lacking in-depth discussion

of leaders' loneliness. As voice has a positive impact on organizational development [9], the effect of leaders' virtues, and role modelling [8]. The recipient of the voice—the leader—is the determinant of whether a follower's suggestion can genuinely play a role. Therefore, we extend the study by examining how workplace loneliness carries the effect of outcomes through an emotional contagion mechanism.

Second, scholars have utilized a variety of theoretical frameworks and mechanisms to explain voice-taking behavior, including information difference theory [65], anchoring theory [66,67], and self-centered bias theory [68]. However, few studies explain how does a leader's emotion affect voice-taking behavior. Therefore, based on the combination of emotions, we use the psychologically oriented regulatory loop mode and the affect theory of social exchange to explore this perspective. Particularly, the psychologically oriented regulatory loop mode was coined nearly 40 years ago, and it explains the relationship between leaders' loneliness and social self-efficacy. The model also describes the psychological circulation mechanism that perceives lonely individuals. The affect theory of social exchange explains the influence of emotions on follow-up behavior in social interactions. Using the two theoretical underpinnings, the paper provides a specific explanation for the role between leaders' loneliness and voice-taking behavior.

Finally, this study has important theoretical constructive significance for a deeper understanding of the "black box" between leaders' loneliness and voice-taking behavior. Considering performance pressures are widespread in organizations that require quality and high level of output [69]. Previous studies have explored how high performance pressure influences team effectiveness, knowledge use, employee motivation [50], and unwillingness to report ethical infractions of peers [70]. However, few studies have used it as a context factor. Moreover, there are few studies on the boundary conditions for leaders' loneliness in the workplace. Therefore, this study makes up for this shortcoming and finds that performance pressure is an important contingency factor affecting leaders' attitudes and behaviors.

4.2 Practical Implications

Loneliness is not only an individual phenomenon, but also a social phenomenon closely related to job performance [37]. If a leader is lonely, it has a certain negative impact on leaders' behavior, and the result may be that the leader cannot properly perform leaders' function or that this negative emotion will hinder the leader in making decisions that are conducive to organizational development. Therefore, leaders' loneliness should be seen as an organizational problem that needs to be addressed to help organization improve performance. At the same time, we also reveal that organizations should be aware that followers' suggestions can increase leaders' ability to identify and respond to threats and opportunities [71], fostering the innovation process [27]. However, the recipient of the voice—the leader—is the backbone of the organization's operations. Given the important influence of leadership on organizational performance and the negative impact of leaders' workplace loneliness on voice-taking behavior, we encourage organizations to: (1) provide some support for leaders; (2) take appropriate measures to alleviate negative cycles of loneliness; and, (3) meet members' psychological needs.

To this end, an organization should provide a series of loneliness interventions to address leaders' loneliness in all areas of life. Intervention may include guiding individuals who tend to adapt to poor social cognition by encouraging members to participate in team activities, providing social support and more opportunities for social interaction, providing a caring communication environment, and creating a good organizational context. A meta-analysis found that the most effective measure for reducing loneliness is to intervene in the poor social cognition of lonely individuals [72]. For example, organizations should encourage employees' pursuit of friendship, analyze their current social networks, and set friendship goals and strategies to achieve them. Since lonely individuals resist reaching out [17], it is not enough to bring lonely individuals together [73], and any intervention requires considerable efforts and follow-ups.

Additionally, high performance pressure is a common corporate pressure, so high performance brings out many negative emotions and behaviors in members of the organization [24]. Therefore, exploring the voice-taking behaviors brought about by high performance pressure is particularly important in the context of leaders' loneliness. Managers should be aware of these issues and work hard to promote the establishment of an internal culture or atmosphere within the organization and encourage leaders to listen

to followers' suggestions for improvement. This will not only enhance employee self-satisfaction, but can also reduce the pressure on leaders. In order to keep the long-term healthy development of a company, organizations should emphasize the social self-efficacy of leaders, and develop involvement processes (i.e., providing positive feedbacks to leaders about their capabilities and job performance) to improve their confidence, influence and interpersonal skills.

4.3 Limitations and Future Research

Although our research possesses several strengths, such as the use of a diary study with reports from both leaders and followers, our study still has several limitations that should be recognized. First, although we included lagged relationships to examine changes in our endogenous variables, our study could not establish causality. For example, this study found that leaders' loneliness has an impact on their social self-efficacy and behaviors, but low social self-efficacy may lead to colleagues' isolation and influence leaders' perception of loneliness. If leaders reject to adopt followers' advice, it can also influence their social self-efficacy level. These speculations require further studies in future research. Second, research on loneliness in the workplace is mostly focused at the individual level, while research at the group level is relatively lacking. Workplaces are hierarchical group organizations, which are not only influenced by the characteristics, emotions and cognition of individuals within the organization but also can be influenced at the organizational level [74]. Therefore, future research can explore the mechanism of the impact of workplace loneliness at the team/organizational level. Third, the scales used in this study are mostly used in the context of Western organizations. Although all the scales have good reliability and validity, employees in different cultural contexts may have different experiences and ways of expressing emotions. In China, a country with high power distance, the presence of different cultural backgrounds may cause cultural adaptation problems. Therefore, future study should develop a scale suitable for measuring our local culture. Fourth, the research object of this paper is a Chinese sample. Members of an organization in different cultural backgrounds may have different experiences and expressions. A cross-cultural examination of loneliness in the workplace may produce certain biases. Data from different countries may be collected by future research for verification.

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