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Linguistic, cognitive, and affective components of L2 listening comprehension: A multidimensional model

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ABSTRACT: There has been a growing interest in listening comprehension in English as a foreign language (L2 listening) concerning the contributing factors. Previous studies mainly focused on how certain variables influence L2 listening, neglecting how the variables interact with each other. Adopting a componential approach, this study aimed to investigate how grammar and vocabulary knowledge, anxiety, and willingness to listen in L2, working memory, and metacognitive awareness interact with overall L2 listening comprehension and each other. A group of 212 students with intermediate to upper-intermediate proficiency in English enrolled at two Turkish state universities during 2020-2021 calendar participated in the study. The participants completed listening, vocabulary, grammar, and digit-span tests, anxiety and willingness scales, and metacognitive awareness questionnaire over a three-week period. The relationship between the components and L2 listening was measured through Structural Equation Modelling (SEM) using maximum likelihood estimation. After analyses, a statistically and theoretically sound model was introduced. The model underscores the significant impact of these components on L2 listening comprehension and displays their complex interplay with each other. Within this intricate web, vocabulary and grammar emerge as pivotal components, substantially influencing L2 comprehension as well as interacting with and shaping the other variables.
Keywords: L2 listening comprehension, linguistic variables, affect, cognition, metacognition

Componentes lingüísticos, cognitivos y afectivos de la comprensión auditiva en L2: Un modelo multidimensional

RESUMEN: Ha habido un creciente interés en la comprensión auditiva en inglés como lengua extranjera en lo que respecta a los factores que contribuyen a ella. Estudios anteriores se centraron en cómo ciertas variables influyen en la escucha en L2 sin investigar cómo interactúan entre sí. Este estudio adoptó un enfoque componencial para investigar cómo el conocimiento de gramática y vocabulario, la ansiedad al escuchar en L2, la disposición a escuchar en L2, la memoria de trabajo y la conciencia metacognitiva interactúan con la escucha en L2 y entre sí. Participaron 212 estudiantes universitarios con dominio intermedio a intermedio alto de dos universidades estatales en Turquía durante el curso 2020-2021. Los participantes completaron instrumentos que midieron cada variable durante tres semanas.

La relación entre los componentes y la escucha en L2 se evaluó mediante el modelado de ecuaciones estructurales (SEM) utilizando estimación de máxima verosimilitud. Tras análisis meticulosos, se presentó un modelo estadístico y teórico sólido. El modelo destaca el impacto significativo de estos componentes en la comprensión auditiva de L2 y sus complejas interacciones. El vocabulario y la gramática emergen como componentes fundamentales, influyendo sustancialmente en la comprensión de L2 y en la configuración de otras variables.
Palabras clave: Comprensión auditiva en L2, variables lingüísticas, afecto, cognición, metacognición

1. Introduction

Comprehending the stimuli around, from casual chats with friends to following instructions in manuals, is a crucial skill. Comprehension entails a specialized reasoning process that helps create a mental representation of a message, whether oral or written (Perfetti et al., 2005). It is critical in education where students' academic growth depends on comprehending course content. In L2 (foreign language) learning environments, comprehension is particularly essential as the language constitutes both content and medium. This underscores its paramount importance for linguistic and academic development (Rashidi & Khosravi, 2010). Therefore, teachers must ensure that the language input matches their students' abilities by controlling factors hindering comprehension. These factors can be task (e.g., text complexity) or learner-related, the latter being diverse and challenging to identify as they can vary among individuals. In the realm of L2 reading, scholars tackled this issue by employing a componential approach to comprehension. This approach sees comprehension as the sum of success in component skills (Carr & Levy, 1990) among which are vocabulary knowledge (Zhang, 2012), grammar knowledge (Lee, 2016; Zhang, 2012), and morphological knowledge (Zhang & Koda, 2012).

This conceptual framework subsequently informed L2 listening research, wherein scholars examined distinct components such as vocabulary, grammar, anxiety, motivation, working memory, metacognition, and their respective roles in determining L2 listening proficiency. However, L2 listening literature still faces important challenges. First, there is a notable bias towards L2 reading comprehension, neglecting the same depth of focus on L2 listening comprehension (Bonk, 2000). Second, existing studies tend to focus on individual learner-related factors, overlooking the potential interactions among them. Bernhardt (2005) underlined the necessity to investigate whether other factors, beyond grammar and vocabulary knowledge, interact and contribute collectively to L2 reading comprehension. The same perspective is also crucial for L2 listening comprehension: not only the individual impact of components but also how they interrelate should be investigated. Third, the existing literature has tended to explicate L2 listening solely through extrapolations from L2 reading studies, particularly through models like Kintsch's Construction Integration Model (1988), and Bernhardt's compensatory model (2005), leading to the lack of a unified model.

Therefore, the current study aims to propose a comprehensive model of L2 listening comprehension depicting how linguistic (vocabulary and grammar knowledge), cognitive (working memory, metacognitive awareness), and affective components (L2 listening anxiety and willingness to listen in L2) interact with L2 listening comprehension and each other by answering the following question:

How do linguistic, affective, and cognitive components interact with L2 listening comprehension and each other?

