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Lexical access, lexical diversity and speech fluency in first language attrition

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Prolonged exposure to a second language changes how the first language (L1) is produced and processed, a phenomenon labelled as language attrition (Yilmaz & Schmid, 2018). The goal of the present study was to explore the extent of Russian language attrition among Russians living in Hungary and to explore how extralinguistic variables, such as length of residence, age, frequency of first language use, and attitudes towards the language, contribute to the process. Besides questionnaires, semantic and letter fluency tasks were used to explore lexical access and a story-telling task to measure lexical diversity and speech fluency. The findings showed that the control group (monolingual Russians living in Russia) outperformed attriters in terms of lexical access and lexical diversity while speech fluency seems to be intact. None of the extralinguistic variables explain the extent of attrition; however, frequency of use is related to the letter fluency tasks.

Keywords: *attitudes, frequency of use, L1 attrition, length of residence, lexical access and diversity, speech fluency*

1. INTRODUCTION

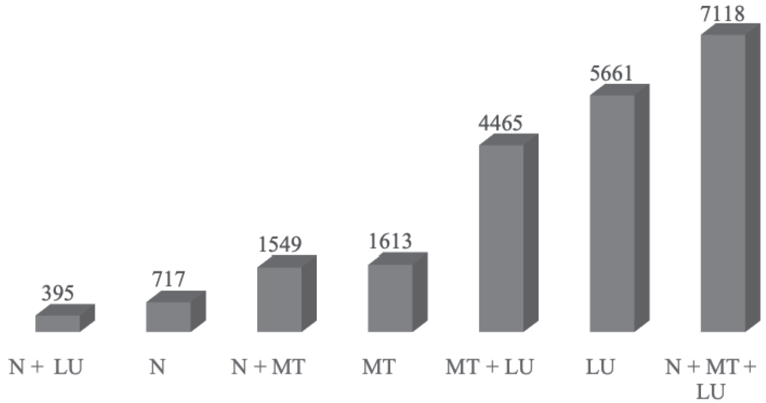
Bilingualism, the everyday use of two languages by an individual (Grosjean, 1985, 2010), has attracted substantial psycho- and sociolinguistic research interest in terms of how two languages are stored and processed in the individual's mind as well as how different languages are used in society. Recently, more and more studies have attempted to integrate the social and individual facets of bilingualism and to answer research questions relying on the context of language use rather than separating it from the environment. Migration is specific in this regard as the language use environment changes. This has a great impact on the person's language use, often leading to a phenomenon labelled as language attrition. In a second language (L2) context, the language of dominance can change, leading to a decrease in the frequency of use of the first language (L1). However, there is ample evidence that bilinguals cannot switch off any of their languages (Kroll et al., 2012), which causes cross-linguistic influence (CLI). Previously, CLI was considered unidirectional (L1 influencing L2), and most studies focused on the changes occurring in the L2 during the course of language acquisition/learning while assuming that the L1 remains stable (Johnson & Newport, 1989; Piske et al., 2001). Research on language attrition has shown that a prolonged exposure to an L2, such as an immigration context, leaves traces on the L1 and that this can be measurable even after such a short period of time as a student exchange program (Linck et al., 2009). The present study aims to explore the extent of language attrition of Russians living in Hungary compared to Russians residing in Russia who use no other languages in their everyday life (i.e., functional monolinguals). The language attrition literature is scarce on research with Russian-paired bilinguals (Laufer and Baladzhaeva, 2015), which increases the significance of this study.

1.1. Russians in Hungary

In the second part of the 20st century, around 20-30 million ethnic Russians migrated to and now live in the post-Soviet states, Germany, the United States, France, Portugal, and many other countries (Heleniak, 2001). Hungary is no exception. The number of Russians in Hungary was not documented until the micro-census of 2016. This was the first census in which non-official minorities were involved (Korean, Vietnamese, Chinese, Arabic, and Russian). According to the census, 21,518 people consider themselves Russian based on three factors: nationality, mother tongue, and language use (Figure 1). This is 0.2% of the entire population of Hungary, and

1.6% of these people speak Russian. One third (7,118) of the Russian minority consider themselves Russian based on all three of these factors, and 5,661 people identify themselves as Russian based solely on language use.

