Mojca Poredoš, PhD, Karmen Pižorn, PhD, Milena Košak Babuder, PhD

The Role of Working Memory in Foreign Language Listening Comprehension Tasks

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KLJUČNE BESEDE: slušno razumevanje, delovni spomin, fonološko zavedanje, tipi nalog, ocenjevanje znanja, angleščina kot prvi tuji jezik

POVZETEK – V raziskavi smo se osredotočili na učinke, ki jih imajo na slušno razumevanje fonološko zavedanje (FZ), delovni spomin (DS) in izpostavljenost angleščini kot prvemu tujemu jeziku. Raziskava je bila izvedena na vzorcu 100 učencev 6. razreda, starih 11 let, katerih prvi tuji jezik je angleščina. Učinka izpostavljenosti angleščini in DS v slovenščini na dosežek pri nalogi dopolnjevanja je DS v angleščini delno posredoval, medtem ko je oba omenjena učinka na dosežek pri nalogi izbirnega tipa posredoval v celoti. Učenci z boljšim DS v slovenščini so si lažje zapomnili besede v angleščini, kar jim je pomagalo pri doseganju boljših rezultatov pri obeh tipih nalog slušnega razumevanja v angleščini. Glede na rezultate bi morali večjo pozornost nameniti zagotavljanju večje pravičnosti pri ocenjevanju slušnega razumevanja in znanja, neodvisno od zmožnosti kognitivnega procesiranja posameznika.

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KEYWORDS: listening comprehension, working memory, phonological awareness, task type, language assessment, English as a foreign language

ABSTRACT – In the study, working memory (WM), phonological awareness (PA), and exposure to EFL (English as a foreign language), as some of the factors affecting pupils' achievements in listening comprehension tasks, were investigated. The sample included 100 Year 6 pupils aged 11, whose first foreign language was English. Results confirmed WM in EFL as a mediator between L1 WM, PA, EFL exposure, and two task types. The effect of exposure and of WM in L1 on the banked gap-fill tasks achievements was partly mediated by the EFL WM, while the same effects were fully mediated when predicting multiple-choice tasks achievements. The relevance of these findings for ensuring greater equality in knowledge testing is discussed.

1 Introduction

Listening as an interactional skill has played an important role in communication among people for thousands of years (Mendelsohn, 1998), while in the last decade, and especially during the COVID-19 epidemic, transactional listening skills have become essential to succeed in the workplace or in school/academic contexts due to the increasing number of listening texts produced in the form of videos, video clips, audio recordings, television shows, vlogs, and so on. Even in their free time, many people would rather watch a video showing how to make something special for lunch than read a long recipe online. When it comes to solving problems related to computer software, many would rather watch the steps they need to follow than read long and complex manuals. It is therefore no exaggeration to say that adults who cannot master listening comprehension in their first language (L1) and, for most of the world's population, in the most widely spread (second) language – EFL (often referred to as English as a lingua franca), are unable to participate actively in today's society. Moreover, listening comprehension

is not only part of comprehensive communicative skills, but also an important component of information intake and learning in the school context.

In the school context, the teaching of listening comprehension has long been somehow neglected and inadequately taught in many EFL (English as a Foreign Language) programmes (Mendelsohn, 1998). In that regard, "the information that 43.5 % of (English) teachers (in lower levels of primary school) often or very often tell stories and only 3.2 % of teachers never tell stories is encouraging" (Drašler Zorič, 2013, p. 62). Moreover, with the advent of the Internet and the accessibility of audio and video texts, listening comprehension has gained prominence both in EFL classrooms and in second language acquisition (SLA) research (Gilakjani and Ahmadi, 2011).

Listening comprehension is about understanding and making sense of spoken language. It is assumed to be a complex process and has been studied by several researchers (Jia and Hew, 2019). Vandergrift (2004) categorises listening into top-down and bottom-up processing, meaning that efficient listeners need to predict, infer, use contextual clues and their background knowledge, but also recognise speech sounds, blend phonemes into syllables, and these into words while at the same time move up to the lexical, syntactic, semantic, pragmatic, and interpretive levels. Anderson (2005) defines listening comprehension as a three-stage model. First, listeners encode in listening input; second, they transform words into mental representations of their meanings (parsing process); and finally, they give response by utilising the resulting mental representations. Another definition was compiled by Field (2013) who divided listening comprehension into lower-level and higher-level listening processes. Perception and parsing were categorised as lower-level processes while meaning and discourse constructions were understood as higher-level processes.

The listening process as defined by Field (2013) during the encoding process, as presented in the model by Anderson (2005), at the lower level relies heavily on the abilities of phonological awareness (PA) (Chard and Dickson, 1999; McBride-Chang, 1995) and working memory (WM), especially phonological working memory (Gathercole et al., 1994).

Working memory

WM facilitates a range of cognitive activities, including listening comprehension and the human thought process, by temporally maintaining information and enabling its manipulation. According to the widely used model of WM proposed by Baddeley and Hitch (1974), it consists of three components: a central executive system, which is associated with the frontal lobes, and two storage systems which have limited capacity, i.e., the phonological loop and the visuospatial sketchpad. The phonological loop, associated with the left temporoparietal region, stores verbal and audio material and is specialised for maintaining phonological information, while visuospatial WM, associated with analogous areas in the right hemisphere, stores visual information (Baddeley, 2003; Baddeley and Hitch, 1974; Gathercole et al., 1994).

Cognitive recourses of WM strongly predict both reading and listening comprehension in the early grades. However, they are broadly more predictive of listening than of reading comprehension (Jiang and Farquharson, 2018). The phonological loop is the

core of the phonological WM, which enables learning and comprehension of spoken and written language in L1 and all other foreign languages. Phonological information is kept in the phonological short-term store in a phonological code and is restored by a subvocal rehearsal process. Good phonological memory capacity enables the maintenance of a reliable representation of the phonological form of the sentence and further facilitates a higher-level analysis of its meaning (Gathercole et al., 1994). Therefore, the phonological loop capacity plays a significant role in foreign language acquisition (Andersson, 2010; Van den Noort et al., 2006) and is a good predictor of children's and adults' ability to learn EFL (Andersson, 2010; Baddeley, 2003). However, WM capacity is not the same in one's L1 as in EFL (Andersson, 2010) since it interacts with the language proficiency in the target language. WM is stronger in the language in which an individual is more proficient (Van den Noort et al., 2006). However, due to the strong association between L1 and EFL processing, the individual's general language aptitude also plays an important role (Andersson, 2010).

Phonological awareness

PA is an ability that enables the process of phonological analysis which occurs before the verbal information enters (phonological) WM (Baddeley, 2003; Gathercole et al., 1994). It includes an understanding of the diverse ways that oral language can be broken down into smaller components and manipulated. More specifically, PA refers to a capability to divide words into sequences of sounds, phonemes, or syllables, regardless of their meaning, focusing only on the structure of the word. It involves auditory and oral manipulation of sounds, and it enables us to process language phonologically. PA is a major source of quality of performance in non-word repetition tasks (Gathercole et al. 1994), essential to reading (Chard and Dickson, 1999; McBride-Chang, 1995), and inevitable in listening comprehension. Ropič (2016, p. 49), for example, established that: "impaired phonological awareness has negative consequences for pupils already in the first few years of primary school (i.e., the first triennium)". In this study, PA and (phonological) WM were studied separately due to a clear theoretical distinction between both, which in some studies is still not recognised (Gathercole et al., 1994), even though such a distinction has been demonstrated by studies in neuropsychological research and imaging (Kovelman, 2012; Wager and Smith, 2003).