2. Literature Review

Due to low empirical accumulation in listening comprehension in English as L2, our understanding of L2 listening is also informed by studies on other languages. A detailed review of the existing L2 listening literature reveals that there are three recurring dimensions frequently addressed, i.e. linguistic, cognitive, and affective.

2.1. Linguistic variables

Defined as the understanding of forms and meanings of words, vocabulary knowledge holds a pivotal role across all language skills. Studies investigating the role of vocabulary knowledge in L2 listening comprehension often fall into two categories based on how they analyse this relationship. The first line examines vocabulary knowledge as the sole contributor to L2 listening comprehension. Notable in this category are studies by Stæhr (2008, 2009) among Danish EFL (English as a foreign language) learners, emphasizing the significant contribution of vocabulary knowledge to L2 listening comprehension. Later studies have also reinforced this significant contribution (Chiang, 2018; Li, 2019; Matthews & Cheng, 2015).

The second category explores vocabulary knowledge in conjunction with other factors such as grammar knowledge, working memory, and metacognitive awareness. Vandergrift and Baker (2015, 2018), for example, examined the relative impact of vocabulary knowledge, working memory, and metacognitive awareness among immersion students, finding vocabulary knowledge to have a predominant effect on L2 listening comprehension. Similarly, other researchers combining vocabulary knowledge with other variables consistently highlight its strong influence on L2 listening comprehension (Aotani, 2011; Oh, 2016; Sağlam, 2014). Overall, whether examined in isolation or alongside other factors, studies unanimously recognise the robust correlation between vocabulary knowledge and L2 listening comprehension.

Grammar knowledge encompasses understanding morphosyntactic elements such as tense, subject-verb agreement, aspect, and articles (Jeon & Yamashita, 2014), serving as a foundational aspect of linguistic development. While not addressed as frequently as vocabulary knowledge, it significantly contributes to L2 listening comprehension. Two separate meta-analyses by Karalık and Merç (2019) and In'nami et al. (2022) examining correlates of L2 listening accentuated a strong link between grammar knowledge and comprehension, while also underscoring the severe lack of studies on this component. For instance, Oh (2016) investigated the relationship between vocabulary, grammar knowledge, and L2 listening comprehension among university students, revealing significant and robust correlations between both variables and successful L2 listening. Similarly, Aotani (2011) and Sağlam (2014) found substantial evidence supporting the significance of grammar knowledge as a predictor of L2 listening performance among university students from various majors.

2.2. Cognitive variables

Working memory, as described by Baddeley (1992) and Just and Carpenter (1992), refers to the brain system for temporarily storing and manipulating information crucial for complex cognitive tasks such as language comprehension, learning, and reasoning, necessitating simultaneous storage and processing of information. Due to the ephemeral nature of listening comprehension where revisiting the text is impossible unlike in reading, working memory lends itself relevant for listening research.

Early investigations into the predictive value of working memory in L2 listening include Call's (1985) study with 41 Arabic and Spanish university students learning English. The study measured memory span through various tasks and correlated the scores with listening test results and discovering a significant moderate correlation between memory and comprehension scores. Similarly, Tsuchihira (2007) measured working memory capacity with a researcher-devised listening-span task and correlated the scores with an English test. The findings emphasized a strong connection between working memory and listening comprehension. The strong association between working memory and L2 listening comprehension was also documented in later research (Masrai, 2020; Namaziandost et al., 2018).

Flavell (1979) defined metacognitive awareness as comprising three distinct yet interconnected knowledge types: person, task, and strategy knowledge. Adapting this concept to L2 listening, Vandergrift et al. (2006) outlined its functions: helping learners manage learning, and offering personal insights into learning abilities. Higher metacognitive awareness induces improved processing and retention of new information. Due to its role in language skills and susceptibility to instruction, metacognition has drawn attention in L2 listening with both correlational and experimental studies highlighting its relevance. In their instrument validation study, Vandergrift et al. (2006) revealed a moderate correlation between metacognitive awareness and L2 listening comprehension. Subsequent correlational studies reported strong links between metacognition and L2 listening comprehension (Kassem, 2015; Kök, 2018; Tafaghodtari & Vandergrift, 2008; Wang & Treffers-Daller, 2017).

In the experimental vein, metacognitive instruction has been found to enhance L2 listening. Al-Jahwari et al. (2019) devised a metacognitive strategy instruction among Omani students. The experimental group, who received strategy training and reflection activities, outperformed the control group in listening comprehension and metacognitive awareness. Other studies observed similar results (Fathi & Hamidizadeh, 2019; Mahdavi & Miri, 2019).

