

Relationship between Task Complexity and Learner Factors: An Analysis of Intermediate and Advanced Learners of Korean Language

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ABSTRACT

This study investigated the impact of learner factors on complexity, accuracy, and fluency (CAF) when performing tasks with varying levels of complexity. The study measured working memory, language anxiety, and the scale and intensity of social interaction among 25 intermediate and 30 advanced Korean learners, as well as native Korean speakers. The results showed that the complexity of spoken language production increased with more complex tasks at the expense of accuracy, particularly among second-language learners. Conversely, native speakers maintained consistent accuracy across different task types. These findings underscore the importance of tailoring task design and implementation to individual learner profiles, which is essential for optimizing task-based language-learning environments. This study advocates a balanced approach that aligns task demands with learner needs to enhance educational outcomes.

Keywords: task complexity, working memory, language anxiety, social interaction, CAF

1. Introduction

With the increasing recognition of the significance of tasks in second language education, there has emerged a consensus on the imperative for curricula that prioritize tasks as foundational units, transitioning from traditional models based primarily on linguistic units. Task activities are pivotal for facilitating the necessary input and output processes for second language acquisition and essential components in the architecture of curriculum design (Kim & Tracy-Ventura, 2011: 287). This shift towards task-based curricula has spotlighted the critical role of task grading and sequencing within second language classrooms (Skehan & Foster, 2001), necessitating the development of systematic criteria for task organization. Responding to this

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requirement, Robinson (2001: 27) suggested Triadic Componential Framework (TCF), positing task complexity as a pivotal factor influencing both the successful completion of tasks and variations among individual learners.

Within TCF, task complexity plays a crucial role in elucidating the variations within individuals regarding successful task performance and language acquisition. Conversely, task difficulty serves to shed light on the differences between individuals (Robinson, 2001: 79-81). Thus, as the cognitive complexity of a task increases, it is suggested that the variance in cognitive and affective factors among learners will increasingly differentiate second language output in task-based interactions.

Reflecting on this aspect of TCF, a series of studies explored task complexity and learner factors (Awwad & Tavakoli, 2022; Kim & Tracy-Ventura, 2011; Kormos & Trebits, 2011; Révész, 2011; Robinson, 2007; Trebits, 2016). Kormos and Trebits (2011) and Awwad and Tavakoli (2022) focused on the impact of working memory, while Robinson (2007), Révész (2011), Kim & Tracy-Ventura (2011), and Trebits (2016) investigated the effects of anxiety on task performance in relation to task complexity.

In the field of Korean language education, studies have been conducted on the impact of task complexity on second language production (Cho & Kim, 2023; Kim, 2020; Lee, 2012; Song, 2023). These studies manipulated the factors of resource-directing variables and resource-dispersing variables to control task complexity, thereby investigating the differences in the complexity, accuracy, and fluency of spoken and written production. However, studies that examined task complexity and individual variation are rare. Lee et al. (2023) represents one of the few studies that have delved into the relationship between learners' cognitive factors and task complexity.

Therefore, to deepen our understanding of task complexity in second language acquisition with Korean as the target language, this study examines the interaction between task complexity and learner factors on language production, drawing on a theoretical framework for task classification. Specifically, it focuses on the influence of learner factors, such as working memory as a cognitive factor and anxiety as an affective factor. Moreover, acknowledging the significant role of social interaction in language development, and considering that the participants are international students studying in Korea, the study further explores the scope and intensity of social interactions among the learners. This focus on social dynamics represents a dimension not frequently addressed in previous studies.

2. Theoretical Background

2.1. The triadic componential framework

The current study was structured around the Triadic Componential Framework (TCF) as proposed by Robinson (2001: 27). This framework has been utilized in research across a variety of target languages, facilitating comparative analysis with the findings of this study. Robinson developed the TCF to establish a detailed framework for sequencing tasks, encompassing three key dimensions.

The first dimension, task complexity, refers to the cognitive requirements imposed on learners by a task, thereby highlighting the varied experiences a learner may have when performing two distinct tasks and underscoring the unique challenges each task presents. In this dimension, the resource-directing variables encourage learners to focus more on linguistic resources by making them use specific qualities of linguistic symbols to express concepts such as causality and intention when performing tasks. Subcategories of the resource-directing variable include 'here and now', +/-few elements, spatial reasoning, causal reasoning, intentional reasoning, and perspective-taking. On the other hand, the resource-dispersing variables increase the performance demands on attention and memory, excluding linguistic resources, thereby directing focus towards other cognitive resources. Subcategories of the resource-dispersing variable include planning time, prior knowledge, single task, task structure, few steps, and independence of steps (Robinson, 2006: 15-16). This study posits that variations in the demands of resource-directing variables will influence learners' language production, with the influence of resource-dispersing variables being held constant.

The second dimension, task condition, relates to the interaction dynamics among participants and the context in which tasks are executed. This dimension includes subcategories such as task participation, encompassing the direction of information transmission and whether the task is closed or open, along with aspects related to participants like the number of participants, their gender, and their familiarity with one another. The dimension is adjusted based on factors such as the requirements of the educational environment and curriculum objectives. Consequently, it does not directly influence the theoretical work involved in the preliminary arrangement of tasks.

