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Second language psychological speaking and listening needs: Scale development, symbiosis, and demographic differences

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Abstract

This study aimed to develop and validate two parallel scales to measure the psychological L2 speaking and listening needs of 863 English-as-a-foreign language (EFL) learners. The associations between three psychological needs (i.e., autonomy, competence, and relatedness) of L2 speaking and of L2 listening were examined to develop insights into oracy (i.e., integration of speaking and listening) in L2 communication. Subsequently, the impact of demographic variables was explored. The data, collected via a 5-point Likert-scale questionnaire, were analyzed through descriptive and correlation analysis, factor analysis, and ANOVA. Exploratory factor analysis was conducted to determine the factor structures, followed by confirmatory factor analysis for validation. Results demonstrated that the validity and reliability of the two developed scales were satisfactory. L2 speaking autonomy was significantly related to L2 listening autonomy, as were competence and relatedness. The three psychological needs of both L2 speaking and listening revealed varying patterns in terms of gender, major, university geographical context, schooling stage (first year to fourth year), and study-abroad experiences. The research findings reinforce the need for integration of

L2 speaking and L2 listening when satisfying university students' psychological needs, contribute to the research field with the measurement scales of psychological needs in L2 speaking and listening settings, and yield implications for teaching the two language skills integratedly.

Keywords: L2 speaking; L2 listening; psychological needs; demographic information; oracy

1. Introduction

Oral second/foreign (L2) communication is an overarching term to refer to L2 listening and speaking, which occur simultaneously in the classroom and in daily interactions (Murphy, 1991). The ability to speak English logically and intelligibly on a particular topic is a key learning goal for English-as-a-foreign language (EFL) learners. Listening comprehension, likewise, is a significant language skill which enables access to various aural and visual L2 resources (Vandergrift, 2007) and whose development has been demonstrated to improve L2 speaking (Vandergrift & Goh, 2012). Driven by the concurrent and symbiotic nature of L2 listening and speaking in oral communication, Goh (2014) used the term *oracy* to capture their combined equivalent importance. However, existing studies that address L2 speaking and listening together are relatively scarce in EFL research (Goh, 2014). Research focusing on learners' motivational constructs of both L2 speaking and listening is even less frequent. According to self-determination theory (SDT), the degree of a learner's motivation depends on three psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2017). In our study, *autonomy* refers to L2 learners' feelings of volition when they internalize their actions as an articulation of their free will in L2 speaking or listening practice. *Competence* is defined as a feeling of effectiveness when the learners feel capable of achieving learning goals and are on the way to successfully perform the target activities in an L2 speaking or listening environment. *Relatedness* is evident when individuals perceive a connection or develop a significant sense of belonging with others while communicating, such as with peers and teachers. Even if previous studies have shed light on L2 speaking or listening motivation in isolation (e.g., Vandergrift, 2005), the three basic psychological needs and the associations between psychological L2 speaking and listening needs are largely underexplored. Moreover, little is known regarding how L2 learners' psychological speaking or listening needs are shaped by demographic variables. This study, therefore, intends to address these research gaps by developing two measurement scales to investigate L2 learners' psychological speaking and listening needs.

2. Literature review

2.1. Basic psychological needs and L2 learning

The concepts of intrinsic (autonomous) and extrinsic (controlled) motivation are included in self-determination theory (Ryan & Deci, 2017). When learning is important and integral to the learner's sense of him/herself, intrinsic motivation towards the task will be formed. Learners are extrinsically motivated when learning is done for the purpose of rewards such as grades or appraisal given by teachers. SDT includes five motivational constructs: (1) *intrinsic orientation* (e.g., enjoyment), (2) *identified regulation* (e.g., recognized value of the extrinsic behavior), (3) *introjected regulation* (e.g., fear of disapproval), (4) *external regulation* (e.g., social approval), (5) *integrated regulation* (e.g., conversion into one's beliefs) and (6) *amotivation* (Ryan & Deci, 2017). SDT contends that when specifiable psychological and social needs are satisfied in the context of an individual's development, this will promote growth, integrity, and well-being. This contention has been proven effective in L2 research (cf. Noels et al., 2000). Researchers such as Noels, Lascano, and Saumure (2019) and Alamer and Almulhim (2021) have examined these basic psychological needs of L2 learners from the SDT perspective in an EFL learning context. These available empirical studies that are related to these psychological needs focus on three main aspects, and their findings not only reveal positive relationships between need satisfaction and the enhancement of learner motivation and academic achievement, but also point to the importance of need satisfaction in the development of specific language skills.

The first strand of research has focused on psychological language needs and their relation to motivational orientations. For example, Chow and Chu (2007) found that relatedness occurred to Chinese students when they were motivated to fulfil their filial obligations for their parents through satisfactory academic achievement. Carreira (2012) reported that intrinsic motivation and introjected and identified regulation were significantly correlated with autonomy, competence, and relatedness in L2 learning. Oga-Baldwin et al. (2017) also found that autonomous motivation was significantly associated with need satisfaction, and this need satisfaction mediated the relationship between supportive teaching and student engagement in a language class. These findings were all consistent with Ryan and Deci's (2017) assertion that satisfying the three basic psychological needs should generate a positive derivative through the embodiment of autonomous motivation.

The second strand of research into psychological needs, as conceptualized by SDT, has attempted to investigate the relationship between L2 psychological needs and English language learning and achievement. For example, Alamer and

Lee (2019) identified a motivational process to explain L2 Saudi students' achievement in English. With the three basic psychological needs as the starting point, they found progressive influence first on goal-setting orientation, then motivational emotional state, and finally language achievement outcome. Similarly, Joe et al. (2017) found that L2 achievement was significantly predicted by perceived competence in a Korean secondary-school context. It can thus be inferred that the three basic psychological needs in the L2 context are situated within the motivational process and play a crucial role in L2 learning and development.

The third strand of research suggests the potential positive impact of need satisfaction on the development of particular language skills. Alamer (2021) has investigated the impact of basic psychological needs on L2 vocabulary learning. He found that the three basic psychological needs in L2 learning were directly linked to vocabulary knowledge among Saudi university students. However, apart from L2 vocabulary learning, few studies have attended to the three basic psychological needs in the learning process of other language skills, particularly L2 speaking and listening. Given the critical role of psychological speaking and listening needs in communication (Carreira, 2012), a domain-specific investigation can help reveal human functioning in a specific setting (Ryan & Deci, 2001) and more specific implications can be yielded for teaching L2 speaking and listening skills, especially when it comes to oracy instruction. To achieve these purposes, there is a need of empirical studies to measure the basic psychological needs of L2 speaking and listening so that the association between the two L2 skills can be explored in a more in-depth way.