Figure 1
The number of Russians in Hungary (micro-census 2016, based on www.ksh.hu)
Slika 1
Broj Rusa u Mađarskoj (mikropopis stanovništva iz 2016., prema www.ksh.hu)



Note: N=nationality, LU=language use, MT=mother tongue

The presence of Russian in the linguistic landscape of two Hungarian towns (Hévíz and Keszthely) was documented by previous studies (Bátyi, 2015; Riamiakova, 2021); however, the language use and language proficiency of the members of the community have not been addressed. The aim of the present study is to find out to what extent the first language (L1) fluency and lexical diversity of Russians living in Hungary differs from those of functionally monolingual speakers in Russia.

1.2. First language attrition

Cross-linguistic influence is a bidirectional process which affects the L2 and the L1 as well. As Yilmaz and Schmid (2018) note, the native language is instable, as the speaker who becomes bilingual may experience changes in how his/her L1 is processed, accessed, and produced. With extensive exposure, the changes can be even more extensive. Such changes to the L1 have been labelled as *language attrition*. Since the first benchmark studies, language attrition has grown into a separate field, which is confirmed by the proliferation of research in the area (Köpke & Schmid, 2004; Schmid & Köpke, 2017; Jarvis, 2019; MacWhinney, 2019; Kroll et al., 2006; de Leeuw et al., 2018, etc.). The definition of first language attrition has been refined and became more detailed as more empirical research was available. One of the earliest and still widely accepted definitions was given by Köpke and Schmid, who define language attrition as "the non-pathological decrease in proficiency in a language that had previously been acquired by an individual." (Köpke & Schmid, 2004: 3). In the present study, the following working definition is used:

> We refer to any of the phenomena that arise in the native language of a sequential bilingual as the consequence of the co-activation of languages, cross-linguistic transfer or disuse, at any stage of the second language (L2) development and use, as language attrition. First language (L1) attrition is therefore considered to be the process by which a) pre-existing linguistic knowledge becomes less accessible or is modified to some extent as a result of the acquisition of a new language, and b) L1 production, processing, or comprehension are affected by the presence of this other language. (Schmid & Köpke, 2017, pp. 637-638)

Language attrition can be manifested at each linguistic level, but the earliest symptoms affect the lexical level, and as a result, speech fluency, the main concerns of the study presented in this article.

Several extralinguistic factors have been identified as related to language attrition: age of attrition (AOA), length of residence in the L2 environment (LOR), frequency of use of the L1 (FOU), and attitudes towards the L1. One of the most uncontradictory factors in the extent of attrition is the AOA, as puberty (the age of 12) seems to "protect" the L1 from attrition. Participants who migrated to an L2 environment after puberty do not show dramatic decrease in their L2 skills (even after 50 years of non-use, see Schmid, 2012), while children adopted at a young age lose the ability to use and even to recognize their native language (Bylund, 2019; Isurin & Seidel, 2015; Pallier et al., 2003; Pierce et al., 2014). As for LOR and FOU, Schmid (2019) reviewed 49 studies, out of which only 12 studies found an effect of LOR and only in the first 10 years of emigration, while FOU was found to be influential in studies where more than 50 participants were included (effect size). The "effect size" of the study group is considered to be the efficient number of the participants, thus leading to a visible effect of the extralinguistic variables (e.g., FOU for this study).

Theories from psychology and other disciplines have also been proposed to account for language attrition. The *interference* theory, for example, suggests that the retrieval of previously acquired information can become inhibited by later-learned information, an effect known as retroactive interference (Anderson et al., 1994). Consequently, a later-learned language (L2) may hinder L1 retrieval; this can be manifested in the form of code-switching and borrowing (Saville-Troike et al., 1995), meaning extension and loan translation (Pavlenko, 2003), decreased lexical diversity (Laufer, 2003), changes in gender marking and word-order (Ecke, 2004). According to the *cue-dependency* theory, every piece of stored information in the memory receives a "tag" (reference point) (Higbee, 1996) which contains information about that memory. The success of information retrieval depends on how accessible these internal (individual state, feelings) and external (contextual) cues are to the individual (Tulving & Madigan, 1970). In a study with Russian-English bilinguals, Marian and Neisser (2000) found that memories are easier to retrieve and more detailed if the language environment of the retrieval is the same as the language of memory encoding. The *Activation Threshold hypothesis (ATH)* (Paradis, 2004, 2007) seems to be a useful framework to account for the L2-L1 effects, as it suggests that the activation level of mental representations (e.g., linguistic representations) is determined by the frequency and recency of their activation. When items are recalled frequently, they become easier to access, but even high-frequency items become inaccessible if no such recall occurs. In the case of bilinguals, the items of both languages are used less. However, the use of any of the languages will cause stimulation in both languages. The activation threshold is affected by the activation of competing information: when the speaker wants to produce a word or structure in the target language, competitors from the non-target language have to be inhibited, and this inhibition event also raises the activation threshold. If the frequency of L2 use increases, L1 will be inhibited repeatedly, leading to difficulties in access.