The third dimension, task difficulty, encompasses learner-specific factors, including cognitive and affective elements like motivation, anxiety, working memory, and aptitude. These elements influence the perceived level of challenge of the task,

thereby acknowledging learner diversity. This dimension, therefore, does not refer to a fixed characteristic of a task but to the relative difficulty perceived by learners based on learner factors, revealing the reasons behind varying performances by different learners on the same task and emphasizing the role of individual differences.

Robinson (2001:79-81) proposed that the concepts of 'difficulty' and 'ease' in tasks are influenced by both the cognitive complexity of the task and the individual differences among learners, with the actual difficulty of a task emerging from the interaction between these elements. As cognitive complexity escalates, the varied cognitive and affective attributes of learners play a more significant role in shaping second language output during task-based interactions. Consequently, task complexity is crucial for interpreting variability in task performance and language learning outcomes within individuals, while task difficulty accounts for the differences observed among individuals.

2.2 Previous studies

Research on the relationship between task complexity and learners' working memory highlights how the management and distribution of attentional resources, memory, and processing capabilities can significantly affect task performance (Robinson & Gilabert, 2007). It is suggested that the cognitive demands associated with increasing task complexity necessitate a greater allocation of attentional resources, which in turn, plays a pivotal role in differentiating learners' second language performance (Robinson, 2011). This relationship underscores the critical influence of working memory on the complexity, accuracy, and fluency of second language output in complex tasks.

Investigations into the effects of working memory on language output reveal that learners with higher working memory capabilities are able to produce more complex, accurate, and fluent responses. For example, studies (Afshar & Tofighi, 2021; Awwad & Tavakoli, 2022; Hyun & Lee, 2018; Zalbidea, 2017) have shown that as tasks become more complex, learners with better working memory not only produce linguistically more intricate utterances but also display improvements in accuracy. This was evident in tasks that challenged learners to utilize their cognitive resources more extensively, where a notable correlation between working memory and language output complexity, especially in terms of syntactic and lexical aspects, was observed.

In studies that have investigated the dynamics of working memory (Awwad &

Tavakoli, 2022; Zalbidea, 2017), tasks that included variables such as the need for inference (+/- inference) and the number of elements involved in completing the tasks (+/- few elements) were employed to assess the role of working memory in language output across tasks of varying complexity. Findings from these studies indicated that higher working memory facilitated enhanced performance, particularly in complex tasks where increased lexical complexity and accuracy were required. Similarly, the manipulation of the '+/- intentional reasoning' variable in narrative tasks led to significant findings where increased complexity and accuracy were noted, although fluency might decrease under such conditions (Afshar & Tofghi, 2021). This suggests that the cognitive load imposed by complex tasks can be mitigated by the learners' working memory capacity, thereby enabling them to manage linguistic challenges more effectively.

Investigations into the correlation between task complexity and learners' working memory delineate an intricate relationship that significantly influences second language acquisition. Research conducted by Kormos & Trebits (2011) and Lee et al. (2023) indicates that working memory exerts a beneficial effect on language proficiency in tasks of lower complexity. Conversely, empirical evidence predominantly demonstrates a more substantial impact of working memory on the execution of tasks with higher cognitive demands. This pattern suggests that the requirement for attentional resources amplifies with the complexity of the task, underscoring the vital role of working memory in enhancing linguistic capabilities. Despite these findings, the diverse outcomes across studies complicate the formulation of a direct proportional relationship between task complexity and the reliance on working memory, suggesting a multifaceted interaction.

The second language anxiety is known to be one of the affective factors that can influence learners' linguistic resources, impacting their performance and learning in a second language (Ishikawa, 2011: 309). A series of studies (Kim & Tracy-Ventura, 2011; Robinson, 2007; Révész, 2011; Trebits, 2016) have examined the effects of language anxiety on learners' performance across tasks of varying complexity, particularly focusing on the manipulation of resource-directing factors among task complexity variables.

Robinson (2007) found that lower levels of output anxiety are associated with the production of more complex language in learners of English with a Japanese background, suggesting that reduced anxiety may facilitate improved performance in linguistically challenging tasks. Similarly, Trebits (2016) observed that among bilingual speakers engaged in storytelling tasks, lower anxiety levels correlate with

enhanced accuracy in both spoken and written language. This points to the potential of anxiety levels to influence language output, where reduced anxiety contributes to higher accuracy, even if producing complex sentences remains challenging.

However, the effects of anxiety do not always emerge. Révész (2011) and Kim & Tracy-Ventura (2011) did not find significant interaction effects, indicating that while task complexity can enhance learning opportunities and improve language accuracy, the learners' anxiety levels do not necessarily impact their performance in a direct manner. Specifically, Kim & Tracy-Ventura (2011) demonstrated that complex tasks facilitate past tense development more effectively than simpler tasks, yet the levels of anxiety did not distinctly influence the learning outcomes.

Research exploring the social interaction on second language development has delved into how social factors, rather than task complexity, affect various aspects of language learning, including speaking (Du, 2013; Hernández, 2010; Isabelli-García, 2006; Llanes et al., 2012; Segalowitz & Freed, 2004), writing (Llanes et al., 2012), and pragmatic development (Bataller, 2010). These studies collectively underscore the significant role of social factors in enhancing learners' oral proficiency and overall linguistic performance.