2.2. L2 speaking and listening

The current research into the association between L2 listening and speaking has been theoretically manifested in the current literature. Brown (2004) argued that L2 listening functions as a part of L2 speaking, and thus without successful listening comprehension individuals cannot communicate effectively. More recently, Goh (2014), in her review article, recommended the use of oracy instruction, involving both speaking and listening, in L2 pedagogy so that learners can understand, increase, and manage their learning processes in a holistic way. Qiu and Xu (2021) found that L2 speaking and listening motivation were associated with each other, highlighting the close relationship between L2 speaking and listening in the communication practices. However, the available empirical studies that have investigated the relationship between basic psychological needs in L2 listening and speaking were not found. Thus, the present study seeks to first develop scales of psychological L2 speaking and listening needs and then examine how close L2 speaking and listening needs are associated with each other.

2.3. The importance of demographic factors to L2 learning

L2 learning has also been shown to be both directly and indirectly influenced by demographic variables (Fromkin et al., 2007), but the role that these demographic variables play in psychological L2 speaking and listening needs has not yet been fully clarified. Specifically, gender differences have been shown to play a role in various aspects of L2 learning, such as the level of language anxiety in the EFL learning context (Jiang & Dewaele, 2019), and attitudes toward learning French (L2) and English (L1) and French learning orientations (Baker & MacIntyre, 2000). Furthermore, university locations have been found relevant to the regional inequality of general education (Xiang et al., 2020); yet few studies have looked into the role of regional differences in L2 settings. It is assumed that L2 learning in universities is a process that progresses dynamically from the first year to the fourth. For example, Sung (2019) found that an L2 learner's sense of language competence progressed over time during their university study. Empirical evidence has further shown that basic psychological needs vary from major to major; Lau and Gardner (2019) found that students with different majors had varying learning styles and preferences. Finally, study-abroad experience is an important aspect when distinguishing the level of L2 listening motivation (Xu & Qiu, 2020). However, the studies overviewed above have not investigated how students' psychological L2 speaking and listening needs are satisfied across different demographic groups (e.g., male vs. female). Thus, the present study endeavors to explore variations in gender, university geographical context, university schooling stages, majors, and study-abroad experience in relation to psychological L2 speaking and listening needs.

3. The present study

The present study aimed to develop and validate scales for psychological L2 speaking and listening needs among Chinese university students, to examine how the L2 speaking and L2 listening needs were associated with each other, and to understand how the needs varied in terms of demographic qualities. The demographic characteristics explored include gender, major (humanities and social science, science, and engineering), university geographical context (Beijing, coastal provinces, inland provinces of China), university schooling stage (freshman, sophomore, junior, or senior), and the presence or absence of study abroad experiences. The following three research questions guided the present study.

1. What is the factor structure model of the psychological needs scales on L2 speaking and listening among L2 Chinese students? (RQ1)

2. How are psychological L2 speaking and listening needs correlated with each other? (RQ2)
3. How do psychological L2 speaking and listening needs vary in terms of gender, major, university geographical context, and schooling stage at university, and study abroad experiences? (RQ3)

4. Method

4.1. Participants

This study was conducted in a Chinese tertiary context where students are EFL learners taught in compulsory English courses. In total, 863 Chinese university students, including 274 male and 589 female, from 16 to 22 years old (M = 18.67, SD = 1.26) were recruited. All the participants had been learning English for more than nine years. The surveyed participants represented a spectrum of different majors including language and literature, communication and journalism, geology, engineering, computer science, law, management, translation studies, and education. These were categorized into four main groups for analysis: humanities and social science, sciences, engineering, and medicine. Their universities were located in nine Chinese provinces representing major regions (northeast, southeast, northwest, southwest, and the capital city) of China: Beijing, Anhui, Hubei, Jilin, Shandong, Zhejiang, Xinjiang, Shanghai, and Chongqing. These were organized into three subcategories for analysis: Beijing, coastal provinces, and inland provinces. There were 549 freshmen, 188 sophomores, 87 juniors, and 39 seniors. They came from Tier 1 universities (N = 711), Tier 2 universities (N = 137), and Tier 3 universities (N = 15). The three tiers of universities in China mainland all provided undergraduate courses and bachelor's degrees. Tier 1 universities are key public universities under the direct leadership of the Ministry of Education, whereas Tier 2 universities refer to ordinary public universities under the leadership of the provincial government and Tier 3 universities are independent and private ones with relatively low admission criteria. Of the 863 participants, 114 had experienced studying abroad, which was defined as any short-term study, tour, or residence abroad for more than one week.

4.2. Scale development

The scales were developed through a two-phase process: item-generation, and item piloting. Two recommendations informed the item-generation process. Initially, we followed Haynes, Richard, and Kubany's (1995) advice that the content of developed items should originate from multiple sources: 1) prior literature and theoretical frameworks, 2) existing or related scales, and 3) the researchers' own

deductive reasoning. Next, we adopted DeVellis's (2016) recommendation that scale developers develop the items three times and use those items that performed best in the final iteration. Hence, the initial item pool was created based on the basic concepts of SDT and psychological needs (Ryan & Deci, 2017) as well as the empirical studies related to psychological needs in L2 contexts (e.g., Alamer, 2021; Carreira, 2012). Additional items were created by modifying existing SDT instruments that were developed to measure the psychological needs in other contexts, such as education (Deci et al., 2001; Tian et al., 2014). Keeping in mind the requirement that the designed item pool should be broad enough to retain only the best-performing items, the developed English scales were pretested with five students to further identify possible confusions or problems. The English scales were sent to two applied linguistics experts who were non-native speakers of English to check the content, wordings, and readability. Subsequently, the revised questionnaire was piloted with 135 university students and achieved high reliability for the overall scale (Cronbach $\alpha = .94$) and each of the three dimensions (autonomy, $\alpha = .91$; competence, $\alpha = .96$; relatedness $\alpha = .90$).