2.3. Affective variables

Anxiety, defined as the state of apprehension linked to a certain entity, has been a recurring topic of discussion in the realm of L2 learning since Horwitz et al.'s (1986) seminal work in which they distinguished language classroom anxiety from general anxiety. Following this influential work, many scholars have provided support for the context-specific nature of anxiety. Kim (2000) moved the literature a step further by introducing the skill-specific concept, foreign language listening anxiety, to better capture apprehension experienced during listening due to its ephemeral nature. Subsequent studies (Brunfaut & Révész, 2015; Elkhafaifi, 2005; Golchi, 2012; Namaziandost et al., 2018; Valizadeh & Alavinia, 2013; Wang & MacIntyre, 2021) also lent support for the detrimental effect of listening anxiety on comprehension.

The concept of "willingness to listen," coined by Akdemir (2016), stems from the notion of "Willingness to Communicate in L2," originally applied to L1 contexts and later extended to L2 communication (MacIntyre et al., 1998; Yashima, 2002). The notion originally denotes individuals' eagerness to enter into discourse through an L2. Akdemir (2016), highlighting the integral role of L2 listening in communication, proposed this concept to manifest positive attitudes toward L2 listening.

A closer examination of L2 listening literature certainly reveals the merit of researching a positive variable which operates in contrast to listening anxiety. Rahimi and Abedini (2009), Tabrizi and Saeidi (2015), and Tafaghodtari and Vandergrift (2008) explored how positive concepts such as self-efficacy beliefs and motivation affected comprehension. They reported significant correlations between these and L2 listening. Valizadeh and Alavinia's (2013) study delved into affective factors among English major EFL learners, revealing moderate negative correlations between emotional intelligence and listening anxiety. Wang and MacIntyre's (2021) research addressed enjoyment in L2 listening and revealed its correlation with listening anxiety and its indirect influence on L2 listening comprehension through its effect on metacognition. This study highlighted the simultaneous existence of positive and negative affective dimensions in L2 listening. These investigations collectively demonstrate that affect encompasses both positive and negative feelings toward L2 listening, coexisting and influencing the comprehension process.

3. Methodology

3.1. Participants and setting

A purposeful and convenient sampling approach was employed to select the participants. The study recruited 212 Turkish university students (117 females and 95 males) aged between 18 and 21 receiving English language preparatory education at two state universities in Türkiye during the spring term of the 2020-2021 academic year. The participants' English proficiency levels ranged from intermediate to upper-intermediate, as determined by the institutional placement test administered by their respective language schools.

3.2. Instruments

3.2.1. L2 listening test (LT)

Due to proficiency constraints, participants' listening comprehension was assessed through a researcher-designed test rather than a standardized one. The passages were extracted from course-books tailored for diverse proficiency levels, ensuring a more precise evaluation of the participants' listening abilities. A collection of passages covering various genres was compiled. Field experts with over ten years of experience delivering listening courses assessed the passages based on speech pace, topic familiarity, accent, background noise, and recording quality. Subsequently, four texts comprising a telephone conversation, a brief anecdote, a radio call-in show, and a documentary were used. The passages were accompanied by 44 questions in true-false, matching, and multiple-choice formats. The experts also assessed

the questions whether they successfully addressed different sub-skills: listening for main ideas/details and making inferences as Vandergrift and Baker (2018) suggested a listening test should tap. Each correct response received 1 and incorrect answers received 0 points.

3.2.2. Vocabulary levels test (VLT)

The Vocabulary Levels Test (Schmitt et al., 2001) was administered to measure vocabulary knowledge. The test contained vocabulary knowledge from 2000, 3000, 5000 and 10000 frequency levels. Based on the participants' proficiency levels and following recommendations from two experts specializing in corpus and L2 vocabulary studies, the 5000 and 10000 levels were excluded. Each item asked the participants to match three definitions with the correct three words out of six. Each level consisted of 10 items addressing 30 words in total. The participants were awarded 1 for correct and 0 points for incorrect matches.

3.2.3. Grammar test (GT)

The researcher devised the GT in collaboration with two experts from the testing unit responsible for syllabus design and academic assessment, as well as two experts specializing in testing courses within the English language teaching department of the host institution. All four experts had over ten years of experience in their respective areas. The structures in the GT were carefully chosen based on the widely recognized Global Scale of English (GSE) guidelines. This framework is internationally acknowledged for determining language proficiency and was adopted by the host university for placement and assessment. Then, the Corpus of Contemporary American English (Davies, 2008), a systematic collection of authentic language, was used to find 10 sentences for each structure. Once the sentence pool was constructed, testing experts were consulted to select 40 sentences from the pool and devise the distractors for multiple-choice items. The participants obtained 1 for correct and 0 points for incorrect answers.

3.2.4. Forward-digit-span test (FDS)

Working memory capacity (WM) was measured through the forward-digit-span test. This test involves recalling a series of numbers and is regarded as an effective tool, yielding high correlations with more complex measures (Unsworth & Engle, 2006). Participants were shown a series of numbers one at a time, starting from four digits and increasing to eight digits. Then they wrote down the series in the order they were presented. The number of correctly recalled series determined the overall WM capacity. This test was chosen due to its practicality and theoretical appropriateness unlike tasks such as sentence-recall measuring listening comprehension itself (Andringa et al., 2012).