Hernández (2010) and Llanes et al. (2012) demonstrated that increased interactional contact with native speakers leads to notable improvements in speaking proficiency, oral fluency, lexical complexity, and accuracy. Further supporting this notion, Du (2013) found that the amount of target language contact significantly impacts spoken fluency among American learners of Chinese, while Segalowitz & Freed (2004) observed a correlation between interactional contact and spoken proficiency, albeit not directly with fluency. These findings suggest that beyond the quantity of interaction, the quality and complexity of communication with native speakers are vital for advancing fluency and proficiency.

Isabelli-García (2006) expanded on these insights by examining the effects of extralinguistic factors, such as motivation, social interaction outside the classroom, and attitudes towards the target culture, on second language learning. The qualitative approach revealed that social interaction with native speakers plays a pivotal role in enhancing the accuracy of second language speaking.

Complementing these findings, Baker-Smemoe et al. (2014) conducted a comprehensive analysis on how various factors, including social interaction, influence second language acquisition across learners of multiple languages. The study identified the degree of social interaction as a key predictor of language improvement, emphasizing that learners who engage more extensively in social

networks and have closer relationships with native speakers exhibit better language development outcomes. Additionally, Bataller (2010) explored the specific impact of social interaction on pragmatic development, finding that social engagement with native speakers can partially influence learners' adoption of appropriate request strategies and expressions.

Studies on task complexity that explored cognitive and affective factors report that individual differences influence learners' language performance in tasks with varying degrees of complexity. The degree of social interaction emerges as a determinant of oral fluency and accuracy. These findings highlight how individual variances shape learners' perceptions of task difficulty, subsequently affecting the complexity, accuracy, and fluency of the language output during task performance. This underscores the intertwined impact of cognitive, affective, and social factors on language learning, prompting this research to investigate their collective influence on learners' oral language development across simple and complex tasks.

Drawing on the TCF and the findings of previous studies, while recognizing the unexplored area of Korean language education, we propose three research questions aimed at clarifying the relationship between task complexity and learner factors:

- RQ1: Does task complexity affect the language production of both native and non-native speakers similarly?
- RQ2: Which learner factors enhance or hinder language production in second language learners?
- RQ3: Do learner factors mitigate the impact of task complexity in second language learning?

3. Research Method

3.1. Participants

The participants consisted of 18 native Korean speakers, 25 intermediate learners (Test of Proficiency in Korean - TOPIK level 4), and 30 advanced learners of Korean (TOPIK level 6). Participants were recruited on a voluntary basis and were randomly assigned to either a simple or complex task group. The allocation to the simple and complex groups was done in a randomized manner to ensure an unbiased distribution of participants across the different proficiency levels. Advanced learners

had been studying Korean for 74.1 months and lived in Korea for 30.6 months, while intermediate learners had a study duration of 34.9 months and a residency of 23.7 months.

Table 1. Participants

Group	Task Group		L1	Age
	Simple	Complex		
Native speakers (N=18)	9 (F = 9)	9 (M = 1, F = 8)	Korean	22.7
Advanced learners (N= 30)	14 (F = 14)	16 (M = 5, F = 11)	Portuguese (1), Chinese (19), Japanese (2), Romanian (1), Turkish (2), English (1), Vietnamese (4)	28.3
Intermediate learners (N=25)	12 (M = 4, F = 8)	13 (M = 1, F = 12)	English (1), Chinese (8), French (1), Japanese (1), Romanian (1), Russian (1), Turkish (1), Uzbek (1), Vietnamese (10)	23.4

3.2. Materials

Previous research has focused on manipulating resource-directing variables to adjust task complexity, and this study developed two tasks within this domain. The first task, a problem-solving task, uses variations in the '+/- few elements' variable to examine the impact of element quantity on engagement and solution strategies. Concurrently, a picture description task employing variations in the '+/- causal reasoning' variable assesses how causal reasoning demands influence language output complexity. This multifaceted approach provides a detailed exploration of task complexity in language learning.

The problem-solving task required participants to recommend suitable accommodations for a guest in need of relocation to another hotel, adapting tasks from Malicka (2014). Participants were presented with a profile of the guest along with a list of five potential accommodations. The tasks included three conditions for the simple task (price, view, meals) and seven conditions for the complex task (location, cost, number of floors, view, parking, etc.), thereby imposing differentiated levels of complexity on participant performance(Figure 1).



Figure 1. Problem-solving tasks (simple and complex)

The picture description task, based on Ishikawa (2006), asked participants to view five pictures and immediately narrate a story for each one. After seeing all five pictures, they were instructed to combine these stories into one comprehensive narrative, considering the order of the pictures. For the simple task, participants told stories from pictures arranged sequentially. The complex task required them to create a narrative from randomly ordered pictures, demanding a higher cognitive load for narrative integration and organization skills(Figure 2).