4.3. Instruments

4.3.1. Scale of psychological L2 speaking/listening needs

In total, 13 items were designed to assess the psychological L2 speaking/listening needs scales: 4 items for autonomy, 5 for competence, and 4 for relatedness. For example, the samples item for autonomy were "I feel like I can pretty much be myself when speaking in/listening to English," for the speaking/listening scale. The sample items for competence were "I can communicate the main point(s) of what I want to say/I can understand the gist of what I hear," for the speaking/listening scale. The sample item for competence was "I experience a warm feeling with the teachers I spend time with," for the speaking and listening scale. All items were designed using a 5-point Likert scale from (1) strongly disagree to (5) strongly agree. A commonly used rule of thumb for evaluating internal consistency was below: $\alpha < 0.5$ = unacceptable; $0.5 <= \alpha < 0.6$ = poor; $0.6 <= \alpha < 0.7$ = acceptable; $0.7 <= \alpha < 0.9$ = good; $\alpha >= 0.9$ = excellent (Hair et al., 2010). The overall reliability of the scale of psychological L2 speaking/listening needs was satisfactory (Cronbach's $\alpha = .91/.91$). The reliability estimates of autonomy ($\alpha = .86/.90$), competence ($\alpha = .87/.86$), and relatedness ($\alpha = .96/.92$) were all above the cut-off value 0.7, demonstrating good reliability.

4.4. Data collection and analysis

The Chinese version of the questionnaires was distributed online. The translation was completed by the first author. The translated questionnaires were then

proofread by a professor in applied linguistics. An English language learner was invited to pick up the language errors. Then, the back translation was conducted by the second author to ensure language accuracy. Accordingly, the first author addressed the issues arising from the translation (e.g., clarity of questionnaire items). Concerning the sample, we first identified our population as Chinese university students and then considered the demographic variables when listing some potential participating institutions. Next, the purposive sampling approach was used and English course instructors were contacted to request that data be collected from their students. Those course instructors who agreed to help send the electronic questionnaire link to their students during their class periods. The participants' consent was obtained before data collection. The ethical approval was also obtained from the first author's university.

The questionnaire data were initially screened before data analysis. To achieve the first goal of this study, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted. EFA was conducted with SPSS 25.0 in the pilot study (N = 135), and CFA was subsequently performed in the main study (N = 863), using *Mplus* 8.0 to test both the theoretical model and an accurate specification of multiple hierarchies to confirm whether each indicator (item) loaded significantly on the expected factors. Oblimin with Kaiser Normalization was the rotation method. The number of factors to be retained was assessed by judging whether eigenvalues were greater than 1, and if factor loadings were greater than 0.3, and by evaluating the scree plot of eigenvalues, and interpretability of factor structure (Hair et al., 2010). Maximum likelihood estimation with robust standard errors was employed when performing CFA to assess the hypothesized models. When evaluating the appropriateness of model fit, we followed Kline's (2016) suggestion that we establish whether the specified model fit the empirical data. The size of standardized factor loadings was interpreted according to Cohen's (1992) guidelines: trivial < 0.1 ≤ small < 0.3 ≤ moderate < 0.5 ≤ large with the cut-off values being 0.1, 0.3, and 0.5, respectively. Alternative models were tested to select better model and were also calculated to further provide evidence for construct validity.

To achieve the second goal, CFA models were computed with the 863 participants to see how closely the three psychological needs of L2 speaking were associated with those of L2 listening. For the third goal, *t*-tests and ANOVA tests were performed independently to pinpoint the differences in autonomy, competence, and relatedness among 863 participants. Independent *t*-tests were conducted to explore the roles of gender differences and study abroad experience, while ANOVA tests were used to investigate regional and disciplinary differences, and also the differences of school year. When the ANOVA was significant, post hoc tests (Tukey Test) were conducted to see differences between specific groups.

5. Results

5.1. Psychometric properties of L2 psychological speaking and listening needs scales

5.1.1. Exploratory factor analysis

We first performed an EFA with the pilot data (N = 135). The Kaiser-Mayer-Olkin of sampling adequacy was 0.91, which was above the cut-off threshold of 0.5, thus suggesting that EFA was able to yield discrete and reliable factors. Bartlett's test of sphericity (χ^2 = 3124.06, df = 325, p < 0.01) indicated that the correlations between items were large enough to perform the EFA. As presented in Table 1, the pilot data generated six factors, as expected, which explained 77.36% of the variance. All of these factor loadings were above 0.3. A scree plot was not included because the factor dimensions in this study were set theoretically. Only LA4 showed cross-loadings on both speaking and listening autonomy, but its item loading was heavier on its corresponding factor, and thus it was retained. Consequently, all the validated items in the pilot study were subject to CFA in a larger sample.

Table 1 EFA results of psychological L2 speaking and listening needs

Item	1	2	3	4	5	6
SA1	.56					
SA2	.51					
SA3	.32					
SA4	.37					
SC1		.61				
SC2		.64				
SC3		.40				
SC4		.75				
SC5		.86				
SR1			.79			
SR2			.93			
SR3			.97			
SR4			.98			
LA1				.80		
LA2				.85		
LA3				.74		
LA4				.79		
LC1					.58	
LC2					.81	
LC3					.51	
LC4					.64	
LC5					.81	
LR1						.56
LR2						.69
LR3						.56
LR4						.59

Note. SA(1) = speaking autonomy, SC(2) = speaking competence, SR(3) = speaking relatedness, LA(4) = listening autonomy, LC(5) = listening competence, LR(6) = listening relatedness

5.1.2. Confirmatory factor analysis

Based on our theoretical underpinnings, the hypothesized first-order correlated factor structure of psychological L2 speaking needs was tested with a larger sample (N = 863). There were three factors: autonomy (4 items), competence (5 items), and relatedness (4 items). The factor loadings can be seen in Figure 1, and all the factor loadings were statistically significant (p < .01). The hypothesized L2 listening needs first-order correlated factor structure results suggested that the size of all standardized factor loadings of this test were also large and that all the factor loadings were statistically significant (p < .01) (see Figure 1). Figure 1 and Figure 2 show the standardized results for the first-order and bifactor correlated model.