Foreign language exposure

In addition to WM and PA, listening comprehension is strongly influenced by EFL exposure. Kabadayi (2014, p. 113) states: "English language teaching in early childhood is of great importance since it makes children aware of different languages and grow up with positive attitudes about the English language." Additionally, early EFL acquisition has an important impact on the cognitive development of children; it enhances basic auditory perceptual skills and improves auditory sustained attention (Marini, Eliseeva and Fabbro, 2019). In Slovenia, children are exposed to EFL in everyday activities through audio (e.g., examples of music, podcasts) and visual (e.g., TV, series, movies, video clips) content, video games, social media, and other activities provided by electronic

gadgets and in school as part of the regular curriculum. It may be assumed that everyday EFL exposure of young EFL Slovenian learners is quite high, since hardly any of the English language programmes are dubbed. Additionally, pupils are exposed to EFL in schools relatively early, since more than 90 % start learning EFL in Year 1 which coincides with age 6. They are first tested with the National English Test (NET) six years later, at the end of Year 6. Listening comprehension development is an important part of the national EFL syllabus in primary school; consequently, its weight is nearly one quarter (24 %) of the NET.

Working memory, phonological awareness, and specific learning difficulties (SpLDs)

Topolovec and Schmidt (2015, p. 3) highlight that "more and more children with learning disabilities are included in regular primary schools in Slovenia". Additionally, deficits in WM and PA are most typical cognitive deficits in specific learning difficulties (SpLDs). Pupils with SpLDs perform lower in the skills of PA and phonological WM compared to pupils without SpLDs (Barbosa et al., 2009). Further, PA and WM have been established as important predictors of reading accuracy, reading comprehension, and arithmetic (Juffs and Harrington, 2011; Leather and Henry, 1994; McDougall et al., 1994), whereas their influence on listening comprehension, especially EFL listening comprehension, is under-researched. Palladino and Cornoldi (2004) point out that EFL learning is correlated with L1 phonological WM problems, EFL phonological WM problems and L1 phonological problems. Based on their findings, we could draw a hypothesis that impairments from L1 WM are transferred to EFL WM and further influence young learners' EFL listening comprehension.

Moreover, pupils with deficits in PA and WM are even further disadvantaged while tested (Banerjee, Lestari and Rossi, 2020; Kormos and Smith, 2012). Not only have they more difficulties acquiring knowledge and skills, but their deficits also influence their potential to demonstrate their true language proficiency, since most tasks heavily rely on different aspects of WM (Alloway, 2006). In the present study, we examined results in listening comprehension in two task types, which draw on WM in diverse ways. The banked gap-fill task requires the recall of information, which is a more arduous process, compared to the recognition process, used in multiple-choice tasks (Kilickaya, 2019; Speer and Flavell, 1979). That is why the banked gap-fill tasks are usually perceived as more difficult compared to the multiple-choice tasks. This is also reflected in lower pupils' achievements in the former tasks.

The results of the NET show that pupils were less successful at banked gap-fill listening comprehension tasks compared to multiple-choice tasks in two consecutive years (RIC, 2019). We hypothesise that the performance on the two types of listening comprehension tasks is correlated with the learners' ability to retain and retrieve information from their WM. Namely, many studies have shown that WM has an important role in reading comprehension, writing, and speaking (Juffs and Harrington, 2011; Leather and Henry, 1994), whereas the role of WM in listening comprehension and its relation to task types has not yet been fully explored. In early foreign language learning, such studies are practically non-existent.

2 Problem and hypothesis

To disentangle the complex issue of the effect of innate predispositions (i.e., WM and PA) on the one hand and the actual effect of language proficiency on an individual's test results on the other, we measured three types of effects (PA, WM and EFL exposure) in two task types (banked gap-fill and multiple-choice). The assumption was that PA, L1 WM and EFL exposure impact language proficiency success in different listening comprehension task types (banked gap-fill and multiple-choice) directly/indirectly via EFL WM. Based on the literature review, the following hypotheses are proposed:

- H1: PA and L1 WM impact (directly and/or indirectly via EFL WM) language proficiency achievements in both task types.
- H2: EFL exposure impacts (directly and/or indirectly via EFL WM) language proficiency achievements in both task types.
- H3: The hypothesised mediation models differ due to the difference in the complexity of the listening comprehension task types.

3 Method

Participants

Our sample included 100 Year 6 pupils from one of the mainstream primary schools; 56% of participants were female. Their first foreign language was English. Most of them started to learn English in Year 4 (45%), less than a third started learning English in Year 1 (27%) and approximately a fifth of them learned it in preschool (16%); a minority of them have been learning English since Year 2 (5%) or Year 3 (7%). They reported to have been exposed to the English language by listening to music in English, watching series, movies or video clips, and/or playing videogames for approximately 3.18 hours per week (SD = 1.76; Min = 1.5, Max = 9).

The average final grade in English in Year 5 was very good (M = 4.11, SD = 0.90, Min = 2, Max = 5). 37% of the participants were awarded grade 5 (excellent), 41% grade 4 (very good), 18% grade 3 (good) and 4% grade 2 (sufficient). Contrary to the teachers, the pupils gave lower self-assessments of their English language proficiency (M = 2.65, SD = 0.90, Min = 1, Max = 4). However, the pupils' self-assessment of their English language proficiency moderately correlated with the teacher's assessment ($\rho = 0.401$, $p < 0.001$). Furthermore, pupils reported they like learning English most of the time (M = 2.79, SD = 0.91, Min = 1, Max = 4).

Instruments

We used established measures to assess the pupils' short-term L1 memory (ACADIA; Atkinson et al., 1972, as cited in Košak Babuder, 2012), PA and L1 WM and EFL WM (SNAP; Weedon and Reid, 2018), and their proficiency in listening compre-

hension tasks in the EFL. In addition, a questionnaire was designed, consisting of 13 questions, to collect specific demographic information (gender, EFL starting age, final Year 5 grade in EFL), and the data on the pupils' EFL exposure, their EFL attitudes, and their self-assessment of EFL language proficiency. Pupils self-assessed their EFL proficiency on a 4-point Likert scale (1 – Very poor to 4 – Very good), indicated their attitudes towards EFL learning on a 4-point Likert scale (1 – I never like learning English to 4 – I always like learning English). The pupils assessed their EFL exposure according to three items – listening to content in English, watching content in English, and playing video games in English – on a 4-point Likert scale (1 – less than 1 hour; 2 – 1 to 2 hours; 3 – 2 to 3 hours; 4 – 3 or more hours).