3.2.5. Metacognitive awareness listening questionnaire (MALQ)

In order to measure the metacognitive awareness of the participants, MALQ (Vandergrift et al., 2006) was used. The instrument consists of 21 6-point Likert-type items related to planning/evaluation, directed attention, personal knowledge, mental translation and prob-

lem-solving. The participants were required to rate items like "*I have a goal in mind as I listen*" from 1 (strongly disagree) to 6 (strongly agree) (see Appendix). The original version of the instrument has acceptable internal reliability scores ranging from .68 for directed attention to .78 for mental translation. In order to eliminate the effects of reading proficiency, the instrument was translated to Turkish employing translation and back-translation. Two experts experienced in linguistics and research methodology, translated the instrument into Turkish and back into English separately. They resolved any mismatches between the translations through negotiations.

3.2.6. Foreign language listening anxiety scale (FLLAS)

Listening anxiety was measured through FLLAS (Polat & Erişti, 2018). The instrument was specifically constructed to measure listening anxiety experienced by Turkish EFL learners at foreign language schools of state universities. The Cronbach's alpha of the original instrument was calculated as .90. It comprises 18 Likert-type items like "*Knowing that I have to understand what I hear is concerning*" addressing individual and environmental factors, control over the listening source, and beliefs about listening tasks (see Appendix). Each item was rated from 1 (Totally disagree) to 5 (Totally agree).

3.2.7. Willingness to listen in L2 scale (WTL)

The study utilized the Willingness to Listen in L2 Scale (Akdemir, 2016) to assess the task-specific enthusiasm to listen in L2. The scale included 19 Likert-type statements like "*I am willing to listen when I can predict from the title*" focusing on factors related to the speaker, listener, task, and topic, which could impact L2 learners' willingness to engage in L2 listening (see Appendix). The internal consistency of the scale was satisfactory (α =.79). The original instrument was translated into Turkish following the translation and back translation method. Participants were required to rate the items from 1 (Never) to 5 (Always).

3.3. Procedure

Before the study, ethical approval was obtained from the ethics committee of the host institution, which then obtained research permission through official correspondence with the relevant regulatory bodies of the universities involved. Then, informed consent was obtained from the participating teachers and students. Subsequently, the instruments were piloted with 30 students at another university in Türkiye different from the two universities where the actual study was conducted. The participants were similar to those in the actual study with intermediate to upper-intermediate proficiency levels as determined through an institutional placement test. The pilot study achieved three objectives: determining the appropriate time allocation for the instruments, identifying potential implementation challenges, and assessing the reliability of each instrument. Table 1 presents the findings of reliability analyses for the pilot and actual study.

Table 1. *Reliability values of the instruments and suggested interpretation (Taber, 2018)*

INSTRUMENT	N OF ITEMS	CRONBACH'S ALPHA		INTERPRETATION
		PILOT	ACTUAL	
MALQ	21	.64	.65	Acceptable
FLLAS	18	.91	.94	Excellent
WTL	19	.88	.87	Fairly high
LT	45	.73	.75	Good
GT	40	.75	.74	Good
VLT	60	.81	.80	Good
FDS	10	.83	.85	Fairly high

Considering the insights obtained from the pilot study, the actual study was carried out during regular class-hours over a three-week period in the spring term. Initially, the LT was administered along with FLLAS, WTL, and MALQ so that the participants could better reflect on their listening processes while rating the items in these instruments. Next, VLT and GT were spared a complete week not to overwhelm the participants as each instrument took almost a class-hour. In the third week, the FDS was administered.

3.4. Data analysis

The data were analysed through structural equation modelling (SEM) using SPSS AMOS software to explore the underlying web of interactions among the variables. Because the data met the assumption of normal distribution, we employed maximum likelihood estimation to estimate the parameters of competing models.

4. Results and Discussion

The data were first analysed to establish whether certain assumptions were met and whether further interventions on the data were needed. The results of the preliminary analyses showed that the data met multicollinearity, normality of error distribution, and homoscedasticity assumptions, indicating no need for any interventions. Table 2 presents the descriptive statistics for the instruments.

Table 2. *Means, standard deviations, and minimum/maximum scores*

	N	*MEAN*	*SD*	*MIN*	*MAX*
LT	212	32.37	6.26	15	44
GT		23.76	7.04	7	38
VLT		44.73	12.16	7	60
FLLAS		56.17	15.7	18	90
MALQ		83.25	12.06	40	113
WTL		55.92	13.01	33	90
FDS		7.09	1.97	3	10

To propose a theoretically and statistically sound model of L2 listening comprehension, different competing models with varying paths among the variables were tested. The formation of these models was informed by a comprehensive review of existing literature in the field. The testing entailed a sequential exploration from commonly embraced viewpoints to those advocated with more reservation.