Table 2 Model fit indices of four models (N = 863)

Fit indices	x^2/df	p	CFI	TLI	RESEA	SRMR
Cutoff criteria	< 5	< .00	> .90	>.90	< .08	< .08
Model 1 (first-order-speaking)	6.19	.00	.94	.92	.07	.03
Model 2 (first-order-listening)	8.48	.00	.91	.90	.08	.04
Model 3 (bifactor-speaking)	5.63	.00	.95	.93	.07	.12
Model 4 (bifactor-listening)	6.62	.00	.94	.92	.08	.12

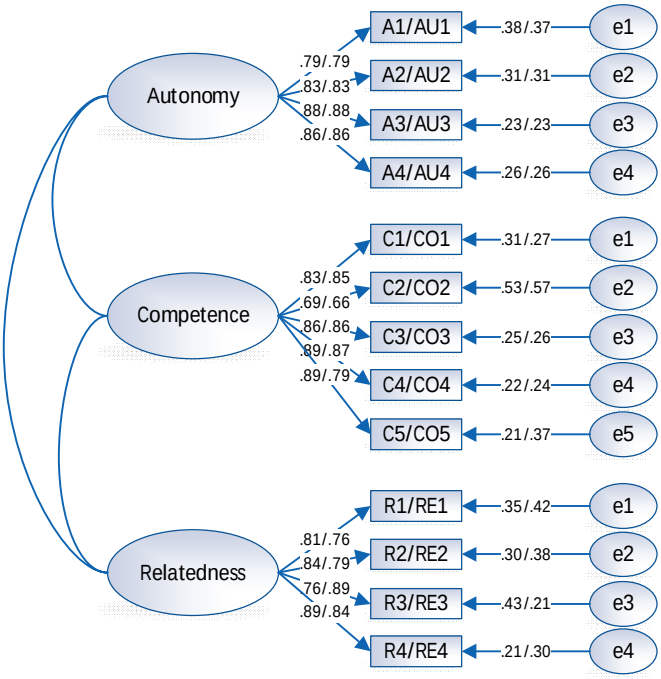

Figure 1 CFA of first-order correlated factor structure of psychological L2 speaking/listening needs (Model 1/Model 2)

To ensure that the above hypothesized model was the one with the closest model fit to the data, we tested the bifactor models of both of the developed scales. As shown in Model 3 (Figure 2), the size of factor loadings on the right side was large and all the factor loadings were statistically significant ($p < .01$). In Model 4, also shown in Figure 2, the size of factor loadings on the right side was large as well and all the factor loadings were statistically significant ($p < .01$). Models 1 and 3 were equivalent, as were Models 2 and 4. The CFA model fit indices of the four models are summarized in Table 2, and all the results show that the data fit the model well. The value of x^2/df was greater than 5 possibly because of the large sample size, which was a limitation. Models 3 and 4 had better model fit than Model 1 and Model 2 because of the lower value of x^2/df and higher value of CFI and TLI, so we determined that the bifactor CFA models of psychological L2 speaking and listening needs better matched our theoretical underpinnings.

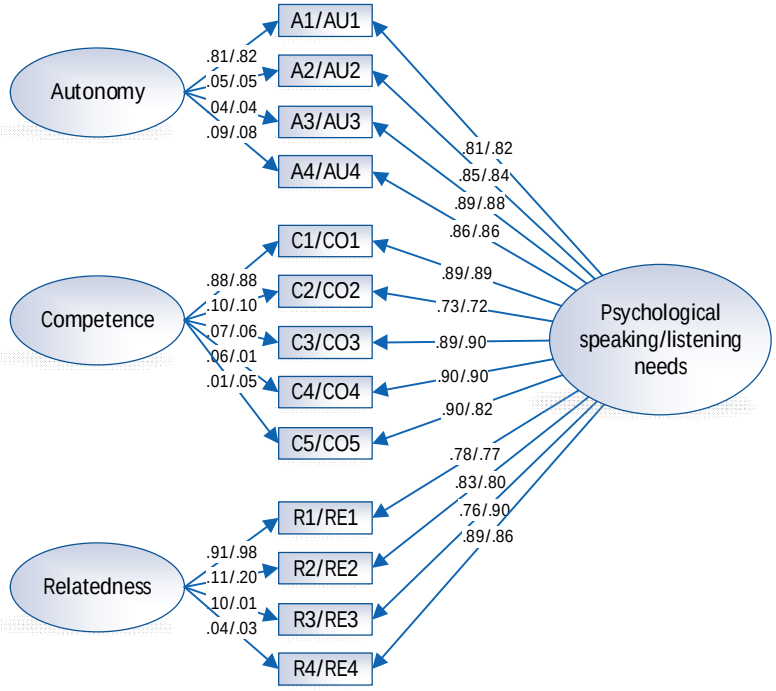

Figure 2 CFA of bifactor models of psychological L2 speaking/listening needs (Model 3/Model 4)

5.1.3. Descriptive and correlation analysis

After presenting the results of EFA and CFA, results of descriptive and correlation analysis were presented in this larger sample ($N = 863$). Mean, standard deviations,

skewness, kurtosis, and item-total correlation for the two scales on the item level were reported. Drawing on the Oxford's (1990) classification of the level of self-reported questionnaire responses, a mean in the range of 3.5-5.0 was categorized as a high level, 2.5-3.4 medium level and 1.0-2.4 low level. The descriptive analysis of psychological L2 speaking needs at the item level showed means for each of the 13 items ranging from 2.66 to 4.09, with standard deviations ranging from 0.92 to 1.09 (see Table 3). The value of skewness and kurtosis in the speaking study fell within the cut-off value range of between ± 3.0 and between ± 8.0 respectively, indicating the univariate normality of the responses (Kline, 2016). The item-total correlation ranged from .56 to .73, which indicates that each item was closely correlated with the sum of items.

In addition, descriptive analysis of psychological L2 listening needs at item level showed means for each of the 13 items ranging from 2.24 to 4.13, with standard deviations ranging from 0.87 to 1.10 (see Table 4). Similarly, the value of skewness and kurtosis for the listening study was less than the cut-off value of ± 3.0 and ± 8.0, signifying the univariate normality of the responses. Violations of normality, multicollinearity and outliers were not detected in either of the psychological L2 speaking or listening needs scales. The item-total correlation ranged from .46 to .74, which shows that each item was well associated with the sum of items.