1.3. Speech fluency, lexical diversity, and language attrition

Speaking is one of the favorite activities of humans (Levelt, 1995), yet non-linguist individuals rarely reflect upon the complex process of speech production. In healthy individuals, speech is highly automatic and fluent and is subserved by a complex system. One of the most widely accepted models of speech production was developed by Levelt (1989) based on the empirical work available at that time, and since then, the temporal parameters of the process have been detailed and the model has been supported by behavioral and neurolinguistic data. The Speaking Model consists of three main components: the conceptualizer, the formulator, and the articulator. The geniality of the system lies in the cooperation between these components (de Bot & Bátyi, 2022). The effectiveness and processing speed of the system is due to its highly automatic nature. When an individual is asked to name a picture (e.g., *ball*), the activation of concepts, lemmas (spreading activation), morphology, phonology, and the full articulatory system happens in less than a second (0.5 – 0.6 s). These automatic processes are completed by controlled processes which are activated when the system faces a problem (e.g., a tip-of-the-tongue phenomenon). Because planning and speaking happen simultaneously, the fluency of speech can be disrupted as the control processes are activated and this monitoring detects a problem at any level of the system. Fluency is referred to as the ability to produce meaningful patterns of linguistic codes in a largely continual manner (Crystal, 1997; Götz, 2013). This is considered an automatic procedural skill, implying that proficient speakers need little attention and effort to produce fluent speech (Schmidt, 1991). Speech fluency is often characterized by time-related and performance-related concepts (Bergmann et al., 2015). Temporal aspects of speech are usually measured in speech-pause relationships, such as speech rate, articulation rate, etc., while performance-related measures are disfluency markers. According to Goldman-Eisler (1968) "spontaneous production in any speaker is a highly fragmented and discontinuous activity in which hesitations act as necessary and natural speech management strategies" (p. 31).

Both monolinguals and bilinguals experience disfluencies and word-finding difficulties. However, processing two languages with the same production system is more complex and is affected by multiple factors. One explanation for this is that the bilingual vocabulary is more extensive, which results in more competition between words when selecting the target word and the frequency of each word will be lower than for monolinguals (Kroll et al., 2012). Word-retrieval difficulty is the most salient and earliest feature of language attrition and can be manifested in an increase of disfluency markers (e.g., hesitations, filled pauses, repetitions) (Schmid & Beers Fägersten, 2010), an increase in tip-of-the-tongue states (Ecke, 2013), slower lexical retrieval, and retrieval failures. Lexical diversity is usually analysed as an indicator of changes in the expressive vocabulary of an individual. Non-attriters usually outperform attriters in this measure even if the latter maintain high proficiency in their L1 (Schmid & Köpke, 2007).

Bilingual studies generally define two types of disfluency markers. Those related to cognitive processes are known as *cognitive disfluency markers* (CDMs). These are indicators of a problem with lexical retrieval (Levelt, 1989; Fox Tree-Clark, 1997), which manifests itself in hesitations, such as silent pauses, repetitions, retractions (e.g., Levelt, 1989). CDMs occur more frequently in the speech of bilinguals, as the speaker's task is to manage and access two linguistic systems simultaneously, increasing the number of hesitation markers. The second type, *semantic disfluency markers* (SDMs), manifest themselves in filled pauses (de Leeuw, 2007). It has been found that CDMs are overrepresented in the speech of beginning or low-proficiency learners but decrease as proficiency becomes more advanced (de Leeuw, 2004; Hilton, 2007; Riazantseva, 2001; Trofimovic & Baker, 2006). For instance, L1 Russian speakers produce longer pauses in their L2 English than L1 speakers (Riazantseva, 2001); however, we have limited knowledge about what happens to the L1 in the process of L2 acquisition. In language attrition, the extra retrieval time needed for lexical items is often filled with disfluencies (Hansen, 2001). Schmid and Beers Fägersten (2010) analysed disfluency markers in the speech of 245 speakers, divided into five groups (German emigrants in Canada; German emigrants in the Netherlands, Dutch emigrants in Canada; monolingual Germans in Germany, and a monolingual Dutch group in the Netherlands). Their findings showed that the (bilingual) attrited groups used more CDMs due to increased demands of bilingual processing in which the attrition of L1 affected the micro-planning. In another study (Bergmann et al., 2015), language learners, attriters, and monolinguals were compared based on their speech output, and the results showed that learners and attriters were equally (dis)fluent and significantly more disfluent than monolingual speakers. As the number of studies looking at the speech production fluency of attriters is relatively low (see e.g. Navracsics, 2015), the goal of the present study is to explore the extent to which Russian migrants living in Hungary and speaking Hungarian as an L2 are different from monolingual Russians living in Russia in L1 speech fluency and lexical diversity.