Most previous studies handled different variables i.e. vocabulary knowledge (Bonk, 2000; Li, 2019; Matthews & Cheng, 2015), grammar knowledge (Babayiğit & Shapiro, 2020; Oh, 2016; Sağlam, 2014), listening anxiety (Kim, 200; Elkhafaifi, 2005), metacognition (Kassem, 2015; Kök, 2018), and working memory (Andersson, 2010; Call, 1985; Tsuchihira, 2007) as isolated constructs bearing individual contributions to L2 listening. Therefore, the first model depicts linguistic, affective, and cognitive factors as isolated components. Put differently, the independent variables were assumed to contribute individually to L2 listening.

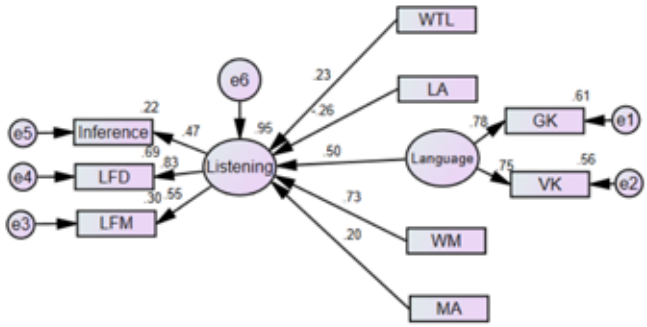

Figure 1. *Model 1*

Note: *LFD= listening for details, LFM= listening for main ideas, WTL= willingness to listen, LA= listening anxiety WM= working memory MA= metacognitive awareness GK= grammar knowledge VK= vocabulary knowledge*

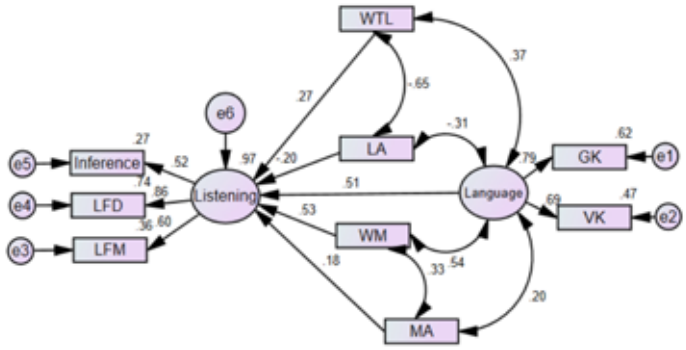

Figure 2. *Model 2*

The results indicated that all of the independent variables in the model have significant predictive value in listening comprehension with standardized regression weights between -.26 and .73. However, the current model fell short in depicting the actual underlying structure ($\chi 2$= 366.329, df= 26, p< .05) with a $\chi 2$/df value of 14.090, much larger than 3.000. Unsatisfactory comparative fit statistics (CFI= .594, NFI= .581, TLI= .437, RMSEA= .249) also indicated poor model fit. The model indicated the need for additional paths among the variables. New models should be tested, demonstrating not only how the variables interact with listening comprehension but also with each other. Figure 2 displays model 2.

In model 2, correlational links, indicated by double-headed arrows, were introduced to obtain better fit indices. The choice to use covariance links rather than causal ones was based on previous studies avoiding causal extrapolations among the independent variables. For instance, Adams et al. (1999) explored the link between WM and VK without suggesting causality between the two. Similarly, Andringa et al. (2012) reported a moderate correlation between WM and linguistic variables like VK, GK, and segmentation. Asadi (2020) investigated how WM, GK, morphological knowledge, phonological awareness, and processing speed affected listening comprehension, noting a moderate correlation between VK, GK, and WM. Florit et al. (2009), Masrai (2020), and Vulchanova et al. (2014) also reported moderate correlations between WM and various linguistic aspects, leading us to propose a covariance link between VK and GK, and working memory.

Additionally, we suggested a covariance relationship between linguistic variables and MA, inspired by Wang and Treffers-Daller's (2017) findings regarding VK and metacognition. We also proposed a correlational link between two emotional factors—LA and WTL—both negatively and moderately correlated with each other. This was inspired by Wang and MacIntyre (2021), who examined the relative effects of metacognition, LA, and enjoyment on listening comprehension. The study highlighted the significant negative moderate correlation between enjoyment and LA. The other two covariance links were between linguistic components and the two affective variables. As our results highlighted that linguistic variables correlated moderately with LA and WTL in reverse directions, a necessity to investigate these relationships in the model arose. The final covariance relation we proposed was between MA and WM as the two variables correlated significantly and moderately with each other.

Despite all regression weights being significant between-0.20 and 0.53 and significant covariance values among independent variables between -0.65 and 0.54, adding covariance patterns moderately improved the model $\chi 2$= 121.107, *df*= 20, p< .05 with a $\chi 2/df$ value of 6.055. Model fit indices (CFI= .879, NFI= .861, TLI= .783, RMSEA= .155) indicated some enhancements, but the model still fell short of reflecting the underlying structure. To improve the accuracy of the model, causal paths were also introduced among the independent variables, leading to models with multiple dependent variables. The new model, displayed in Figure 3, treated LA, WTL, WM, and MA as both independent and dependent variables.