Table 3 Descriptive analysis of psychological L2 speaking needs at the item level (*N* = 863)

When speaking in English, I feel that…	*M*	*SD*	Skewness	Kurtosis
Autonomy (4 items)				
1. I have a sense of choice about how to speak in English (e.g., the choice of language expression, content, speaking strategies).	3.52	1.05	-.17	-.60
2. I feel free to express my thoughts about the speaking topics.	3.48	1.07	-.11	-.69
3. I feel like I can pretty much be myself when speaking in English.	3.58	1.09	-.21	-.74
4. My decisions during the English-speaking process (e.g., decisions on language expression, content, speaking strategies) stem from what I personally want to do.	3.65	1.04	-.28	-.58
Competence (5 items)				
1. I can communicate the main point(s) of what I want to say.	3.46	.92	-.06	-.33
2. I can solve communication problems when I do not know how to say something.	3.18	.96	.06	-.23
3. I can accomplish a task in real life (e.g., asking the price of an item in a store).	3.57	.99	-.28	-.40
4. I can produce fluent English speech.	2.93	1.02	.22	-.21
5. I can produce grammatically accurate English speech.	2.66	.99	.36	-.08
Relatedness (4 items)				
1. I experience a warm feeling with the teachers I spend time with.	3.96	.95	-.51	-.52
2. The teachers are generally friendly towards me.	4.09	.92	-.67	-.22
3. I get along with my teachers.	4.03	.93	-.55	-.44
4. I get along with my peers.	3.98	.96	-.59	-.24

Table 4 Descriptive analysis of psychological L2 listening needs at item level (*N* = 863)

When listening to English, I feel that...	*M*	*SD*	Skewness	Kurtosis
Autonomy (4 items)				
1. I have a sense of choice about how to listen to English texts (e.g., listening strategies).	3.77	1.02	-.48	-.30
2. I feel free to select the listening topics or text types that I am interested in.	3.70	1.08	-.43	-.57
3. I feel like I can pretty much be myself when listening to English.	3.62	1.10	-.33	-.68
4. My decisions during the English listening process (e.g., decisions on listening strategies) stem from what I personally want to do.	3.66	1.05	-.31	-.61
Competence (5 items)				
1. I can understand the gist of what I hear.	3.39	.90	-.34	.08
2. I can figure out the meanings of words or phrases I do not know.	2.63	.91	.30	-.03
3. I can use the information heard in English to accomplish a task in real life (e.g., follow directions to an unknown address).	2.92	.95	.03	-.33
4. I can understand speech of different English dialects (e.g., Japanese English, Indian English, etc.).	2.24	.87	.30	-.43
5. I can understand speakers' underlying meaning.	2.38	.90	.28	-.14
Relatedness (4 items)				
1. I experience a warm feeling with the teachers I spend time with.	3.83	1.01	-.41	-.60
2. The teachers are generally friendly towards me.	4.13	.91	-.80	.11
3. I get along with my teachers.	4.06	.91	-.61	-.36
4. I get along with my peers.	4.05	.90	-.58	-.31

As seen in Table 5, the mean of relatedness of L2 speaking at factor level was above 4 (4.01), showing a high level. The mean of competence was just above 3 (3.16), demonstrating a medium level, and the mean of autonomy was between 3 and 4 (3.56), suggesting a high level. Likewise, the mean of relatedness of L2 listening at factor level was high (4.02), the mean of competence was medium (2.71), and the mean of autonomy was high (3.69). Results of correlation analysis in Table 5 showed that the three psychological L2 speaking needs correlated significantly with each other at $p < .001$ level. According to Cohen's (1988) criteria, competence and autonomy were related strongly ($r = .61$) as were autonomy and relatedness ($r = .66$), while relatedness and competence were associated moderately ($r = .41$). Results of correlation analysis in Table 5 showed that the three psychological L2 listening needs correlated with each other significantly at $p < .001$ level. Autonomy and relatedness correlated strongly ($r = .70$). The associations between autonomy and competence ($r = .37$), and between competence and relatedness ($r = .29$) were moderate.

Table 5 Descriptive analysis, correlation analysis, and reliability estimate of L2 speaking/listening needs at factor level (*N* = 863)

		M	*SD*	1	2	3	α
1	Autonomy	3.56/3.69	.93/.93	1			.86/.90
2	Competence	3.16/2.71	.79/.72	.61**/.37**	1		.87/.86
3	Relatedness	4.01/4.02	.89/.83	.66**/.70**	.41**/.29**	1	.96/.92

Note. **$p < .001$

5.2. Associations between psychological L2 speaking and listening needs

To pinpoint the associations between L2 speaking and L2 listening, we first calculated a measurement model which entailed both their psychological needs (two second-order models; see Figure 3). This yielded a satisfactory model fit (x^2/df = 4.95; p < .001; CFI = .91; TLI = .90; RMSEA = .07, SRMR = .05). In the interest of conciseness, only the latent variables are displayed in Figure 3, which shows that the two constructs were highly associated (β = .81). Then, the association between L2 speaking and listening autonomy, between L2 speaking and listening competence, and between L2 speaking and listening relatedness were calculated in another first-order CFA model with six latent variables, which also generated a good model fit (x^2/df = 4.89; p < .001; CFI = .91; TLI = .90; RMSEA = .07, SRMR = .05). Considering publication word and space limits, this model is not illustrated here, but the correlation coefficients obtained from this CFA model are presented in Table 6. The correlation coefficients between psychological L2 speaking and listening needs were all above .05, suggesting a large association in L2 oral communication (see Table 6).

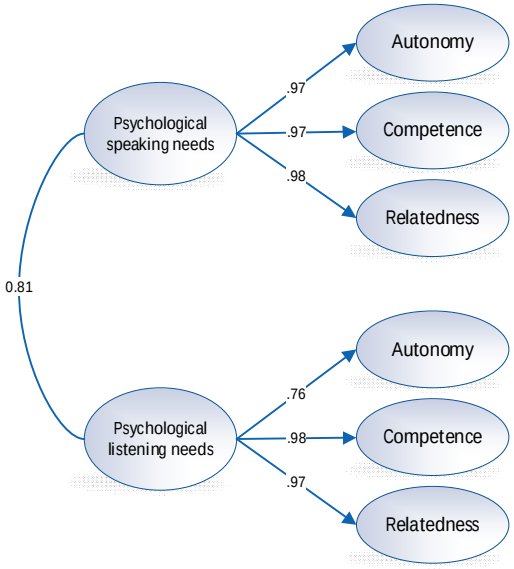

Figure 3 The measurement model of psychological L2 listening and speaking needs

Table 6 The correlation between psychological L2 speaking and listening needs

L2 speaking-listening needs	Correlation coefficient via CFA
L2 speaking and listening autonomy	.99**
L2 speaking and listening competence	.73**
L2 speaking and listening relatedness	.85**

Note. **p < .001

5.3. Demographic variations

This section displays the demographic variations across gender, university geographical context, school years, disciplinary differences, and study abroad experience. Regarding English speaking (Table 7), results of independent *t*-tests showed that female participants manifested significantly higher degrees of autonomy and relatedness than their male counterparts whereas no significant differences were found in competence. Regarding English listening, female learners were more confident about their competence than males, but the degrees of autonomy and relatedness between the two groups were similar.