Studies of language production are an essential step in the research of not only the bilingual mind but language attrition itself. Moreover, they are the clearest way to see the difference between monolingual and bilingual speakers (Schmid & Beers Fägersten, 2010). Schmid & Beers Fägersten (2010) concluded that the language performance of bilinguals is more complex, as their linguistic system is more sophisticated. In addition, broader cognate access leads to cross-linguistic influence. In conclusion, the language production tasks (e.g., story-telling tasks based on the cartoon *Frog, Where Are You?*) give participants freedom of expression, and thus their language seems more "natural," which in turn enables the research of language attrition as well as the comparison of attrited and non-attrited groups.

1.4. Research questions and hypotheses

The motivation and novelty of the research has grown out of the fact that in bilingualism research the changes in the L1 during language development has been neglected and as a result only in the last decade showed an increase in the systematic research in language attrition. The scarcity of research is especially pronounced in the study of speech fluency and language attrition. This study addresses questions regarding lexical access, lexical diversity and speech fluency of Russians living in Hungary. The main questions of the study are the following:

- To what extent is the L1 maintained by Russians living in Hungary based on their frequency of use and attitudes towards the L1?
- Is there any difference between the attrited and the non-attrited (monolingual) groups in lexical access and lexical diversity?
- Is there any difference in the temporal and performance-related measures of speech fluency between the attrited and the non-attrited (monolingual) groups?
- To what extent are extralinguistic measures (age, length of residence, frequency of use) related to lexical access, lexical diversity, and speech fluency among the attrited group?

It is assumed that Russians living in Hungary have positive attitudes towards their L1 and that they use the language at home and with their friends, but that the monolingual Russian group outperforms the attrited group in all linguistic tasks.

2. METHODOLOGY

2.1. Participants

In order to answer the research questions, two groups were included in this study: a ***target group*** (N = 50) of Russian emigrants living in Hungary and a ***control group*** (N = 50) of monolingual Russian residents in Russia.

The main selection criteria for participants in the two groups were the following:

- for the target group a minimum of seven years of residence in Hungary;
- for the control group – to be monolingual residents in the L1 environment with low or no exposure to any L2.

For all participants, Russian is the L1, and after settling in Hungary, most participants in the target group have either never returned to Russia or rarely visited their home country.

As described above, most studies with less than 50 participants could not find a significant effect of the frequency of use (FOU) on language attrition, so in this study, both the target and the control group consist of 50 informants (see Table 1).

Table 1
Descriptive data of the target group (N=50) and the control group (N=50)

Tablica 1
Deskriptivni podatci ciljne (N=50) i kontrolne skupine (N=50)

	Target group					Control group				
	Mean	SD	Median	Min.	Max.	Mean	SD	Median	Min.	Max.
Age	45.14	11.32	45	20	73	41.1	10.92	40	22	65
Length of residence	18.64	9.97	16.5	7	62	N/A	N/A	N/A	N/A	N/A
Age at emigration	26.5	8.71	27	5	50	N/A	N/A	N/A	N/A	N/A

The two groups were matched based on age and level of education (higher education: 33 participants in the target group and 30 in the control group; professional technical school: 17 in the target group, 20 in the control group); however, the gender distribution is different (target group: 38 females and 12 males; control group: 46 females and 4 males). According to the questionnaire results, 34 participants in the target group have Hungarian spouses, 10 have Russian spouses, and 6 are single or widowed.

Participants were contacted with the help of social network webpages, such as Facebook. The Russian public pages were the primary target for participant recruitment, for example, *Az Oroszok*, *Самовар*, etc. The blog www.LiveJournal.com was used to create a call for participants to find more volunteers to join the project.