Later, the cumulative perceived time of pupils' EFL exposure was calculated using all three responses. The sampled pupils also reported their use of L1 and/or English subtitles, to which they answered yes, occasionally or no. Finally, the pupils expressed their views on how EFL exposure supports their language proficiency on a 4-point Likert scale (1 – Yes, a lot to 4 – No).

Short-term memory was assessed by a subtest included in the validated ACADIA test (Atkinson et al., 1972, as cited in Košak Babuder, 2012). The ACADIA test measures the development of 13 skills that are critical to a pupil's learning success (as cited in Košak Babuder, 2012). We used subtest 8 – Auditory Memory, which measures the ability to remember numbers and words after they are presented acoustically. The subtest consists of 15 tasks with the maximum score of 20 points.

The pupils' L1 PA and their EFL WM were examined separately by applying two subtests from the Slovenian validated version of the Special Needs Assessment Profile Test – SNAP (Weedon and Reid, 2018). SNAP was originally developed in the UK and is widely used (Reid, 2017). It provides a systematic and comprehensive overview of SpLDs in pupils aged 5 to 14 (Weedon and Reid, 2018). Test 2 (Phonological Awareness) and Test 8 (Backward Recall of Words) were administered. Test 2 was a phoneme deletion task, in which pupils had to delete specific phonemes in 10 spoken non-words in their L1. Test 8, administered in the pupils' L1 and EFL, comprised 18 questions consisting of different words told to the participants who had to memorise and repeat them to the examiner in reverse order.

To investigate the pupils' listening comprehension level, four tasks from the previous years (2017 and 2018) of the Slovenian National English Tests (NET) for Year 6 pupils were administered. The NET is a standardised assessment tool designed to obtain information about the English language proficiency of young Slovenian learners. Each participant was tested in two banked gap-fill tasks and two multiple-choice tasks. In the two banked gap-fill tasks, the pupils completed the gaps with an appropriate word or phrase from a set of given words while listening to a text. The first text was about the people of Hawaii, while the second one was a story about a prince. The first listening text had a Flesh-Kincaid Reading Ease value (Kincaid et al., 1975) of 3.3, while the second one had 2.1. The texts were delivered at the speed of 136 and 132 words per minute. In the multiple-choice tasks, the pupils selected one of three choices to answer questions about two listening input texts. The topics were the story of Chameleon Larry and a letter to Santa Claus. The first text had a Flesh-Kincaid Reading Ease value (Kincaid et al., 1975) of 2.1, while the second had 2.2. The listening texts were delivered at

the speed of 125 and 132 words per minute. All four tasks consisted of six items and had acceptable reliability indices in the respective years in which they were administered.

Procedure

Parents and participating pupils provided informed consent. The listening comprehension tasks of the Slovenian NET, the subtest of the ACADIA test, and demographic questions were group administered during class time. One of the researchers and a teacher supervised the testing and the administration. Pupils were also individually assessed using the three subtests of SNAP, which were administered by a trained research assistant in the school. Quantitative statistical analyses were conducted using SPSS and Mplus.

4 Results

First, we calculated the descriptive statistics, checked the normality of distribution by calculating the Kolmogorov-Smirnov statistics, and calculated the correlation between the constructs using Spearman's ρ correlation coefficient (see Table 1). Based on the descriptive statistics presented and previous research, we attempted to determine the predictors of the young learners' achievements in both types of tasks, i.e., blanked gap-fill tasks and multiple-choice tasks. Moreover, we later formed mediation models that confirmed WM in L1 as a mediator of PA, and WM in EFL as a mediator of exposure to English and WM in L1.

Our results show that Year 6 pupils were exposed to English for approximately 3.2 hours per day by listening to music, watching series, movies, or video clips, and/or playing video games. In addition, daily exposure to English was weakly to moderately correlated with the pupils' performance in listening comprehension and their WM in EFL. The participants performed significantly better on multiple-choice tasks compared to banked gap-fill tasks ($Z = –5.48$, $p < 0.001$, $\eta^2 = 0.30$), confirming that gap-fill tasks (FV = 49.2 %) were more difficult than multiple-choice tasks (FV = 61.7 %). However, performance on gap-fill tasks and multiple-choice tasks showed the strongest correlation, probably because both measure proficiency in listening comprehension in English.

The pupils achieved significantly higher results in L1 WM compared to their EFL WM ($Z = –7.08$, $p < 0.001$, $\eta^2 = 0.50$). Furthermore, L1 WM and EFL WM were only moderately correlated ($\rho = 0.40$, $p < 0.001$), implying that L1 WM and EFL WM are two distinct but correlated abilities.

Gender was not correlated with any of the included constructs. Short-term memory was weakly positively correlated with the pupils' PA and L1 WM and EFL WM. L1 PA was moderately correlated with WM measured in the same language. Similarly, only EFL WM, but not L1 WM, correlated moderately with their performance on the selected gap-fill and multiple-choice tasks.

Table 1

Descriptive statistics, including Kolmogorov-Smirnov test, and correlations between measured constructs

	Descriptive statistics				*Kolm.-Smir.*	*Spearman's ρ correlation coefficients*						
	M	*SD*	*Min*	*Max*	*Stat.*	*Gender*	*STM in L1*	*PA*	*WM in L1*	*WM in EFL*	*Ach. in banked gap-fill task*	*Ach. in multiple-choice task*
STM in L1	11.8	2.3	5	17	0.11*	0.19						
PA	8.6	1.5	4	10	0.23**	–0.05	0.27*					
WM in L1	6.9	1.8	3	11	0.18**	0.10	0.31**	0.40**				
WM in EFL	5.2	1.4	1	9	0.16**	0.07	0.29*	0.23	0.40**			
Ach. in banked-gap fill task	5.9	3.5	0	12	0.10*	–0.11	0.16	0.23	0.17	0.54**		
Ach. in multiple-choice task	7.4	3.0	1	12	0.13**	–0.03	0.22	0.18	0.14	0.55**	0.69**	
Exposure to EFL (time in h/day)	3.2	1.8	1,5	9	0.23**	–0.15	0.06	0.07	–0.06	0.29*	0.42**	0.30*

Note. Kolm.-Smir.: Kolmogorov-Smirnov test of normal distribution; STM in L1: Short-term memory in L1 (measured with the ACADIA subtest); PA: Phonological awareness; WM in L1: Working memory in L1; WM in EFL: Working memory in EFL; Ach. in banked-gap fill tasks: Achievement in banked gap-fill tasks; Ach. in multiple-choice task: Achievement in multiple-choice tasks; Exposure to EFL (time in hours per day); Gender: 1 – female, 0 – male; * – $p < 0.01$; **– $p < 0.001$.