Table 7 Gender differences (speaking/listening)

Gender	*N*	Autonomy	Competence	Relatedness
		M (*SD*)	*M* (*SD*)	*M* (*SD*)
Female	589	3.60 (0.90)/3.72 (0.90)	3.19 (0.76)/2.77 (0.67)	4.09 (0.83)/4.05 (0.79)
Male	274	3.46 (1.00)/3.61 (0.98)	3.11 (0.86)/2.59 (0.82)	3.86 (0.97)/3.95 (0.91)
t		2.174/1.604	1.394/3.315	3.537/1.705
p		.030/.109	.164/.001	<.001/.089
Cohen's *d*		.15/-	-/.24	.25/-

Furthermore, ANOVA test results revealed significant differences among EFL learners from the three university geographical contexts of China for all the psychological speaking and listening needs (Table 8). Specifically, according to the post hoc (Tukey test) results in Table 9, students from Beijing and coastal provinces obtained significantly higher degrees of autonomy and relatedness than those from inland provinces in both speaking and listening. Also, Beijing participants were more confident about their speaking and listening than their inland peers, and the mean for listening competence for those from coastal provinces was significantly higher than those from inland provinces.

Table 8 University geographical context (speaking/listening)

Area	*N*	Autonomy	Competence	Relatedness
		M (*SD*)	*M* (*SD*)	*M* (*SD*)
Beijing	90	3.80 (1.00)/3.93 (0.90)	3.47 (0.81)/3.03 (0.79)	4.23 (0.77)/4.20 (0.75)
Coastal	149	3.73 (0.80)/3.89 (0.83)	3.26 (0.72)/2.96 (0.67)	4.22 (0.75)/4.17 (0.73)
Inland	624	3.48 (0.94)/3.60 (0.94)	3.09 (0.80)/2.60 (0.70)	3.93 (0.92)/3.95 (0.86)
F		7.834/9.143	10.509/26.089	9.782/6.620
p		<.001/<.001	<.001/<.001	<.001/<.001

Table 9 Tukey post hoc results for university geographical context

	Speaking			Listening		
	Autonomy	Competence	Relatedness	Autonomy	Competence	Relatedness
Beijing vs Coastal	*p* = .838	*p* =.108	*p* = .997	*p* = .938	*p* = .753	*p* = .970
Beijing vs Inland	*p* = .006 *d* = .33	*p* < .001 *d* = .42	*p* = .007 *d* = .35	*p* = .005 *d* = .36	*p* < .001 *d* = .58	*p* = .024 *d* = .31
Coastal vs Inland	*p* = .009 *d* = .29	*p* = .054	*p* = .001 *d* = .35	*p* = .002 *d* = .33	*p* < .001 *d* = .53	*p* = .011 *d* = .28

When comparing the differences among students in different school years in the program, we again observed significant differences in competence and relatedness for speaking and competence for listening (Table 10). Unsurprisingly, Year 4 students were more confident about their speaking and listening skills than Year 1 students (Table 11), and Year 3 students felt more related to teachers and peers when learning English speaking than their Year 2 counterparts.

Table 10 School years (speaking/listening)

Year	*N*	Autonomy	Competence	Relatedness
		M (*SD*)	*M* (*SD*)	*M* (*SD*)
Year 1	549	3.59 (0.96)/3.72 (0.96)	3.12 (0.82)/2.67 (0.71)	4.05 (0.90)/4.04 (0.85)
Year 2	188	3.45 (0.90)/3.59 (0.89)	3.18 (0.78)/2.71 (0.75)	3.85 (0.87)/3.90 (0.82)
Year 3	87	3.66 (0.80)/3.79 (0.76)	3.21 (0.69)/2.86 (0.75)	4.17 (0.77)/4.12 (0.75)
Year 4	39	3.37 (0.92)/3.41 (0.99)	3.54 (0.63)/3.02 (0.67)	4.00 (0.87)/4.01 (0.78)
F		1.986/2.382	3.756/4.325	3.332/1.848
p		.114/.068	.011/.005	.019/.137

Table 11 Tukey post hoc results for school years

	Speaking			Listening		
	Autonomy	Competence	Relatedness	Autonomy	Competence	Relatedness
Year 1 vs Year 2	*p* = .327	*p* = .832	*p* = .076	*p* = .448	*p* = .910	*p* = .271
Year 1 vs Year 3	*p* = .951	*p* = .766	*p* = .678	*p* = .943	*p* = .151	*p* = .855
Year 1 vs Year 4	*p* = .567	*p* = .015 *d* = .57	*p* = .991	*p* = .253	*p* = .032 *d* = .51	*p* = .996
Year 2 vs Year 3	*p* = .391	*p* = .990	*p* = .049 *d* = .39	*p* = .456	*p* = .480	*p* = .232
Year 2 vs Year 4	*p* = .977	*p* = .079	*p* = .820	*p* = .740	*p* = .113	*p* = .913
Year 3 vs Year 4	*p* = .478	*p* = .203	*p* = .794	*p* = .218	*p* = .710	*p* = .911

Disciplinary differences were also observed among all the speaking and listening needs (Table 12). In the case of psychological needs related to speaking, humanities and social science (HSS) students demonstrated higher degrees of autonomy, competence, and relatedness than their peers in science and engineering (Table 13), and the same trend was also observed in the listening needs between humanities and social science students and those of science and engineering students (Table 13).