2.2. Instruments

In order to answer the research questions, three instruments were used for data collection: a questionnaire and two linguistic tasks.

2.2.1. Social Personal Background Questionnaire

Information on personal background, frequency of language use, and language attitudes were collected by the Social Personal Background Questionnaire (SPBQ) (retrieved from www.languageattrition.org). This instrument was chosen because it is part of the Language Attrition Test Battery (Schmid, 2004; 2011) and has been used across diverse language contexts, theoretical frameworks, and research objectives (e.g., Keijzer, 2007, de Leeuw, 2009, Dostert, 2009, Cherciov, 2011, Opitz, 2011). The questionnaire was adapted and translated into Russian. A pilot study was conducted with only a few participants for confirming clarity of the questions, so no reliability analysis was possible. In attrition studies, finding participants is challenging; for this reason, most attrition studies include no pilot phase in questionnaire development.

The questionnaire had the following aims:

(a) to obtain data ensuring interparticipant comparability: social background, education level;

(b) to elicit information about participants' language learning history and use: length of residence in the host country, amount of contact with either language since emigration, age of L2 acquisition, etc.;

(c) to elicit self-report data on participants' language proficiency;

(d) to elicit information about participants' attitudes towards language in general and towards integration into the host community.

The questionnaire included 79 questions of three types: yes/no questions, Likert scale questions, and open-ended question. The questions can be divided into four sub-categories (following Cherciov, 2011):

1. demographic information (yes/no questions and open-ended questions);
2. contact with L1 (e.g., native language of friends; amount of contact with friends/family in country of origin) (Likert scale questions);
3. frequency of use of L1 (FOU) (e.g., use of L1 with partner, children; preferred language) (Likert scale questions);
4. attitudes towards L1 (e.g., opinions on importance of maintaining L1; language preference; cultural preference) (Likert scale questions).

The participants of the Russian control group received a background questionnaire containing questions about participants' personal information, such as gender, education, place of living, language use, etc. Both questionnaires were administered in Russian.

The questionnaire results were coded following the coding book developed by Schmid, in addition to the SPBQ (www.languageattrition.org). This was an important step, as the Likert scale questions were administered in the form of multiple-choice questions and had to be converted into numerical values. More points were given to answers which denote high frequency of L1 use and positive attitudes towards the L1 (see example below, the numerical values in brackets are the assigned codes that translate the answers to a Likert scale).

What language or languages do you use more often when talking with your children?

a. Only Hungarian (0)
b. Both Russian and Hungarian, but mostly Hungarian (0.25)
c. Both Russian and Hungarian, no preference (0.5)
d. Both Russian and Hungarian, but mostly Russian (0.75)
e. Only Russian (1)

Some items in the questionnaire did not show any variability, so they were excluded from the final analysis (going to church, club membership, L1 media (TV, radio, magazines), feeling homesick, intentions of moving to Russia).

As one of the main extralinguistic factors assumed to influence the level of attrition is FOU, language contact and choice were merged into one variable labeled frequency of use (merging was possible as the correlation between the two variables was strong r=0.7).

The reliability and the internal consistency of the two factors are good and moderate, respectively: FOU (13 items): Cronbach a=.86, language attitude (10 items) Cronbach a=.6. Due to the low reliability of the attitude factor, it will not be included in statistical tests as an extralinguistic variable.

2.2.2. Verbal fluency task

The verbal fluency task (VFT) was used to measure lexical access and to explore the extent to which the mental lexicon is affected by language attrition. The letter and semantic fluency tests were both used in the two groups, and the participants were instructed to list as many items within the given category as they could within 60 seconds. All repeated words were excluded from the final count. Verbal fluency tasks are believed to require search strategies that draw on executive control during the lexical retrieval process. Friesen et al. (2013) argue that the demand for executive control is greater in letter category tasks. This statement is supported by some studies which indicate that individuals tend to produce fewer lexical items during letter tasks than semantic tasks (e.g., Gollan et al., 2002; and Kormi-Nouri et al., 2012). One possible cause for this is that the task demands for semantic category are consistent with the structure of semantic memory; in one's mind, concepts are clustered based on semantic properties, which helps during the lexical retrieval process – e.g., for speech production (Luo et al., 2010). In contrast, producing words from a letter cue is an uncommon strategy in lexical retrieval, and lexical entries are not listed in alphabetical order (Strauss et al., 2006).