Figure 2. Picture description tasks (simple and complex)

To validate the task complexity, the researchers conducted 'self-perception questionnaires' on task complexity. Participants rated the difficulty of the tasks they performed using a Likert 9-point scale. The results indicated that the complex problem-solving tasks received higher average scores ($M=4.28$) than the simple tasks ($M=4.04$), reflecting a medium effect size ($f^2 = 0.09$). For the picture description tasks, the complex tasks had slightly higher average scale scores ($M=5.14$) than the simple tasks ($M=5.08$), showing a small effect size ($f^2 = 0.03$).

3.3. Research instruments

3.3.1. Working memory

To assess learners' working memory, this study utilized a computer-based tool (Baik, 2014) that measures phonological, visual, and spatial working memory. The assessment began with a phonological task where participants listened to Korean words during math operations and then recalled and verbalized these words, with scores based on recall accuracy. The visual memory task required participants to memorize and then shade a grid pattern displayed on the screen, with scoring determined by the accuracy of the recalled pattern's location. In the spatial memory task, participants memorized and then pressed blocks in the sequence they flashed on the screen, employing a serial recall method for assessing the precision of sequence recall.

3.3.2. Anxiety

To evaluate language anxiety, this study employed a questionnaire developed by MacIntyre and Gardner (1994) and adapted it for the Korean language. The aim was to identify anxiety at three learning phases: input, processing, and output, termed the IPOA scale. Input anxiety refers to unease with new language input, often due to the target language appearing too fast or complex. Processing anxiety is the stress in organizing and retaining new language information, particularly during second language cognition. Output anxiety is the fear of using the language, affecting speaking or writing tasks. The instrument includes six items for each phase, with a mix of three positive and three negative statements. Responses were measured on a Likert scale from 1 ("strongly disagree") to 9 ("strongly agree"), with adjustments made for responses to negatively worded items.

3.3.3. Social interaction survey

To measure the degree of social interaction of learners, the study employed the Social Interaction Questionnaire for Study Abroad (SASIQ) developed by Dewey et al. (2012, 2013). SASIQ is designed to measure the social networks of second language learners during study abroad, assessing dimensions such as size, continuity, intensity, density, and distribution. Size refers to the number of acquaintances a learner has within their social network, while continuity indicates the extent of interaction with people, represented by the frequency of interactions. Intensity denotes the strength of relationships, with the questionnaire allowing respondents to rate the closeness felt towards members of their social network on an 8-point scale. Density measures how closely connected the members of the network are, gauging the average size of groups of friends or acquaintances; a larger number of people in each group suggests a higher network density. Lastly, distribution refers to the average number of social groups a learner participates in, with more groups indicating a broader network distribution.

3.4. Procedures

A pilot study was conducted, through which the number of conditions in the problem-solving task was supplemented and the sequence of images in the picture description task was scrambled to increase cognitive load.

In the main experiments, two tasks were performed with an interval of one week to prevent the performance of tasks being affected by mental fatigue. All processes were conducted one-on-one between the research participant and the researcher. In the first session, after obtaining consent from the participants, participants took a working memory test. After a 3-minute break, participants performed a problem-solving task, followed by a task complexity questionnaire. In the second session, researchers administered the language anxiety survey and a social interaction survey. Following a 3-minute break, participants performed the picture description task and completed the task complexity questionnaire. The sequence of the two sessions is summarized in Table 2.

Table 2. Procedures

	Learner factors	Tools	Time spent (min.)
First session	Cognitive (Working memory)	Phonological memory test	7
		Visual memory test	7
		Spatial memory test	3
	Task	Problem solving	10
		Task complexity questionnaire	2
Second session	Affective (Anxiety)	IPOA survey	7
	Social interaction	SASIQ	10
	Task	Picture description	10
		Task complexity questionnaire	2

The researcher used a cell phone recorder to record learners' language production while performing the task. The transcription was completed by a researcher pursuing a master's degree in Korean language education, and another researcher reviewed the transcription. Learners' language production during task performance was recorded and transcribed. An initial analysis to assess complexity, accuracy, and fluency (CAF) of the transcribed data was performed by a researcher with over three years of experience in teaching Korean, with a confirming review by another researcher with more than ten years of experience. This analysis process was repeated until full consensus was achieved on the dataset.

3.5. Analysis

The current study employed the Analysis of Speech unit (AS-unit) to assess learners' language complexity, accuracy, and fluency. The AS-unit, encompassing independent and dependent clauses or units smaller than a clause, facilitates speech analysis through intonation and pauses, particularly when sentence components are omitted or the demarcation of independent clauses is ambiguous. This approach is effective for evaluating communicative meaning within syntactic units (Won et al., 2019).

In terms of complexity, we quantified the proportion of dependent clauses per AS-unit, as proposed by Foster & Skehan (1996). Dependent clauses were classified based on the use of specific particles into noun, relative, adverbial, and quoting clauses, following the categorization by Nam & Ko (1985: 384). Complexity thus

reflects the sophistication and variety of language structure. Accuracy was measured by the ratio of error-free clauses to the total number of clauses, taking into account pronunciation, vocabulary, and grammatical correctness while omitting natural omissions and aggregating repeated errors as singular instances. Fluency was assessed by the tally of meaningful syllables over the entire speaking duration, excluding non-essential syllables emanating from fillers, repetitions, corrections, and repairs, aligning with Ellis's (2003) definition of fluency as the production of language in a manner akin to that of native speakers.