Table 12 Disciplinary differences (speaking/listening)

Discipline	*N*	Autonomy	Competence	Relatedness
		M (*SD*)	*M* (*SD*)	*M* (*SD*)
HSS	444	3.72 (0.89)/3.85 (0.89)	3.30 (0.74)/2.84 (0.71)	4.17 (0.80)/4.15 (0.75)
Science	266	3.36 (0.95)/3.47 (0.93)	2.99 (0.79)/2.62 (0.67)	3.88 (0.93)/3.88 (0.89)
Engineering	142	3.40 (0.96)/3.58 (0.97)	3.05 (0.91)/2.47 (0.78)	3.79 (0.97)/3.85 (0.90)
Medicine	11	3.59 (0.71)/3.73 (0.81)	3.22 (0.54)/2.87 (0.63)	3.75 (0.82)/4.07 (0.87)
F		10.018/10.151	9.422/12.099	10.530/7.996
p		< .001/< .001	< .001/< .001	< .001/< .001

Table 13 Tukey post hoc results of disciplinary differences

	Psychological L2 speaking needs			Psychological L2 listening needs		
	Autonomy	Competence	Relatedness	Autonomy	Competence	Relatedness
HSS vs Sci.	*p* < .001	*p* < .001	*p* < .001	*p* < .001	*p* = .001	*p* = .001
	d = .39	*d* = .41	*d* = .33	*d* = .42	*d* = .32	*d* = .33
HSS vs Eng.	*p* = .005	*p* = .017	*p* < .001	*p* = .027	*p* < .001	*p* = .003
	d = .35	*d* = .30	*d* = .43	*d* = .29	*d* = .50	*d* = .36
HSS vs Med.	*p* = .975	*p* = .991	*p* = .468	*p* = .980	*p* = .999	*p* = .992
Sci. vs Eng.	*p* = .986	*p* = .902	*p* = .822	*p* = .730	*p* = .254	*p* = .988
Sci. vs Med.	*p* = .886	*p* = .829	*p* = .972	*p* = .843	*p* = .715	*p* = .910
Eng. vs Med.	*p* = .932	*p* = .929	*p* = .999	*p* = .966	*p* = .348	*p* = .872

Note. HSS = Humanities and social science; Sci. = Science; Eng. = Engineering; Med. = Medicine

Study-abroad experience was also an influential factor, as those with overseas learning experience significantly outperformed those without in all the speaking and listening needs (Table 14). This indicates that study-abroad experience might also help to satisfy EFL learners' psychological needs.

Table 14 Study abroad experience (speaking/listening)

Study abroad experience	*N*	Autonomy	Competence	Relatedness
		M (*SD*)	*M* (*SD*)	*M* (*SD*)
+experience	115	3.98 (0.84)/4.03 (0.84)	3.58 (0.77)/3.17 (0.71)	4.27 (0.77)/4.23 (0.76)
-experience	748	3.49 (0.93)/3.63 (0.93)	3.10 (0.78)/2.64 (0.70)	3.98 (0.90)/3.98 (0.84)
t		5.307/4.314	6.192/7.547	3.362/3.046
p		<.001/<.001	<.001/<.001	.001/.002
Cohen's *d*		.55/.45	.62/.75	.35/.31

6. Discussion

This study developed the scales of psychological L2 speaking and listening needs, explored their associations, and examined how they were influenced by demographic factors. Findings of this study are discussed in accordance with three research questions.

6.1. Development and validation of the scales

Responding to RQ1, our findings show that the parallel structured scales have been validated and that the three psychological needs correlated significantly within the speaking and the listening scales respectively (Van den Broeck et al., 2016). This further supports Ryan and Deci's (2017) SDT and their claim that the three needs are antecedents of human motivation. This study also theoretically contributes to the understanding that basic psychological needs can be satisfied in L2 speaking and listening contexts. When these psychological needs are satisfied, the self-determined form of motivation can be enhanced, which, in turn, may generate desired or positive learning outcomes (Noels et al., 2019). Given the positive correlations among the needs within each scale, we can infer that enhancing the satisfaction of one need (e.g., autonomy) can also contribute to the fulfilment of other needs (e.g., competence, relatedness), which, in turn, motivate and promote L2 learning. In addition, from our results, the means of both L2 speaking and listening relatedness were above 4, suggesting that while communicating with others, Chinese university students perceive a higher connection or a stronger sense of belonging with peers and teachers. This can be explained by the fact that in the Chinese collectivist culture, students who have satisfying relationships with their parents are more likely to have a higher motivation to achieve better learning outcomes (Chow & Chu, 2007), and this satisfying relationship may also be extended to their teachers and peers. However, Chinese university students proved to have a lower level of perceived competence in L2 listening. The reason might be that Chinese university students do not have many opportunities outside the classrooms to engage in authentic and real-time communications to be competent listeners (Xu & Qiu, 2020).

6.2. Correlations between psychological speaking and listening needs

When it comes to RQ2, the results further show that psychological L2 learners' speaking and listening needs were correlated, indicating that satisfying learners' psychological L2 speaking needs could lead to higher satisfaction of their L2 listening needs and vice versa. From the learner motivation perspective, this finding

echoes existing literature that has suggested listening and speaking skills to be interrelated, integrated, and inseparable (Brown, 2004; Goh, 2014). A possible explanation for this correlation is that the actual communication process is a combination of listening and speaking in which one needs to receive, understand, and decode the interlocutor's information and then generate message content, formulate and articulate a response (Vandergrift & Goh, 2012). This study reveals a symbiosis between L2 speaking and listening autonomy, competence, and relatedness. Students' psychological listening needs are likely to be satisfied when they manifest high levels of speaking autonomy, competence, and relatedness. In this respect, this study demonstrates the close connection between L2 speaking and listening, further supporting the need for oracy instruction (Goh, 2014). Moreover, our study also illustrates the importance of social environment (i.e., L2 speaking and listening context) with respect to needs satisfaction (Ryan & Deci, 2017). This means that the needs satisfaction does not occur alone but simultaneously happen in L2 listening and speaking contexts. In addition, our findings support the essentiality of integrating listening and speaking into the concept of oracy to some extent. This is partially consistent with Qiu and Xu's (2021) findings that L2 speaking and listening motivation were integrated and L2 speaking and listening should be taught and assessed together.