As for the letter fluency task, most studies used FAS letters in English (Spreen & Strauss, 1998; Delis et al., 2001). These 3 letters in English were shown to be good stimuli in terms of category size (how many possible words can be named) and frequency (how many frequently occurring words can be named) (Gollan et al., 2002). Snodgrass and Tsivkin (1995) using corpus methods identified ДОС as the equivalent letters in Russian. The authors made a comparison between the 6,318 most frequent words from the British National Corpus (2017) and the list of the 5,000 most frequent Russian words from Sharoff (2001). For each letter of the two alphabets, they calculated the percentage of words starting with a particular letter that were some of the most frequently occurring words: words starting with <д>, <о>, and <с> represent 4.46%, 7.20%, and 11.48%, respectively, of the most frequent Russian words, and words starting in <f>, <a>, and <s> represent 4.83%, 6.77%, and 11.48%, respectively, of the most frequent English words in the frequency lists mentioned above. In the present research, the choice was the most frequent letter out of the three above-mentioned letters: <с>. The participants had to list as many words, in relation to the given stimuli, as possible, which allows us to conduct a further investigation of verbal fluency, comparing the two groups using the elicited data. As for the semantic fluency task, the category 'animals' was chosen as the most common stimulus used in previous studies.

2.2.3. Story-telling task

A story-telling task was administered to measure the lexical diversity and speech fluency of the participants (see Bátyi, 2020; Bátyi & Kemppainen, 2022). The "frog story" cartoon (*Frog, Where Are You*? by Mayer, 1969) was chosen because it has been used successfully in a wide variety of studies (Berman & Slobin, 1994). The cartoon includes 30 pictures in which a boy and his puppy are searching for an escaped frog and have all kinds of adventures in the process. The participants were asked to tell the story in their L1, which resulted in elicited spontaneous speech. The recordings were transcribed and analyzed for disfluencies.

2.3. Procedures

The participants' consent was requested in the introduction of the questionnaire, where all the relevant information about the study and confidentiality were included. After filling in the online questionnaire, the participants were contacted and asked to complete the semantic and letter verbal fluency tasks and the story-telling task. In the verbal fluency task, the participants were instructed to list as many items starting with a given letter or within a given semantic category as they could in 1 minute. In the story-telling task, they were asked to get familiar with the story first by going through the pictures and then to tell the story. There was no time-restriction, so the length of the recordings varies, ranging from 1 minute to 9 minutes. The recordings were transcribed and prepared for analysis, and the temporal aspects of speech were analyzed in PRAAT.

Table 2 shows a summary of measures and their definitions used in this study. Temporal measures of speech follow the definitions given in Kormos (2006).

Table 2
An overview of measures
Tablica 2
Pregled mjera

Task	Measure	Definition
Verbal fluency	Letter fluency	Items starting with a specific letter
	Semantic fluency	Items belonging to a specific category (e.g., food, animals, etc.)
Story-telling	Speech rate	The total number of syllables produced in a given speech sample divided by the amount of total time required to produce the sample (including pause time), expressed in seconds. This figure is then multiplied by sixty to give a figure expressed in syllables per minute.
	Articulation rate	The total number of syllables produced in a given speech sample divided by the amount of time taken to produce them in seconds, which is then multiplied by sixty. Unlike in the calculation of speech rate, pause time is excluded. Articulation rate is expressed as the mean number of syllables produced per minute over the total amount of time spent speaking when producing the speech sample.
	Phonation-time ratio	The percentage of time spent speaking as a percentage of the time taken to produce the speech sample.

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Story-telling	Speech rate	The total number of syllables produced in a given speech sample divided by the amount of total time required to produce the sample (including pause time), expressed in seconds. This figure is then multiplied by sixty to give a figure expressed in syllables per minute.
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	Phonation-time ratio	The percentage of time spent speaking as a percentage of the time taken to produce the speech sample.
	Number of silent pauses per minute	The total number of pauses over 0.2 sec divided by the total amount of time spent speaking expressed in seconds and is multiplied by 60.
	Mean length of pauses	The total length of pauses above 0.2 seconds divided by the total number of pauses longer than 0.2 seconds.
	Filled pauses	The speaker involves "strategy" to fill the empty pause, usually caused by tip-of-the-tongue phenomenon.
	Retracing with correction	The speaker begins to say something, stops and then repeats the phrase with some content or form correction.
	Retracing without correction	The speaker begins to say something, stops and then repeats exactly the same phrase or content without correction.
	Word repetition	Repeated words.
	Types	The number of different types of words.
	Tokens	The total number of words uttered.
	STTR	"Sophisticated type-token ratio [STTR]—word types per square root of two times the words $\frac{type}{\sqrt{2 * tokens}}$ that takes the length of the sample into account" (Larsen-Freeman - Cameron 2008, pp. 143–144).