To respect the law of parsimony and justify the formation of a mediation model, we first conducted a regression analysis (see Table 2), in which we included exposure to the EFL, WM in the L1 and EFL, and PA in the L1 as predictors of listening comprehension proficiency in two task types. Since there was no significant correlation between achievement in different tasks, gender, and short-term memory in L1, we excluded these variables from the regression predicting achievements in different listening comprehension tasks. Using the regression analysis, we were unable to confirm PA and WM in the L1 as important individual predictors of listening comprehension, even though these are important cognitive abilities that significantly affect learning. The results suggested the need for a mediation model, as unexpectedly only WM in EFL was a significant individual predictor of listening comprehension proficiency measured by

banked gap-fill and multiple-choice tasks. Additionally, EFL exposure predicted the pupils' achievements in the banked gap-fill task.

Table 2

Summary of regressions predicting achievements in banked gap-fill and multiple-choice tasks

	β (CI)	*SE*	*p*	*VIF*
Multiple-choice task F (4,95) = 12.09, p < 0.001; Adjusted R^2 = 0.31				
Constant	1.43 (–1.71; 4.56)	1.58	0.369	
Exposure to EFL	0.16 (–0.13; 0.46)	0.15	0.278	1.13
PA (in L1)	0.05 (–0.32; 0.42)	0.19	0.807	1.23
WM in L1	–0.15 (–0.47; 0.18)	0.16	0.365	1.51
WM in EFL	1.18 (0.77; 1.59)	0.21	< 0.001	1.45
Banked gap-fill task F (4,95) = 14.48, p < 0.001; Adjusted R^2 = 0.35				
Constant	–2.74 (–6.35; 0.87)	1.82	0.135	
Exposure to EFL	0.57 (0.23; 0.91)	0.17	0.001	1.13
PA (in L1)	0.22 (–0.21; 0.64)	0.22	0.312	1.22
WM in L1	–0.14 (–0.52; 0.23)	0.19	0.458	1.51
WM in EFL	1.14 (0.67; 1.61)	0.24	< 0.001	1.45

Note. PA: Phonological awareness; WM in L1: Working memory in L1; WM in EFL: Working memory in EFL

Based on previous inconclusive research, our hypothesis and the presented descriptive statistics, an input mediation model with two possible variations was formed. The variations of the model depended on the type of task used to evaluate the proficiency in listening comprehension (see Figure 1). L1 WM was predicted to mediate the effect of L1 PA on EFL WM, while EFL WM was predicted to mediate the effects of L1 PA, L1 WM and EFL exposure on the listening comprehension achievements. Furthermore, we included L1 PA, L1 WM and EFL exposure as direct predictors of EFL WM, and EFL exposure as a direct predictor of proficiency in listening comprehension. We tested the described model in Mplus (Version 7.4). As evident from the goodness of fit indices presented in Table 3, the proposed model fitted the data well and explained 31% of variance in WM in the EFL, 37% of variance in listening comprehension proficiency measured with banked gap-fill tasks, and 34% of variance in listening comprehension proficiency measured with multiple-choice tasks.

Figure 1

Input mediation model predicting achievement in banked gap-fill tasks (version a) and multiple-choice tasks (version b), with EFL working memory and L1 working memory as mediators

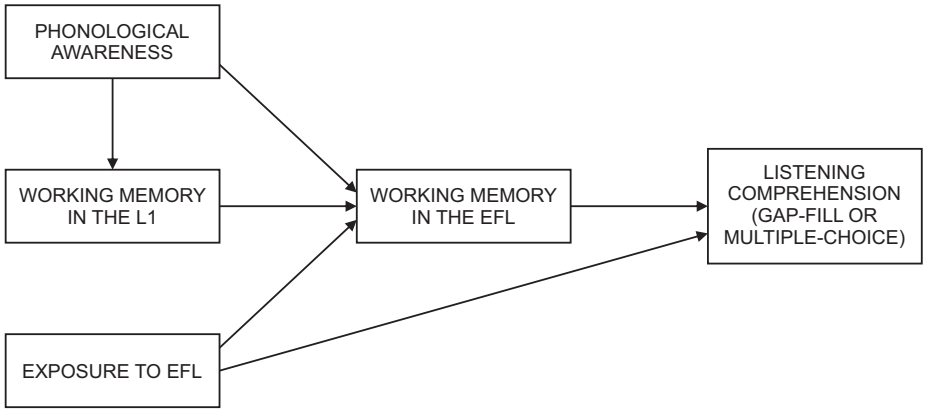


Table 3

Goodness of fit statistics for two mediation models: predicting achievement in banked gap-fill tasks (Model A) and multiple-choice tasks (Model B)

									R^2		
Model	*X2 (df)*	*p*	*RMSEA (CI)*	*p*	*CFI*	*TLI*	*SRMR*	*WRMR*	*WM L1*	*WM EFL*	*Task*
Model A (banked gap--fill tasks)	2.50 (4)	0.64	0.00 (0.00; 0.12)	0.74	1.00	1.03	0.03	0.42	0.17	0.31	0.37
Model B (multiple--choice tasks)	2.03 (4)	0.73	0.00 (0.00; 0.11)	0.81	1.00	1.05	0.03	0.37	0.17	0.31	0.34

Note. WM in L1: Working memory in L1; WM in EFL: Working memory in EFL

As is evident from Figure 2, a composite of direct paths existed from L1 PA, via L1 WM and EFL WM, to listening comprehension proficiency measured by the banked gap-fill tasks and the multiple-choice tasks. Moreover, EFL exposure directly predicted EFL WM. EFL WM was the only direct predictor of the achievements in the multiple-choice tasks, while the achievements in the banked gap-fill tasks were additionally directly predicted by EFL exposure. There was no direct path between L1 WM, PA and the participants' listening comprehension results; moreover, PA did not even directly predict EFL WM.

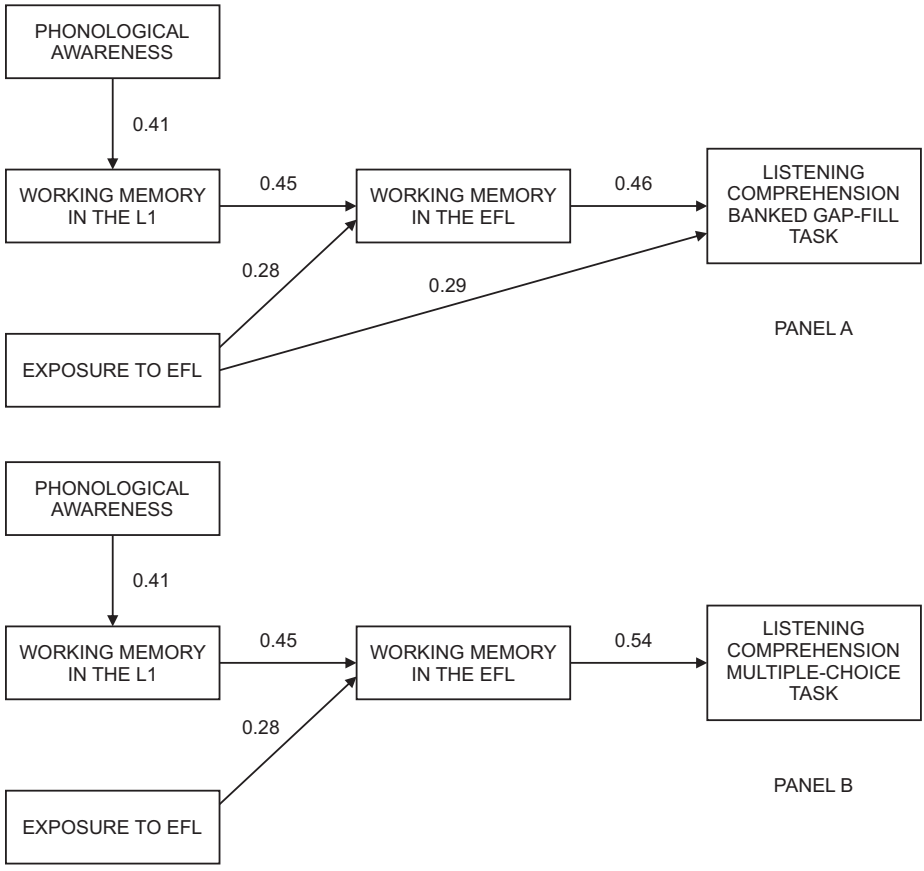
However, PA predicted EFL WM ($\lambda = 0.18$, $p < 0.001$) indirectly via L1 WM and it even influenced the achievements in both task types, i.e., banked gap-fill tasks