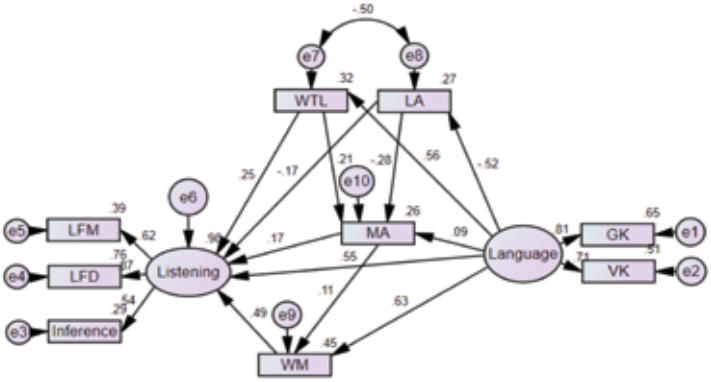

Figure 3. *Model 3*

In the third model, linguistic variables were hypothesized to affect working memory capacity. Similarly, we hypothesized that the linguistic factors influence affective components which correlate negatively with each other, and that affective components affect MA which contributes to changes in WM. The model adjustments were all inspired from the literature. The first causal link added to the model was between linguistic variables and WM. Scholars mostly remained hesitant to advocate a causal relationship between these two variables. For example, Vandergrift and Baker (2018) commented on a possible effect of linguistic variables on WM as follows:

> *For the young learners in this study, WM should improve as L2 language proficiency increases. Greater L2 language proficiency helps listeners retain and process increasingly larger amounts of meaningful speech.* (p.93).

In a similar vein, Bourdeaud'hui et al. (2020) tentatively associated lack of vocabulary knowledge with low performance in WM as:

> *...this study also revealed that non-native speaking students had a disadvantage in the area of verbal working memory and had a more limited vocabulary knowledge, which could have a mediating effect on their performance in listening comprehension* (p. 23).

Adams et al. (1999) question the widely assumed correlational relationship between working memory and vocabulary, and advocate a causal link instead:

> *The causal nature of this relationship has been the subject of much debate and the correlational nature of the present study is not informative in this regard. However, the most likely account now seems to be that the relationship is interactive; not only do phonological memory skills influence long-term learning, but word knowledge affects phonological memory performance* (p.371).

Taken together with the results we obtained, these arguments by previous researchers gave way to the introduction of a causal path from linguistic components to WM in model 3. As opposed to previous studies which assumed a covariance relationship between linguistic

variables and WM, or asserted that WM influences linguistic variables, we propose that WM depends on linguistic variables instead.

We also contemplated causal links between affective variables and WM over MA. Along with robust correlations among these variables, what Wang and MacIntyre (2021) speculated about the possible causes of listening difficulties was effective in our decision to insert these paths into our model:

> *This may be part of a vicious cycle wherein high anxiety and low enjoyment might consume cognitive resources, and narrow the material available for cognitive processing, leading to greater comprehension difficulties and poorer performance* (p.505).

As highlighted by Wang and MacIntyre (2021), positive and negative emotions significantly impact how effectively individuals manage and canalize their cognitive sources. This is well-reflected in Golchi (2012), who found that listening anxiety negatively affected strategy use during listening comprehension. Kassem (2015) also discovered a strong association between listening self-efficacy beliefs and increased strategy use. Emotional well-being affects how strategic listeners are, which in turn influences the WM capacity available for processing oral stimuli. This chain of interactions aligns with the dynamic nature of WM proposed by Just and Carpenter (1992).

Causal paths were introduced from linguistic components to emotional variables based on significant correlations observed. Elkhafaifi (2005) and Golchi (2012) indicated that increased proficiency and experience in the target language result in reduced L2 listening anxiety. This informed the decision to incorporate causal links between linguistic components and affect.

Furthermore, Goh and Hu (2014) found that higher proficiency levels were associated with increased metacognition scores, leading us to introduce a causal path from linguistic components to metacognition. Compared with the previous models, the model fit values increased significantly and reached satisfactory levels ($\chi2$= 32.254, *df*= 18, p< .05) with a $\chi2/df$ value of 1.792, smaller than 3.000. A similar improvement was also observed in comparative fit indices as well (CFI= .983, NFI= .963, TLI= .966, RMSEA= .061). In model 3, all regression and covariance values between independent and dependent variables were significant except for those between language and metacognitive awareness, and metacognitive awareness and working memory. Due to statistical insignificance, the direct causal link from linguistic components to metacognition was deleted in model 4:

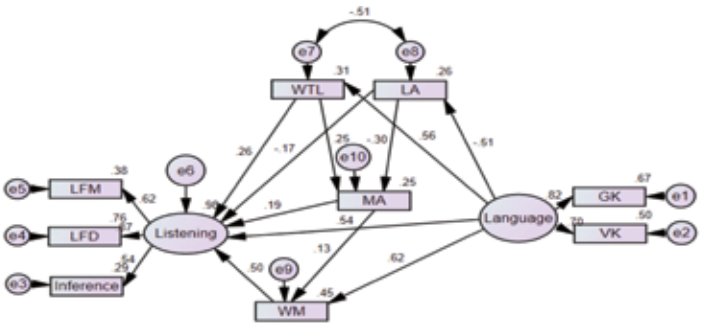

Figure 4. *Model 4*

Model 4 was the most successful in capturing the underlying interactions with linguistic, affective, and cognitive variables all intertwined with each other and L2 listening comprehension. The fit indices of the models are displayed in Table 3.