Subsequent to data collection, results pertaining to working memory, anxiety, and social interaction, alongside speech analysis outcomes, were systematically organized within Excel. A multiple regression analysis was then executed using R, designating task and learner factors as independent variables and language production analysis results as dependent variables. This structured approach ensures a direct, concise, and academically rigorous examination of how various factors influence learners' language proficiency.

4. Results

4.1. Cognitive and affective factors

In the problem-solving task, the learners of Korean exhibited increased complexity (Intermediate learner $M=0.41$; Advanced learner $M=0.74$) and fluency (Intermediate learner $M=2.13$; Advanced learner $M=2.80$) in complex tasks, whereas accuracy (Intermediate learner $M=0.57$; Advanced learner $M=0.74$) increased in simple tasks. Producing more sentences with more complex structures appears to have resulted in decreased accuracy. However, the results were the opposite for native Korean speakers.

In the picture description task, intermediate-level learners showed increased fluency ($M=1.46$) with more complex tasks and increased complexity ($M=0.62$) and accuracy ($M=0.60$) with simple tasks when speaking immediately upon seeing a picture. However, when they had a chance to organize their thoughts before speaking, complexity ($M=1.77$) increased with more complex tasks, and fluency ($M=1.86$) increased with simple tasks. On the other hand, advanced learners showed increased complexity ($M=1.58$) and accuracy ($M=0.70$) with more complex tasks in both immediate and revised speech, and fluency ($M=2.43$) increased with simple

tasks. For native speaker groups, in immediate speech, complexity ($M=1.48$) increased with simple tasks, and fluency ($M=2.76$) increased with complex tasks, but in revised speech, complexity ($M=2.13$), accuracy ($M=0.97$), and fluency ($M=3.44$) all increased with simple tasks. These results and tendencies are shown in Table 3 and Figure 3.

Table 3. CAF by group × task complexity

Group	Task	Problem solving			Picture description					
					Immediate			Delayed		
		C*	A**	F***	C	A	F	C	A	F
Intermediate learner	Simple	0.38	0.57	2.10	0.62	0.60	1.33	1.26	0.63	1.86
	Complex	0.41	0.54	2.13	0.60	0.42	1.46	1.77	0.63	1.54
Advanced learner	Simple	0.73	0.74	2.77	0.87	0.63	2.03	1.52	0.68	2.43
	Complex	0.74	0.70	2.80	1.05	0.65	1.81	1.58	0.70	2.35
Native speaker	Simple	0.98	0.91	4.63	1.48	0.97	2.62	2.13	0.97	3.44
	Complex	0.75	0.94	4.20	1.26	0.97	2.76	1.96	0.95	3.26

*C: Complexity [dependent clauses per AS-units], **A: Accuracy [error-free clauses per total clauses], ***F: Fluency [# of meaningful syllables over the speaking duration]

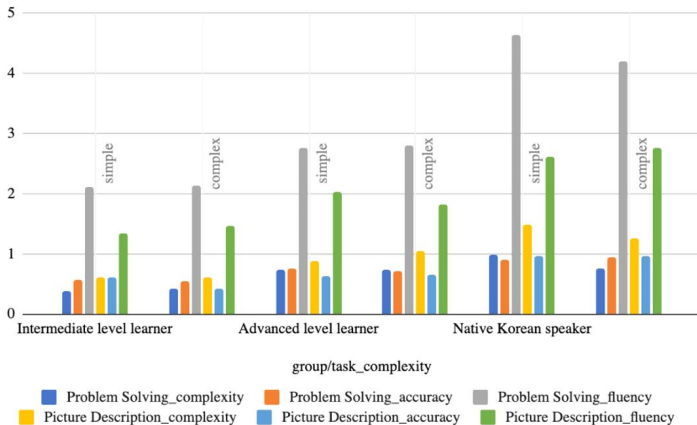


Figure 3. CAF by group × task complexity

There were no significant differences in the scores of both cognitive and affective factors between task groups ($p > 0.05$). The native speaker group overall had higher

working memory scores than the learner group with the Korean phonological memory scores being nearly twice as high compared to the learners ($F = 38.90$, $p < 0.001$).

Intermediate learners showed higher anxiety in all areas of input ($M=4.08$), processing ($M=3.82$), and output ($M=3.31$), regardless of task complexity, than advanced learners ($F = 291.31$, $p < 0.001$). This indicates that learners with lower proficiency in Korean and faced with complex tasks feel greater anxiety (Table 4, Table 5).