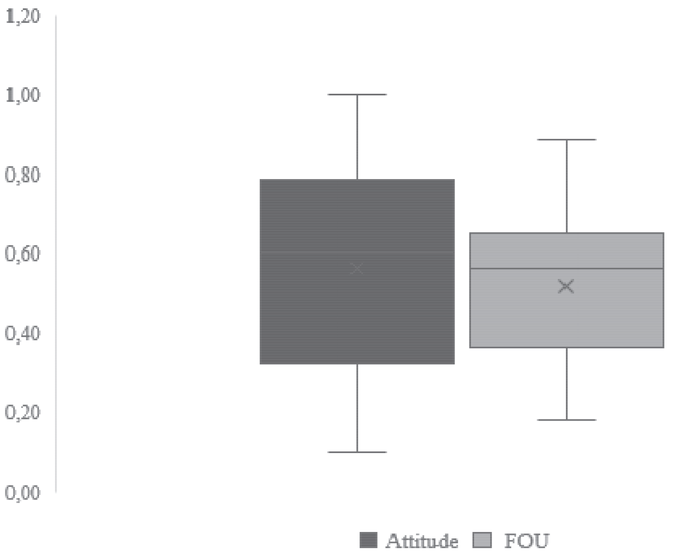
3. RESULTS

3.1. Frequency of use and attitudes

Participants were asked to rate their proficiency in Russian before moving to Hungary and now, on a scale from very bad (0) to very good (1); at the group level, they reported that it was originally 0.93 but that it decreased to 0.72.

Figure 2 shows the answers of the participants in terms of their attitude towards Russian (M=0.56, SD=0.25), and the frequency of use of the language (M=0.52, SD=0.18). In general, their attitude is positive to the L1 at the group level; however, the answers are more heterogeneous (ranging from 0.1 to 1) than in the FOU factor (from 0.18 to 0.89).

Figure 2
The distribution of results in the attitude and FOU factors
Slika 2
Distribucija rezultata faktora stavova i učestalosti uporabe jezika



Note: FOU=frequency of use

A closer analysis of the individual items in the two scales (Table 3 and 4) shows the variability of the answers. According to the self-report of the participants, they use Russian often (1) and mostly with relatives in Russia (2); however, they rarely visit the home country (12). The frequency of use of the L1 has significantly decreased since they moved to Hungary (4) as the majority of their friends are Hungarians (5) and the language used in the family (with partners (7, 8) and children (9, 10)) is predominantly Hungarian (see Table 3).

Table 3
Average results to the items in the FOU factor
Tablica 3
Prosječni rezultati po česticama za faktor Učestalost uporabe jezika

	Question	Mean
1	How often do you speak Russian?	0.88
2	What language or languages do you mostly use to keep in touch with relatives and friends in Russia?	0.96
3	Are you in frequent contact with relatives and friends in the Russia?	0.61
4	Do you think you use more or less Russian since you moved to Hungary?	0.24
5	What is the mother tongue of the majority of your new friends?	0.26

6	What is the native language of current or last partner?	0.35
7	What language or languages do you mostly use when talking to your (ex)partner?	0.34
8	What language or languages does your partner mostly use when talking to you?	0.57
9	What language or languages do you mostly use when talking to your children?	0.45
10	What language or languages do your children mostly use when talking to you	0.45
11	Did /do you ever correct your children's Russian?	0.35
12	Have you ever been back to Russia since leaving for Hungary?	0.38
13	In general, do you have more Russian- or Hungarian-speaking friends in Hungary?	0.45

Note: the highlighted answers are above the factor mean (0.52)
FOU=frequency of use

As is shown by Table 4, participants on average feel slightly more at home in the Russian culture (3) but speaking Hungarian is more comfortable (4). Russian maintenance (1), and transmitting the language to children (2, 5) is moderately important for them, and those who have children regret that they do not speak and understand the language (6).