Table 3. *Model fit indices of the hypothesized model*

Model	χ2	*p*	*df*	χ2/*df*	*CFI*	*NFI*	*TLI*	*AIC*	*RMSEA*
Model 1	366.329	.00	26	14.090	.594	.581	.437	404.329	.249
Model 2	121.107	.00	20	6.055	.879	.861	.783	171.107	.155
Model 3	32.254	.021	18	1.792	.983	.963	.966	86.254	.061
Model 4	33.140	.023	19	1.744	.983	.962	.968	85.140	.059

Cut off values for model fit indices:
χ^2/df < 3.00; CFI >.95; NFI >.95; TLI>.95; RMSEA<.08; AIC= lower values signal better models

When we investigate the fit indices, it is evident that the final model outperformed the rest with all values substantially increasing to satisfactory ranges for a good model-data fit (Schreiber et al., 2006). Similarly, as presented in Table 4, all paths yielded significant values denoting that the proposed relationships reflected the actual underlying structure.

Table 4. *Standardized and unstandardized estimates of Model 4*

	Direction		Standardized estimate	SE	C.R.	p
LA	←	Language	*-.514*	*.208*	*-6.750*	***
WTL	←	Language	.560	.171	7.389	***
MA	←	WTL	.249	.072	3.193	.001
MA	←	LA	-.305	.060	-3.907	***
WM	←	MA	.125	.010	2.116	.034
WM	←	Language	.621	.026	8.023	***
Listening	←	LA	-.169	.003	-2.807	.005
Listening	←	WM	.496	.033	5.916	***
Listening	←	WTL	.256	.004	3.869	***
Listening	←	MA	.191	.003	3.795	***
Listening	←	Language	.543	.015	4.773	***
e7	↔	e8	-.505	12.787	-5.712	***

***. *p*<.001
Note: LA= listening anxiety WTL= Willingness to listen MA= Metacognitive awareness WM= Working memory

The model is comprehensive, and both statistically and theoretically sound in depicting the underlying structure of L2 listening. The closest to the proposed model is Vafaee and Suzuki's (2020) model depicting the relationship between VK, GK, MA, LA, WM, and L2 listening. Their study is invaluable for comprehensively addressing linguistic, affective, and cognitive factors, simultaneously. However, a closer look into their model reveals significant shortcomings. First, it lacks the positive side of the affective domain, providing an incomplete structure of L2 listening comprehension.

Second, it heavily relies on statistical values and neglects the suggestions by previous literature, thus overlooking the complexity of certain components. For example, WM is

granted a peripheral role, assumed to solely affect L2 listening comprehension and to be negatively affected by LA. This oversimplification neglects the potential contributions of other skills to WM, wrongly suggesting that interventions may not impact this construct. Similarly, LA is only linked to L2 listening comprehension through its effect on WM, disregarding its complex interactions with other skills. Metacognition is also assigned an inferior role, assumed to directly impact L2 listening comprehension alone, overlooking its intricate relationship with other skills. Additionally, linguistic variables are hypothesized to make individual and isolated contributions to L2 listening comprehension, limiting the model's explanatory power.

In contrast, our model assigns intricate roles to each variable, emphasizing their high levels of interaction. Linguistic variables are seen as foundational, directly and indirectly affecting other independent variables and listening comprehension, mirroring Kintsch's (1988) construction integration model and supporting Perfetti's (2007) lexical quality hypothesis and Bernhardt's (2005) compensatory model. Our model stresses that changes in foundational skills lead to substantial changes in affect, metacognition, and working memory. Enhancements in listeners' L2 linguistic abilities can improve emotional responses toward listening, reducing cognitive load and improving cognitive resource management, consequently enhancing L2 listening comprehension performance, as also proposed by Wang and MacIntyre (2021).

In sum, our model offers a comprehensive perspective, illustrating the intricate relationship among linguistic, affective, and cognitive elements in L2 listening comprehension. It highlights the possibility of enhancing L2 listening comprehension by improving individual component skills, thus leading to significant overall progress.

5. Conclusion and Further Research

This study aimed to construct a holistic model of L2 listening, encompassing linguistic, affective, and cognitive factors simultaneously. The emerging model is theoretically rooted in the L2 listening literature as well as having robust statistical foundations and it elaborately depicts the complex network of interactions among the linguistic, affective, and cognitive components and their contribution to L2 listening comprehension.