($\lambda = 0.09$, $p = 0.004$) and multiple-choice tasks ($\lambda = 0.10$, $p = 0.001$). Furthermore, the achievements in the banked gap-fill tasks and the multiple-choice tasks were indirectly predicted via EFL WM by EFL exposure (the effect on gap-fill tasks was: $\lambda = 0.13$, $p = 0.002$, and on the multiple-choice tasks: $\lambda = 0.15$, $p = 0.001$) and by L1 WM (the effect on gap-fill tasks was: $\lambda = 0.21$, $p < 0.001$, and on multiple-choice tasks: $\lambda = 0.24$, $p < 0.001$). The total effect of EFL exposure on the multiple-choice task results was equal to the indirect effect, while its effect on the banked gap-fill task was a sum of the direct and indirect effect ($\Sigma\lambda = 0.42$).

We almost entirely confirmed all three of our hypotheses, since PA, L1 WM and EFL exposure affected achievements in both types of listening comprehension tasks. Moreover, as shown in Figure 1, the mediation model differed due to the difference in the complexity of the listening comprehension tasks.

Figure 2

Mediation models predicting achievement in banked gap-fill tasks (Panel A) and multiple-choice tasks (Panel B), with EFL WM and L1 WM as mediators



5 Discussion

The aim of the present study was to offer an additional insight into the complex question of differential effects of predispositions and proficiency on individuals' achievements measured with two types of tasks. More specifically, we focused on a narrow field, namely how L1 PA, L1 WM, EFL WM and EFL exposure affect listening comprehension measured with multiple-choice tasks, which demand recognition and are easier, while the banked gap-fill tasks demand more recall, i.e., information retention, and are more difficult (Speer and Flavell, 1979). We hypothesised that chosen predictors have differential direct and indirect effects on listening comprehension depending on the task type selected for a testing instrument.

Banked gap-fill and multiple-choice tasks were selected since they differ significantly in terms of difficulty (Kilickaya, 2019). The results of this study show that the pupils made significantly fewer mistakes when choosing the right answer from the set of given answers in the multiple-choice tasks than when filling the gap with the right word in banked gap-fill tasks. It is likely that the difference in identified difficulty is at least partly the consequence of a diverse utilisation of WM (Speer and Flavell, 1979); however, we cannot draw unambiguous conclusions based on the presented mediation models. Nevertheless, if we want to be equitable and provide all pupils with equal opportunity to show their listening comprehension skills, it is imperative to be sensitive to the fact that test tasks differ in terms of their demand on WM capacity.

The research results encourage a more intense inspection of how different task types draw on WM (Speer and Flavell, 1979), since the effect of WM on the achievements in the banked gap-fill tasks and the multiple-choice tasks in the presented mediation models are highly similar. On the one hand, pupils must recall a correct answer from their long-term memory while completing a banked gap-fill task. This is a rather arduous memory process and relies heavily on WM. On the other hand, the selected multiple-choice tasks demanded only recognition and retention of three short answers beneath the question, which is considered an easier memory task. However, if young learners must compare the right answer to other offered answers (distractors), which are more or less ambiguous, the process of comparison also becomes an arduous process which again relies heavily on WM. As such, the unexpected similarity between the models sparks an interest in a distinct perspective on the involvement of WM in both types of tasks, moving away from bare differentiation between the recall and recognition process (Speer and Flavell, 1979).

Based on previous research (Andersson, 2010; Palladino and Cornoldi, 2004; Van den Noort et al., 2006) which set the basis for differentiation between L1 WM and EFL WM, we investigated the differences between them and included L1 WM and EFL WM in the models as separate constructs. Similarly to Van den Noort et al. (2006), the pupils in our research had significantly better WM in L1 (the language in which they were more proficient) compared to their WM in EFL. This offers additional evidence that WM in L1 and WM in EFL have different capacities and are not the same (Andersson, 2010), even though they have some similarities. Our results, comparing WM in L1 and in EFL and their effect on listening comprehension, offer additional support to the hy-

pothesis of language proficiency interacting with the WM capacity (Andersson, 2010; Van den Noort et al., 2006).

As predicted in our first hypothesis, WM in L1 and PA in L1 predicted achievements in both types of listening comprehension tasks indirectly through WM in EFL. A sequence of direct paths from PA in L1, WM in L1 and WM in EFL to listening comprehension assessed by gap-fill and multiple-choice tasks was established. Effects of PA and WM in L1 were mediated in full through WM in EFL and could be interpreted as a part of individuals' general language aptitude (Andersson, 2010). The effects of PA and WM in L1 on listening comprehension in EFL would have been overlooked, had we used only a robust statistical analysis. However, with a more complex approach in the form of mediation analysis, a more covert influence of PA and WM in L1 on listening comprehension in EFL was detected. Our results are in line with the findings of Palladino and Cornoldi (2004) that foreign language learning is related to L1 phonological WM problems, EFL phonological WM problems and L1 phonological problems. This offers additional support to the hypothesis that impairments from L1 WM generalise to EFL WM and further influence pupils' listening comprehension proficiency.

Furthermore, achievements in gap-fill and multiple-choice tasks were indirectly predicted by exposure to EFL, which includes listening to music in English, watching series, movies or video clips, and/or playing videogames. Our results show that Year 6 pupils were exposed to the English language for more than 3 hours per day, which represents a relatively big part of their leisure time. The young learners who were more exposed to EFL in their leisure time had better achievements in both task types compared to those who were less exposed. Greater EFL exposure probably influenced the pupils' passive knowledge and awareness of language (Laufer and Paribakht, 1998), which indirectly affected their WM, EFL proficiency and, consequently, their achievement in both types of tasks. Additionally, exposure directly predicted the pupils' achievements in the banked gap-fill tasks, but not the results in the multiple-choice tasks. When confronted with the banked gap-fill tasks, the pupils with higher EFL exposure had a significant advantage during the listening comprehension assessment compared to the less exposed pupils. It may be assumed that while doing banked gap-fill tasks, due to the difficulty of this type of task (Kilickaya, 2019), young learners rely on diverse sources of information, including knowledge passively acquired through EFL exposure (Laufer and Paribakht, 1998). However, during multiple-choice tasks pupils rely more on verbal support, and do not draw from pre-existing knowledge. Nevertheless, as predicted in our third hypothesis, mediation models differ due to the difference in the complexity of the listening comprehension tasks. However, the main difference between the models predicting different types of tasks is not the contribution of WM to achievement in a specific task type, but the effect exposure to EFL has on achievements in gap-fill tasks (but not on multiple-choice tasks).