Table 4. Results of cognitive and psychological factors by groups

Factor (total score)		Intermediate learner	Advanced learner	Native speaker
Working memory	Visual (3300)	848.00	891.30	1,108.39
	Spatial (560)	372.72	380.27	414.61
	Phonological (350)	118.44	113.40	222.06
Anxiety	Input (6)	4.08	4.25	
	Process (6)	3.82	4.13	N/A
	Output (6)	3.31	3.86	

Table 5. ANOVA Results of cognitive and psychological factors by groups and task

Factor		df	Sum Sq.	Mean Sq.	F	p
Visual	Group	2	785,837	392,919	2.166	0.12
	Task	1	15,797	15,797	0.09	0.77
Spatial	Group	2	20,128	10,064	2.39	0.10
	Task	1	16	16	0.00	0.95
Phonological	Group	2	313,827	156,913	38.90***	<0.001
	Task	1	6860	6,860	1.70	0.20
Anxiety	Group	2	1,988,045	994,023	291.31***	<0.001
	Task	1	4,251	4,251	1.25	0.27

4.2. Social interaction

Among intermediate-level learners of Korean, the group performing complex tasks spent more time using both Korean and other foreign languages than the group

performing simple tasks. Conversely, in the advanced-level learners of Korean, the group performing simple tasks showed longer durations of Korean and other languages usage than the group performing complex tasks. Comparing the two groups, intermediate learners used other languages for longer durations than Korean. However, advanced learners used Korean for longer periods than other languages. There were no significant differences in the results of the survey between task groups.

The intermediate group had a higher number of contacts for communication in other languages, while the advanced learner group had more contacts for communication in Korean. However, both the intermediate and advanced group had higher frequency and intensity for communication in other languages than in Korean.

Lastly, looking at the social relationship results, the intermediate learner group had a larger number of groups and a higher density in their network compared to the advanced learner group. This is partly due to the fact that the most advanced learners were graduate school students and they allocated more resources to the academic area than social interaction(Table 6).

Table 6. Results of social interaction survey by groups

Social factor		Intermediate learner	Advanced learner
Time spent (Korean) (hour/week)	Speaking	21.70	20.38
	Listening	26.40	24.77
	Reading	18.00	30.80
	Writing	11.12	19.53
Time spent (other languages) (hour/week)	Speaking	24.98	20.78
	Listening	33.20	16.52
	Reading	27.12	16.53
	Writing	14.94	10.68
Size (N)	Total number of people	12.12	17.80
	Number of people (Korean)	5.72	10.83
	Number of people (Other languages)	7.28	8.50
Frequency (time/week)	Korean	12.77	16.62
	Other languages	18.59	18.84
Intensity (frequency*closeness)	Korean	63.50	81.84
	Other languages	91.28	117.23
Distribution (N)	Number of groups	2.76	1.70
Density (N)	Group size (max.)	4.41	3.71
	Group size (avg.)	2.74	2.67

4.3. Inferential results

To investigate whether the factors analyzed in Sections 4.1 and 4.2 exhibit significant correlations with the complexity, accuracy, and fluency of spoken language production in each task, a multiple regression analysis was conducted for all variables concerning the complexity, accuracy, and fluency of each task, dividing the subjects into groups of native and non-native speakers. Tables 7 and Table 8 display only the values that are significant at the alpha level of 0.05, and those with a probability close to or lower than the significance threshold of 0.1.

In the problem-solving tasks, the simple tasks showed no significant correlation. However, the results of the complex tasks revealed a significant correlation between the frequency of contact with Korean speakers and the oral fluency of learners of Korean ($\beta = 1.30, t = 2.34, p < 0.05$). Additionally, the intensity of contact with Korean speakers was measured with a significance probability slightly higher than .05, but the model's fit, indicated by a multiple R² of 76% ($\beta = -1.52, t = -2.13, p = 0.07$), suggests that the factor could influence the outcomes.

Table 7. Results of social interaction survey by groups

Task	Group	Variable	Estimate	SE beta	Std. error	t value	p value	ΔR
Complex	NNS	Freq_Koreans	10.04	1.30	4.29	2.34*	<0.05	0.76
		Intens_Koreans	-2.07	-1.52	0.97	-2.13	0.07	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

NNS: Non-native speakers, Freq_Koreans: Number of times meeting Koreans weekly, Intens_Koreans: Intensive of meeting with Koreans.

In the simple picture description task, the native speaker group showed a positive correlation between spatial working memory and the complexity of language production. However, the significance probability was slightly higher than 0.05, and the multiple R^2 was 47%, indicating that the values were not significant.

On the other hand, for the non-native speakers group, a correlation approaching significance, emerged between the time spent speaking other languages and the complexity of language production ($\beta = 1.99, t = 2.10, p = 0.09$), suggesting that speaking in learners' L1 might promote the production complex sentences, thereby positively affecting the complexity of the target language. The proficiency levels among learners, as well as the number of contacts with speakers of other languages,

exhibited a degree of influence on the fluency. Although the probabilities were not significant, they were close to the alpha level. Additionally, considering the value of the multiple R-squared, this suggests that these factors are relevant for understanding variations in fluency ($p > 0.05$, $R^2 = 0.91$). This suggests that having social contacts without the pressure to use the target language may facilitate learners' willingness to communicate.

In the complex picture description task, the language production of non-native learners of Korean showed significant correlations with various factors. The proficiency level of the learners was proved to be the major factor in predicting language production complexity ($p < 0.05$, $R^2 = 0.90$). On the other hand, the frequency of contact with speakers of foreign languages was inversely correlated with the complexity of language production.