The model places linguistic variables at its core, as changes in VK and GK trigger consequential effects on L2 listening comprehension and other components. Success in GK and VK closely relates to affect, with increased linguistic knowledge bringing about reduced LA while increased WTL. These affective factors, in turn, facilitate the effective use of metacognition during listening. Higher levels of WTL and lower LA correlate with enhanced metacognition. The successful utilisation of metacognition boosts the available space in WM, enabling better processing of linguistic input and creating a more vivid representation of the listening text.

The model underlines important implications for L2 classes. First, seizing every opportunity to improve not only VK but also GK will prove fruitful since improvements in these components will have a butterfly effect on the other components and thus on L2 listening comprehension. Second, improving the emotional state of L2 leaners by choosing relevant materials will have multiplied benefits for their successful use of cognitive sources which will help them construct a better cognitive representation of the listening texts. Third,

metacognitive instruction, reinforced with an emotionally encouraging learning environment, will also be conducive to managing and canalising the available cognitive sources which in turn will fare L2 listening comprehension.

Given the limitations, further studies are necessary to validate the model. Initially, we focused on English as an L2; future research could address other languages. Additionally, while we controlled participants' proficiency levels, subsequent research should include individuals with varying L2 proficiencies.

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7. Appendix

MALQ

	1	2	3	4	5	6
Before I start to listen, I have a plan in my head for how I am going to listen.						
I focus harder on the text when I have trouble understanding.						
I find that listening in English is more difficult than reading, speaking, or writing in English.						
I translate in my head as I listen.						
I use the words I understand to guess the meaning of the words I don't understand.						
When my mind wanders, I recover my concentration right away.						
As I listen, I compare what I understand with what I know about the topic.						
I feel that listening comprehension in English is a challenge for me.						
I use my experience and knowledge to help me understand.						
Before listening, I think of similar texts that I may have listened to.						
I translate key words as I listen.						
I try to get back on track when I lose concentration.						
As I listen, I quickly adjust my interpretation if I realize that it 1s not correct.						
After listening, I think back to how I listened, and about what I might do differently next time.						
I don't feel nervous when I listen to English.						
When I have difficulty understanding what I hear. I give up and stop listening.						
I use the general idea of the text to help me guess the meaning of the words that I don't understand.						
I translate word by word, as I listen.						
When I guess the meaning of a word, I think back to everything else that I have heard, to see if my guess makes sense.						
As I listen, I periodically ask myself if I am satisfied with my level of comprehension.						
I have a goal in mind as I listen.						

FLLAS

		1	2	3	4	5
1	While listening, I constantly fear missing an important detail.					
2	I believe that my efforts during listening activities won't be sufficient for success.					
3	Post-listening speaking and writing activities increase my anxiety during the listening process.					
4	I worry that I won't correctly understand the content.					
5	When I don't understand what's being said, I fear failing exams.					
6	Listening tests with multiple speakers are a source of anxiety for me.					
7	I fear losing track of the conversation while trying to comprehend what I'm hearing.					
8	Knowing that I have to understand what I hear is concerning.					
9	My anxiety increases when listening to content with unknown words, phrases, and sentence structures.					
10	I have difficulty focusing on what is being said during listening activities.					
11	My anxiety rises when the content is presented without visual or subtitle support.					
12	When listening to content on unfamiliar topics, I feel a sense of helplessness.					
13	Not being able to control the speaker's pace increases my anxiety.					
14	When I don't understand what I'm hearing, not being able to pause the conversation causes me stress					
15	Factors like the speaker's tone, intonation, and pronunciation make me anxious.					
16	Comprehending spoken language is the most challenging skill in learning a foreign language.					
17	Listening is the most anxiety-inducing activity in the language learning process.					
18	I believe that difficult content is chosen for listening activities.					

WTL

		1	2	3	4	5
1	I am willing to listen to a speaker with a different rhythm.					
2	I am willing to listen to a speaker with a high speech rate.					
3	I am willing to listen to a speaker with a different/difficult vocabulary.					
4	I am willing to listen to a speaker with a different or difficult accent.					
5	I am unwilling to listen when I do not have enough vocabulary.					
6	I am unwilling to listen when I do not have enough background knowledge.					
7	I am unwilling to listen when I do not have enough prior knowledge.					
8	I am unwilling to listen when I do not have enough knowledge and application of listening strategies.					
9	I am willing to listen when I do pairwork.					
10	I am willing to listen when I do groupwork.					
11	I am willing to listen when I can predict the next.					
12	I am willing to listen when I can predict from the title.					
13	I am unwilling to listen because of conceptual difficulty of the text/audio.					
14	I am unwilling to listen when I have difficulty in interpreting the meaning.					
15	I am unwilling to listen if there are difficult grammatical patterns.					
16	I am unwilling to listen if the text/audio is long and dense.					
17	I am unwilling to listen because of syntactic complexity of the task.					
18	I am unwilling to listen because of syntactic complexity of the text/audio.					
19	I am unwilling to listen when I have difficulty in long answers/questions.					