We almost entirely confirmed all three of our hypotheses, since PA, WM in L1 and in EFL, and exposure to EFL mostly indirectly, but also directly, predicted listening comprehension independently of the chosen task type. Moreover, mediation models differed in relation to the complexity of the task chosen for measuring listening comprehension. However, due to some limitations, further and more regular research is needed to shed additional light on the relations presented in the present study.

We would like to emphasise that caution is needed when generalising these findings, since our study had some, not so negligible, limitations. Firstly, the current data, due to the relatively small sample size, did not allow a more complex statistical analysis which could help us to explain in greater detail the differences between the processes involved in solving different listening comprehension tasks. For example, with a bigger sample we could simultaneously (in one model) compare the involvement of WM in gap-fill and multiple-choice tasks, which we could not do in the present research due to the small sample size. Moreover, further research is needed to search for measurement invariance between groups. We are especially interested in whether the processes are the same for pupils diagnosed with SpLD and pupils without the diagnosis (measurement invariance).

Additionally, another aspect of our research could be the accumulated exposure to EFL, since children in Slovenian society are relatively often exposed to English even before they enrol in school. In accordance with previous studies (Andersson, 2010; Palladino and Cornoldi, 2004; Van den Noort et al., 2006), the models could differ due to the proficiency of children in an individual foreign language. We could inspect this hypothesis by testing our models on the different languages to which pupils have been more exposed (e.g., bilingual children, children living abroad) or less exposed (e.g., choosing a language which is less common in the everyday life of children).

Furthermore, it would be interesting to further inspect the influence PA has on listening comprehension. It would be especially interesting to check if PA is the same for L1 and EFL or if these two are separate constructs, as can be seen in the case of WM. The model presented in this study should then be appropriately adapted to such findings.

6 Conclusion

Even though listening comprehension is one of the key processes of gaining knowledge and language proficiency, only scarce research focuses on this process. To truly understand listening comprehension, we must gain an insight not only into task performance (Kilickaya, 2019), but also into the effect deficits have on this performance. The chosen cognitive processes (PA and WM) in L1 and EFL and exposure to EFL, mostly indirectly, but also directly, predicted pupils' achievements in gap-fill and multiple-choice tasks. Furthermore, the models predicting achievements in each type of task differed significantly. Better achievement in gap-fill tasks was predicted by greater exposure to EFL, while greater exposure did not improve individuals' results in multiple-choice tasks.

Firstly, it is important to develop cognitive processes in L1. Any improvement in pupils' WM in L1 will probably also impact their achievement in EFL (and likely in all other languages). The effect will be indirect, through a generalisation of improvements and techniques in WM in the foreign language.

Secondly, in accordance with the proficiency hypothesis (Andersson, 2010; Van den Noort et al., 2006) and the results of our study, it would be very reasonable to increase exposure to EFL (or another targeted language) as much as possible. Exposure to

language could be increased by including specific EFL content in other school activities or subjects, since you can learn any content through any language you choose. There are many possibilities for an interdisciplinary approach.

Thirdly, we believe special consideration should be given to overcoming the differences in demonstrating knowledge in listening comprehension tasks between pupils with different cognitive process capacity and ensure greater equality in knowledge testing. The question of equity is especially important when assessing the knowledge of pupils with SpLD, who have important deficits especially in the above-mentioned cognitive processes and represent roughly 5–15 % of school-age children across different languages and cultures (APA, 2013). Teachers usually do not think much about how pupils with SpLD will react to a specific type of task, which makes this line of research that much more important. Fair assessment is an inclusive competence and "inclusive competencies are important competencies which teachers should already build during their educational process" (Drljić and Kiswarday, 2021, p. 19). Thus, special consideration should be given to overcoming the differences in listening comprehension tasks between pupils with diverse cognitive processing capacity (especially WM) and ensuring greater equality in knowledge testing.

Dr. Mojca Poredoš, dr. Karmen Pižorn, dr. Milena Košak Babuder

Vloga delovnega spomina pri nalogah slušnega razumevanja v tujem jeziku

Poslušanje je že tisočletja pomembna komunikacijska sposobnost (Mendelsohn, 1998), ki je v zadnjem desetletju, še posebej pa v času pandemije covida-19, postala ključnega pomena za uspeh na delovnem mestu in v učnem oz. izobraževalnem okolju. V učnem okolju je slušno razumevanje še toliko pomembnejše, saj je eden ključnih načinov sprejemanja informacij. Pri učenju tujih jezikov je bil pomen slušnega razumevanja dolgo časa zanemarjen (Mendelsohn, 1998). Raziskovalci so namenili večjo pozornost procesu slušnega razumevanja pri poučevanju tujega jezika šele s pojavom spleta in z večjo dostopnostjo različnih avdio vsebin v tujem jeziku. Anderson (2005) ugotavlja, da kompleksen proces slušnega razumevanja poteka v treh zaporednih fazah. V prvi fazi poslušalec sprejme slušni vnos, v drugi fazi ga pretvori v mentalne reprezentacije pomena, ki jih v tretji fazi uporabi pri podajanju odgovora. Zaznavanje in razčlenjevanje slušnega vnosa sta procesa, ki potekata na nižji ravni, medtem kot sta oblikovanje pomena in diskurza procesa višje ravni (Field, 2013). Slušno razumevanje se predvsem v začetni fazi (Anderson, 2005) in pri procesih nižje ravni (Field, 2013) v veliki meri zanaša na zmožnost fonološkega zavedanja (FZ) (Chard in Dickson, 1999; McBride-Chang, 1995) in na delovni spomin (DS), še posebno fonološki delovni spomin (Gathercole idr., 1994).

DS omogoča z ohranjanjem informacij in omogočanjem njihove manipulacije številne kognitivne dejavnosti, med njimi tudi slušno razumevanje in proces mišljenja. Sestoji iz treh komponent: centralnega izvršitelja, fonološke zanke in vidno-prostorske skicirke (Baddeley, 2003). Pri tem je fonološka zanka ključni del fonološkega DS, ki

omogoča učenje in razumevanje govorjenega in zapisanega jezika. Fonološke informacije, shranjene v fonološki shrambi v govorni obliki, se obnavljajo s pomočjo artikulacijskega kontrolnega procesa. Dober fonološki DS omogoča ohranjanje kakovostne informacije v fonološki obliki in olajšuje razumevanja pomena (Gathercole idr., 1994). DS, predvsem zmogljivost fonološke zanke, poleg slušnega razumevanja pomembno napoveduje tudi učinkovito učenje tujih jezikov (Andersson, 2010). Zmogljivost DS v prvem in tujem jeziku ni enaka ter se povezuje z obvladovanjem jezika. DS posameznika je boljši v jeziku, ki ga slednji bolje obvlada (Van den Noort, Bosch in Hugdahl, 2006).