The time spent listening to Korean was not statistically significant but was close to the alpha level with a high R-squared ($t = 2.91$, $p = 0.09$, $R^2 = 0.90$), suggesting that this factor might also have a positive influence on the complexity. The intensity of contact with people speaking foreign languages was also not statistically but was close to the alpha level with high R-squared ($t = -2.91$, $p = 0.09$, $R^2 = 0.90$). This implies that higher proficiency levels and less frequent contact with speakers of other languages may lead to the use of more complex sentences.

The accuracy of speech also showed a significant correlation with the proficiency level of learners ($t = 3.24$, $p < 0.05$, $R^2 = 0.92$). Although statistically not significant, the time spent listening to Korean showed a negative correlation with accuracy. This suggests that listening too much without having opportunities to make language output limits accuracy.

In the current study, lower anxiety scores indicate higher levels of anxiety, and a positive correlation between anxiety and fluency was observed ($t = 2.43$, $p < 0.05$, $R^2 = 0.88$). This suggests that the more at ease learners are in their psychological state, the higher the fluency of their language production. Additionally, the time devoted to Korean writing, a form of written production, not only enhances written output but also contributes to increasing the fluency of oral production ($t = 2.48$, $p < 0.05$, $R^2 = 0.88$). Furthermore, phonological memory ($t = 2.16$, $p = .06$, $R^2 = 0.88$) and the frequency of contact with speakers of other languages ($t = 1.99$, $p = .08$, $R^2 = 0.88$), both close to the alpha level of 0.05 with high R^2 , showed positive correlations with fluency. Phonological working memory was proven to influence fluency. The frequency of meeting with people speaking a foreign language might have lowered the anxiety levels of learners.

Table 8. Results of multiple linear regression for the picture description task

Task	Group	Variable	Estimate	SE beta	Std. error	t value	p value	ΔR		
Simple	NS	C	WM_Spatial	0.86	1.14	0.42	2.02	0.10	0.47	
		C	SP_T_ForeignL	4.54	1.99	2.16	2.10	0.09	0.81	
	NNS		ADV_Learner	104.39	0.93	51.81	2.02	0.10		
		F	INTMD_Learner	-104.39	-0.93	51.81	-2.02	0.10	0.91	
			Meet_Foreigner	21.21	1.66	9.36	2.27	0.07		
			ADV_Learner	63.30	0.80	21.77	2.91*	<0.05		
Complex	C		INTMD_Learner	-63.30	-0.80	21.77	-2.91*	<0.05		
			LS_T_Kor	-1.38	-0.77	0.73	-1.90	0.09	0.90	
			Freq_Foreigner	-1.71	-0.76	0.62	-2.74*	<0.05		
			Intens_Foreigner	-0.24	-0.61	0.13	-1.91	0.09		
			ADV_Learner	33.71	0.82	10.41	3.24*	<0.05		
	NNS	A		INT_Learner	-33.71	-0.82	10.41	-3.24*	<0.05	0.92
				LS_T_Kor	-0.64	-0.68	0.35	-1.84	0.10	
				SP_T_ForeignL	-0.56	-0.54	0.30	-1.90	0.09	
			WM_Phonologica 1	0.38	0.48	0.17	2.16	0.06		
		F	Anxiety	0.39	0.54	0.16	2.43*	<0.05	0.88	
	WRT_T_Kor	2.62	0.76	1.06	2.48*	<0.05				
	Freq_Foreigner	1.74	0.61	0.88	1.99	0.08				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

NS: Native speaker, NNS: Non-native speaker, WM_Spatial: Spatial working memory, SP_T_ForeignL: Time spent speaking foreign languages weekly, ADV_Learner: Advanced-level learner, INTMD_Learner: Intermediate-level learner, Meet_Foreigner: Number of foreigners meeting weekly, LS_T_Kor: Time spent listening Korean weekly, Freq_Foreigner: Number of time meeting foreigners weekly; Intens_Foreign: Intensity of meeting with foreigners weekly, WM_Phonological: Phonological working memory, WRT_T_Kor: Time spent writing Korean weekly.

5. Discussion

5.1. Does task complexity affect the language production of both native and non-native speakers similarly?

The findings reveal distinct responses to task complexity between native and non-native speakers. Non-native speakers, both intermediate and advanced learners of Korean, exhibited increased complexity and fluency in complex tasks but at the cost of accuracy, aligning with Robinson (2007) and Révész (2011) who suggested that increased cognitive demands might compromise accuracy due to the allocation of cognitive resources to manage complexity. Contrarily, native speakers maintained or even improved accuracy across tasks, which may reflect their inherent proficiency and capacity to navigate linguistic challenges without sacrificing accuracy, echoing findings by Kim (2020) and Song (2023) on the adaptability of native speakers to task complexity.

5.2. Which learner factors enhance or hinder language production in second language learners?

The study identified working memory, language anxiety, and social interaction as key factors influencing language production among learners. Intermediate learners showed higher levels of anxiety compared to advanced learners, negatively impacting their language output, consistent with studies by Kim & Tracy-Ventura (2011) and Trebits (2016). However, the degree of social interaction, especially the frequency and intensity of contact with Korean speakers, positively correlated with fluency in complex tasks for non-native speakers, suggesting the importance of social engagement for language acquisition, as supported by findings from Isabelli-García (2006) and Hernández (2010).