6.3. Demographic information and need satisfaction

Moving on to RQ3, the results also revealed gender and disciplinary differences, and that those with varying university contexts, stages of schooling, and with and without study-abroad experience also reported different degrees of need satisfaction. In this study, female participants' satisfaction with L2 speaking autonomy and relatedness and L2 listening competence was significantly higher than those of males, whereas their degrees of L2 speaking competence and L2 listening autonomy and relatedness were similar. One explanation for this finding could be that females may be more willing to communicate in an L2 than males (Donovan & MacIntyre, 2004), and being willing to communicate has been positively correlated with self-determined motivation and basic psychological needs (Joe et al., 2017). Therefore, female students might obtain higher satisfaction of basic psychological needs in these linguistic areas. Also, in exam oriented L2 classrooms, such as China, where both male and female learners may have limited experience in interactive tasks and the lack of interaction causes both groups of learners to engage less inside and outside the classrooms (Xu & Qiu, 2020). Thus, in this learning environment, their sense of autonomy and relatedness may not obviously differ as shown in our study.

The university geographic context was also linked to L2 learners' satisfaction of psychological needs. In China, coastal provinces (e.g., Shanghai, Zhejiang),

in general, are more developed than inland provinces (e.g., Hubei, Xinjiang) which leads to disparities in higher education (Xiang et al., 2020). Beijing was listed as an independent category because of its role as a capital province and its economic development as an inland urban province. In our findings, the means for L2 speaking and listening autonomy and relatedness for the Beijing and coastal groups were significantly higher than those for inland participants, and Beijing students obtained a higher degree of competence for speaking and listening than inland counterparts, implying that the basic psychological needs for L2 learners from more developed areas could be better satisfied than those for inland students. This may be attributed to the disparity in educational resources between the more developed and less developed areas reported in the literature (Xiang et al. 2020), as inland learners may have relatively fewer opportunities to communicate in English and develop their speaking and listening skills than their Beijing and coastal province peers, and they might be less confident about their language performance. There is also a trend of academic mobility or "brain drain" from inland to Beijing or coastal universities, leading to an imbalance regarding teaching and research quality (Chen, 2016). Therefore, another explanation is that traditional teacher-centered and exam-oriented L2 classrooms may be more typical in inland provinces. In comparison, teachers in more developed areas may adopt more diverse teaching methodologies (e.g., learner-centered approaches such as task-based instruction), generating more real-time communication experience for learners and satisfying their psychological needs in a better way.

Students' university schooling stage (Years 1-4) was also related to learners' satisfaction of needs. As expected, the means in speaking and listening competence for senior year students (Year 4) were higher than those of Year 1 students, which is likely due to their more developed English skills at the later stage of their university study. Similarly, Year 3 learners felt a stronger sense of relatedness with their teachers and peers than Year 2 students, possibly because they were more familiar with their classmates and teachers after more than two years' university studies. However, since no other significant differences were found in the schooling stage comparisons, these findings are inconclusive.

The fourth factor that turns out to be influential is academic discipline, as the humanities participants were found to possess higher degrees of all the needs than their science and engineering counterparts in both speaking and listening. Shaaban and Ghaith (2000) found that the major did not affect learners' motivation to learn English as a foreign language, but regarding basic psychological needs, the story could be different. Science and engineering students' basic psychological needs in L2 speaking and listening may require more attention than those for students of the humanities, social sciences and medicine. A possible reason is that learners from different disciplines may have different

learning styles and preferences. For example, Lau and Gardner (2019) found that L2 learners from soft science disciplines (e.g., humanities and social science) were more active in the learning process (being autonomous in L2 learning according to Lau, 2017) than their peers in the hard sciences. Their finding may also help explain the current result. English language learning itself belongs to the subjects of the humanities. While learning English, HSS students can find out interest, advantage, and/or learning goal. Moreover, although disciplinary differences have been regarded as crucial for teaching academic English due to different academic conventions in different disciplines, their relationship with L2 motivation is worth exploring further.

Finally, the lack of study-abroad experience has been reported to affect L2 performance and L2 listening motivation (Xu & Qiu, 2020), and our study further proposes that study-abroad experience strengthens L2 learners' sense of autonomy, competence, and relatedness in speaking and listening. Overseas learning experiences offered the learners real-time communication opportunities to develop their knowledge and the strategies of listening and speaking in the target language; hence, they might be more confident about their communication skills and have better developed English speaking and listening learning strategies, and greater knowledge of what to include when communicating than those without prior study-abroad experience (Xu & Qiu, 2020).

7. Concluding remarks

This study examined basic psychological needs for L2 speaking and listening with two scales. Our findings provide a basis for some pedagogical implications as well as directions for future research. The limitations are also acknowledged in this section.

Regarding pedagogical implications, teachers may focus on the instruction of integrated language skills and listening-and-speaking tasks, creating interactive communication experience (Goh, 2014) to achieve the satisfaction of L2 learners' psychological speaking and listening needs, as the need satisfactions of the two skills are correlated. Teachers can also use the validated measurement scales to investigate the psychological needs of their own students so as to develop more insights into the motivational profiles of their students. Moreover, they may consider students' demographic information when designing tasks (e.g., gender), and try their best to satisfy students' basic psychological needs in L2 communication. With respect to the methodological implication, our study successfully adopts both first-order and bifactor CFA models to verify the construct validity of basic psychological needs, which sheds light on future validation studies in L2 contexts. In relation to conceptual contribution, our study consolidates the concept of oracy by showing the close relationship between psychological

L2 speaking and listening needs, which inspires future researchers to treat and study L2 listening and speaking in an integrated manner.

The present study has limitations. Students' questionnaire input were only self-reported data which might need to be triangulated with other data sources, such as observation, performance and so on. Furthermore, due to practical constraints, data on students' learning outcomes were not collected. Consequently, the predictive validity of the psychological L2 speaking and listening needs scale on language outcomes was not addressed. In addition, although the data covering students from different regions of China were collected, the sample size was not very large compared with the student population in China.

As to the suggestions for future validation studies, participants from different countries or regions can be recruited to address how psychological needs vary across different cultural contexts. In addition, future studies may collect the data of students' learning outcome in a larger scale to longitudinally examine the changes of psychological L2 speaking and listening needs. In summary, we hope that the findings of our study not only contribute to our understanding of the relationship between L2 speaking and L2 listening from the motivation perspective but also reinforce the necessity of integrated listening-and-speaking instruction in second and foreign language classrooms.

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