Na proces slušnega razumevanja pomembno vpliva tudi fonološko zavedanje (FZ), ki omogoča proces fonološke analize pred vstopom besedne informacije v DS (Baddeley, 2003; Gathercole idr., 1994). FZ vključuje razumevanje različnih načinov možne delitve govorjene informacije v manjše komponente in njihove manipulacije. Bolj natančno se FZ nanaša na zmožnost razdelive besede v zaporedje fonemov in zlogov, neodvisno od njihovega pomena in z osredotočenostjo zgolj na strukturo besede. Vključuje slušno in govorno manipulacijo glasov in omogoča fonološko procesiranje jezika (Gathercole idr., 1994).

Poleg DS in FZ prispeva k slušnemu razumevanju tudi izpostavljenost jeziku oz. jezikom. Še posebno zgodnje učenje angleščine (ang.) kot prvega tujega jezika ima pomemben vpliv na kognitivni razvoj otrok, spodbuja spretnost slušnega zaznavanja in prispeva k vzdrževanju slušne pozornosti (Marini, Eliseeva in Fabbro, 2016). V Sloveniji so otroci izpostavljeni ang. pri vsakodnevnih dejavnostih, npr. v obliki avdio in video vsebin, video iger in družbenih medijev, ter v šoli kot delu rednega predmetnika. Pri vsakodnevnih aktivnostih je izpostavljenost angleškemu jeziku med slovenskimi učenci razmeroma visoka, saj imamo zelo malo vsebin sinhroniziranih v ang. V šoli pa se začnejo učiti ang. kot prvega tujega jezika že v 2. razredu, pri starosti 7–8 let. V 6. razredu se lahko prvič prostovoljno vključijo v nacionalno preverjanje znanja (NPZ) iz ang.

Primanjkljaji DS in FZ so najbolj tipični kognitivni primanjkljaji pri specifičnih učnih težavah (SUT; Barbosa idr., 2009). Hkrati pa DS in FZ pomembno napovedujeta pravilnost branja, bralno razumevanje in uspešnost pri aritmetiki (Juffs in Harrington, 2011; Leather in Henry, 1994), medtem ko je njun vpliv na slušno razumevanje slabše raziskan. Palladino in Cornoldi (2004) ugotavljata, da je učenje ang. kot tujega jezika povezano s slabšim DS v prvem in tujem jeziku ter drugimi fonološkimi težavami v prvem jeziku. Poleg tega pa so učenci s primanjkljaji DS in FZ dodatno prikrajšani pri ocenjevanju znanja (Kormos in Smith, 2012), saj se večina nalog v veliki meri opira na različne vidike DS (Alloway, 2006). V pričujoči raziskavi smo primerjali dve nalogi slušnega razumevanja, nalogo dopolnjevanja in nalogo izbirnega tipa. Naloge dopolnjevanja v večji meri temeljijo na priklicu, ki je bolj zahteven spominski proces, in so zato pogosteje zaznane kot težje, medtem ko naloge izbirnega tipa temeljijo na nekoliko manj zahtevnem procesu prepoznave, kar vpliva na zaznavanje tega tipa nalog kot lažjega.

V raziskavi smo se osredotočili na vpliv, ki ga imajo predispozicije (tj. DS in FZ) in izpostavljenost jeziku na posameznikov dosežek pri različnih tipih nalog slušnega razumevanja, nalogah dopolnjevanja in nalogah izbirnega tipa. Predpostavili smo, da (H1) bosta FZ in DS v prvem jeziku (neposredno ali posredno preko DS v ang.) vplivala na dosežek pri obeh tipih nalog slušnega razumevanja. V nadaljevanju smo predvideli, da (H2) bo izpostavljenost jeziku (neposredno ali posredno preko DS v ang.) prav tako vplivala na dosežek pri obeh tipih nalog slušnega razumevanja. Naša zadnja hipoteza

(H3) pa je bila, da se bosta modela poti razlikovala zaradi različne zahtevnosti nalog slušnega razumevanja.

V raziskavi je sodelovalo 100 učencev 6. razreda ene izmed osnovnih šol iz osrednjega dela Slovenije (56 % učenk), katerih prvi tuji jezik je ang. V povprečju so poročali, da so ang. preko različnih vsebin izpostavljeni 3,18 ure na teden (SD = 1.76). V povprečju so bili s strani učiteljev ocenjeni z oceno prav dobro (M = 4.11, SD = 0.90).

Z uveljavljenimi pripomočki smo izmerili kratkotrajni spomin učencev v slovenščini (slov.) (ACADIA; Atkinson, Johnston in Lindsay, 1972, v Košak Babuder, 2012), FZ v slov. ter DS v slov. in ang. (SNAP, Weedon in Reid, 2018). Kratkotrajni spomin smo ocenili z uporabo podtesta 8 – Slušni spomin, pripomočka ACADIA, ki ga sestavlja 13 veščin, kritičnih za učenčevo učno uspešnost (v Košak Babuder, 2012). FZ v slov. ter DS v slov. in ang. smo ocenili z dvema podtestoma, Test 2 – Fonološko zavedanje in Test 8 – Ponovitev besed v obratnem vrstnem redu, v Sloveniji validiranega pripomočka SNAP (Weedon in Reid, 2018). Test 8 smo izvedli tudi v angleškem jeziku. Za ocenjevanje slušnega razumevanja smo uporabili štiri naloge iz NPZ za 6. razred iz preteklega šolskega leta. Znanje vsakega učenca smo preverili z dvema nalogama dopolnjevanja in dvema nalogama izbirnega tipa. Pri nalogah dopolnjevanja so na osnovi dveh besedil (Havaji in Zgodba o princu) z besedami iz podanega nabora dopolnjevali prazna mesta v stavkih. Pri nalogah izbirnega tipa pa so učenci na osnovi besedila (Zgodba o kameleonu Larryju in Pisanje pisma Božičku) izbrali pravilen odgovor med tremi podanimi možnimi odgovori. Vsa uporabljena besedila so bila primerne zahtevnosti za začetnike in podana s primerno hitrostjo. Učenci so odgovorili tudi na 13 demografskih vprašanj, ki so zajemala: ime, priimek, razred, spol, čas začetka učenja ang., samoocenо znanja ang., končno oceno pri ang. v preteklem šolskem letu, naklonjenost do učenja ang. in tri vprašanja, povezana z izpostavljenostjo vsebinam v ang.

Starši in udeleženci so podali soglasje k sodelovanju v raziskavi. Naloge slušnega razumevanja NPZ, podtest pripomočka ACADIA in vprašalnik z demografskimi vprašanji smo izvedli v času pouka, s tremi podtesti preizkusa SNAP pa so bili preizkušeni individualno.