The results also highlight the importance of phonological working memory in influencing fluency. The nearly significant p-values, combined with the substantial explained variance ($R^2 = 0.88$), underscore the potential impact of phonological memory and social linguistic interaction on language fluency. This underscores the critical role that both internal cognitive mechanisms and external social interactions play in the development of linguistic skills.

5.3. Do learner factors mitigate the impact of task complexity in second language learning?

The proficiency level emerged as a significant predictor of language production complexity and accuracy, indicating that higher linguistic proficiency can mitigate the challenges posed by task complexity. This is in line with the assertions by Kormos & Trebits (2011) that working memory capacity, a proxy for cognitive ability, can enhance performance in complex tasks. Interestingly, the study also found that the time spent engaging with the Korean language, particularly through listening, though not statistically significant, showed a trend towards improving complexity and accuracy, suggesting a nuanced role of immersive exposure in managing task complexity.

The findings suggest several pedagogical implications for second language instruction. First, task complexity should be carefully calibrated to the learners' proficiency level, ensuring that tasks are challenging yet manageable. Second, educators should incorporate strategies to mitigate language anxiety, possibly through supportive feedback and creating a positive classroom environment. Third, promoting social interaction within the language learning context, such as through group work or language exchange programs, can enhance fluency and linguistic confidence. Lastly, curriculum designers should consider integrating listening and speaking activities that mimic real-world interactions, fostering both the cognitive and social aspects of language learning.

6. Conclusion

This study explored the interrelation between task complexity, learner factors, and language production in the context of second language acquisition. It examined how native and non-native speakers of Korean navigate varying levels of task complexity and identified critical learner factors such as working memory, language anxiety, and social interaction that influence language production capabilities. The findings underscore the nuanced impact of task complexity on linguistic output, revealing that while task complexity might enhance certain aspects of language production, it could also impose constraints depending on individual learner attributes. In addition, this research highlights the potential of social interaction and language immersion in mitigating the challenges posed by complex tasks, offering valuable

insights into designing effective language learning programs that cater to diverse learner needs. This study contributes to the broader discourse on second language pedagogy, suggesting practical strategies for leveraging task complexity and learner factors to facilitate language learning and acquisition.

The current study, while providing substantial insights, has its limitations. Firstly, the sample size and demographic composition, primarily focused on learners of Korean with a specific language proficiency level, may not fully capture the dynamics of learner factors. Additionally, this study concentrates solely on spoken language, which may not encompass the full spectrum of language use and acquisition. This specificity might restrict the generalizability of the findings to the broader field of second language acquisition. Furthermore, the dependence on self-reported measures for variables such as language anxiety and social interaction could introduce subjective biases. Future research could mitigate these limitations by including a more diverse participant pool and using objective measures to validate self-reported data, thus enhancing the robustness and applicability of the findings.

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Appendix 1. Items for the Input, Processing, and Output Anxiety Scales

영역	문항 내용
Input anxiety scale	1) I am not bothered by someone speaking quickly in Korean.
	2) It does not bother me if my Korean notes are disorganized before I study them.
	3) I enjoy just listening to someone speaking Korean
	4) I get flustered unless Korean is spoken very slowly and deliberately.
	5) I get upset when I read in Korean because I must read things again and again.
	6) I get upset when Korean is spoken too quickly.
Processing anxiety scale	7) Learning new Korean vocabulary does not worry me, I can acquire it in no time.
	8) I am anxious with Korean because, no matter how hard I try, I have trouble understanding it.
	9) The only time that I feel comfortable during Korean tests is when I have had a lot of time to study.
	10) I feel anxious if Korean class seems disorganized.
	11) I am self-confident in by ability to appreciate the meaning of Korean dialogue.
	12) I do not worry when I hear new or unfamiliar words, I am confident that I can understand them.
Output anxiety scale	13) I never feel tense when I have to speak in Korean.
	14) I feel confident that I can easily use the Korean vocabulary that I know in a conversation.
	15) I may know the proper Korean expression but when I am nervous it just won't come out.
	16) I get upset when I know how to communicate something in Korean but I just cannot verbalize it.
	17) I never get nervous when writing something for my Korean class.
	18) When I become anxious during a Korean test, I cannot remember anything I studied.

Appendix 2. Items for the Social Interaction Scales

Section	Questionnaire
Time spent	1) How much you use Korean in a week. (Speaking, Listening [*] , Reading, Writing)
	2) How much you use your native language, not Korean, in a week. (Speaking, Listening [*] , Reading, Writing)
Size, Frequency, Intensity	3) Please write down your friends' or acquaintances' name. (Maximum 30 people)
	4) What language you use when you speak with this person? (Each person)
	5) How many times you meet this person? (Each person) ^{**}
Distribution, Density	6) How close are you to this person? (8=very close, 1=not close, Each person)
	7) Please write down meetings or activities you participate in using Korean. (Maximum 10 meetings or activities)
	8) Please draw your friends or acquaintances into each meeting or activities you wrote. (You can leave people if they do not belong anywhere in the meetings or activities.)

^{*} Listening: YouTube, Podcast, TV, music, etc.

^{**} (Example) 2-3 times per 1 week, 2-3 times per 1 day, 1 time per 1 month, etc.