Izračunali smo opisne statistike in Spearmanov ρ koeficient korelacije med uporabljenimi konstrukti ter s pomočjo regresijske analize in modela poti ugotavljali pomembne napovednike za uspešnost pri posameznem tipu naloge. Učenci so bili bolj uspešni pri nalogah izbirnega tipa v primerjavi z nalogami dopolnjevanja ($Z = –5.48$, $p < 0.001$, $\eta^2 = 0.30$), kar nudi dodatno podporo ugotovitvi, da so naloge dopolnjevanja težje (It = 49,2 %) kot naloge izbirnega tipa (It = 61,7 %). Prav tako smo ugotovili pomembno razliko v DS v slovenskem in angleškem jeziku ($Z = –7.08$, $p < 0.001$, $\eta^2 = 0.50$), ki sta dalje izkazovala zgolj zmerno povezanost ($\rho = 0.40$, $p < 0.001$), kar podpira trditev, da sta DS v slov. in DS v ang. dve ločeni, vendar med seboj povezani sposobnosti. FZ v slov. se je zmerno povezoval zgolj z DS v slov., medtem ko se je DS v ang. zgolj zmerno povezoval z uspešnostjo pri nalogah slušnega razumevanja.

Z regresijsko analizo, v katero smo kot napovednike slušnega razumevanja vključili izpostavljenost ang., DS v slov. in ang. ter FZ, smo ugotovili, da zgolj DS v ang. pomembno individualno prispeva k pojasnjevanju dosežkov pri obeh tipih nalog. Izpostavljenost angleškemu jeziku je pomembno napovedovala zgolj slušno razumevanje, ocenjeno z nalogami dopolnjevanja. Na osnovi regresijske analize, naših hipotez in

dvoumnosti ugotovitev predhodnih raziskav smo se odločili oblikovati model poti, s katerim smo želeli preveriti mediacijsko vlogo DS v ang. Oblikovali smo dve različici modela poti, kjer smo z različico A napovedovali naloge izbiranja, z različico B pa naloge dopolnjevanja. Predvidevali smo, da bo FZ napovedoval DS v slov., ta pa bo dalje napovedoval DS v ang., ki bo posredoval učinke na dosežek pri posamezni nalogi slušnega razumevanja. Izpostavljenost ang. naj bi neposredno napovedovala DS v ang. in slušno razumevanje. Model se je dobro prilegal podatkom. Pojasnili smo 31 % variance DS v ang. in 37 % variance slušnega razumevanja, ocenjenega z nalogami dopolnjevanja, ter 34 % variance slušnega razumevanja, ocenjenega z nalogami izbirnega tipa. DS v ang. je bil edini napovednik slušnega razumevanja pri nalogah izbirnega tipa, medtem ko je dosežek pri nalogah dopolnjevanja napovedovala tudi izpostavljenost ang. DS v ang. je na naloge slušnega razumevanja posredoval vpliv FZ, DS v slov. in izpostavljenosti ang.

Skoraj v celoti smo podprli vse tri hipoteze, saj so FZ, DS v slov. in izpostavljenost ang. posredno vplivali na dosežke pri obeh tipih nalog. Kljub vsemu pa se je med modeloma pokazala pomembna razlika glede na kompleksnost uporabljenih nalog slušnega razumevanja. Kot smo predvidevali v prvi hipotezi (H1), sta FZ in DS, izmerjena v slov., posredno preko DS v ang. napovedovala slušno razumevanje, ocenjeno z obema tipoma nalog. FZ in DS tako zelo verjetno predstavljata del posameznikove splošne zmožnosti za učenje jezikov (Andersson, 2010). Naši rezultati so skladni tudi z ugotovitvami Palladina in Cornoldija (2004), ki sta podprla povezanost zmožnosti za učenje jezikov s težavami v DS v prvem in tujem jeziku ter fonološkimi težavami. Podprli pa smo tudi ugotovitev, da DS v prvem jeziku in DS v tujem jeziku kljub nekaterim podobnostim nista enovit konstrukt (Van den Noort idr., 2006; Andersson, 2010). Boljše slušno razumevanje je posredno, pri nalogah dopolnjevanja pa tudi neposredno napovedovala večja izpostavljenost jeziku (H2). Sklepali smo, da se učenci pri težjih nalogah (naloge dopolnjevanja) bolj zanašajo na raznolike vire, ki jim omogočajo tudi večjo uspešnost pri takih nalogah. Raznolika raba virov glede na težavnost posamezne naloge je skladna z našo tretjo hipotezo (H3), da se bodo modeli poti razlikovali glede na težavnost nalog.

Ugotovili smo, da učenci naredijo manj napak pri nalogah izbirnega tipa v primerjavi z nalogami dopolnjevanja, iz česar smo sklepali, da so naloge izbirnega tipa za učence lažje kot naloge dopolnjevanja. Kljub vsemu pa velika podobnost modelov poti pri napovedovanju dosežkov pri različnih tipih nalog in nedokončnost naših rezultatov kaže na potrebo po bolj poglobljenem raziskovanju, kako se različne naloge opirajo na spoznavne sposobnosti, kot je DS (Speer in Flavell, 1979), ter nakazujejo odmik od zgolj ločevanja med priklicem in prepoznavanjem.

V članku izpostavljamo pomen razvijanja kognitivnih procesov v prvem jeziku, saj imajo ti preko generalizacije in transfera pomemben vpliv na kognitivne procese v tujih jezikih. Poudarjamo tudi pomembnost izpostavljenosti tujemu jeziku, saj slednja pomembno prispeva k boljšemu slušnemu razumevanju, predvsem pri bolj zahtevnih nalogah. Posebno pozornost pa bi morali posvetiti tudi preseganju neposrednega vpliva kognitivnih omejitev na izkazovanje znanja in s tem zagotavljati večjo pravičnost ocenjevanja tudi za osebe s primanjkljaji pri posameznih kognitivnih procesih, npr. učence s specifičnimi učnimi težavami.

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Dr. Mojca Poredoš (1991), asistentka za psihologijo na Pedagoški fakulteti Univerze v Ljubljani.
Naslov/Address: Golo 127, 1292 Ig, Slovenija/Slovenia
Telefon/Telephone: (+386) 041 841 978
E-mail: mojca.poredos@pef.uni-lj.si

Dr. Karmen Pižorn (1964), redna profesorica za angleščino v izobraževanju na Pedagoški fakulteti Univerze v Ljubljani.
Naslov/Address: Parižlje 51/D, 3314 Braslovče, Slovenija/Slovenia
Telefon/Telephone: (+386) 01 589 22 99
E-mail: karmen.pizorn@pef.uni-lj.si

Dr. Milena Košak Babuder (1969), docentka za specialno in rehabilitacijsko pedagogiko na Pedagoški fakulteti Univerze v Ljubljani.
Naslov/Address: Kvedrova 19, 1000 Ljubljana, Slovenija/Slovenia
Telefon/Telephone: (+386) 01 589 23 29
E-mail: milena.kosak@pef.uni-lj.si