Table 4
Average results to the items in the Attitude factor
Tablica 4
Prosječni rezultati po česticama za faktor Stav prema jeziku

	Question	Mean
1	Do you consider it important to maintain your Russian?	0.47
2	Do you consider it important that your children can speak and understand Russian?	0.54
3	Do you feel more at home in Russian or in Hungarian culture?	0.57
4	Do you feel more comfortable speaking Russian or Hungarian?	0.46
5	Do you encourage your children to speak Russian?	0.54
6	If your children do not speak or understand Russian, do you regret that?	0.7
7	Do you think Russian plays an important role in the relationship between your close family members?	0.67

Note: the highlighted answers are above the factor mean (0.56)

3.2. Lexical access and lexical diversity

3.2.1. Comparison of the target and control group

Lexical access was operationalized as performance on the letter- and semantic fluency tasks. The monolingual control group performed better on both tasks as compared to the target group (see Table 5). The differences between the control and the attrited group as shown by the results of the independent t-test was significant in the semantic fluency task ($t(98) = -5.030$, $p < .001$) and in the letter fluency task as well ($t(98) = -4.043$, $p < .001$). If we look at the within-group comparisons, both groups performed slightly better on the letter fluency task, but the difference is not significant according to the paired samples t-test (control (t(49) = .134, p = .894), target (t(16) = 1.231, p = .224).

Table 5
Descriptive data of the verbal fluency tasks
Tablica 5
Deskriptivni podatci za zadatke verbalne fluentnosti

	Semantic fluency		**Letter fluency**	
	Mean	**SD**	**Mean**	**SD**
target group	22.08	6.09	23.24	7.94
control group	30.72	10.5	30.84	10.65

Lexical diversity was measured by the elicited spontaneous speech of the participants. Based on the total number of words (tokens) and the different types of words (types), the lexical diversity was calculated (see the formula in Table 2). As shown in Table 6, the control group produced longer and more varied texts on average, and on the lexical diversity measure (STTR), a marginally significant difference was found by the independent samples t-test (t(98)=-2.022, p < .05).

Table 6
Difference in lexical diversity between the target group and the control group
Tablica 6
Razlika između ciljne i kontrolne skupine prema leksičkoj raznolikosti

	Mean (SD)		Significance
	Target group	Control group	p
Tokens	316.26 (73.31)	336.3 (114.3)	.299
Types	190.38 (38.01)	205.36 (55.44)	.118
Lexical diversity (STTR)	7.5 (0.7)	7.8 (0.9)	.046*

Note: STTR=sophisticated type-token ratio

3.2.2. The role of extralinguistic variables in lexical access and lexical diversity

According to Pearson's correlation (Table 7), within the attrited group a moderate significant correlation was found between FOU and letter fluency (r = .329, p < .01). Age and length of residence show no significant correlation with either fluency or lexical diversity measures. However, a weak non-significant negative correlation was found between age and the lexical measure (STTR), showing that older participants produced less diverse vocabulary.

Table 7
Correlation between extralinguistic variables and the results of verbal fluency and lexical diversity.
Tablica 7
Korelacija između izvanjezičnih varijabli i rezultata na zadatcima verbalne fluentnosti i leksičke raznolikosti.

	STTR	Letter fluency	Semantic fluency
age	-.213	.063	-.027
LOR	-.047	.078	-.055
FOU	-.183	.329*	.080

*. Correlation is significant at the 0.05 level (2-tailed)
Note: LOR=Length of residence, FOU=frequency of use, STTR= sophisticated type-token ratio

3.3. Speech production and fluency results

3.3.1. Comparison of the target and control groups

Table 8 shows the results of the speech fluency measures. It is apparent that, on average, the control group did better on the temporal measures (faster speech). However, the number of silent pauses per minute was higher in the control group.

Table 8
Difference between the target and control groups in speech fluency measures
Tablica 8
Razlika na mjerama govorne fluentnosti između ciljne i kontrolne skupine

	Mean (SD)		Significance
	Target group	**Control group**	**p**
Speech rate	**204.5 (38.9)**	**206.7 (31.8)**	**.75**
Articulation rate	288.4 (68.9)	291.9 (58.1)	.78
Phonation-time ratio	72.7 (13.7)	71.8 (9.8)	.69
Number of silent pauses per minute	23.8 (11.2)	27.4 (8.8)	.08
Mean length of pauses	0.6 (0.2)	0.6 (0.1)	.11
Filled pauses	5.2 (6.4)	5.1 (5.9)	.97
Retracing with correction	2.3 (1.6)	2 (1.4)	.42
Word repetition	1.4 (0.7)	1.2 (0.4)	.45

significance p<.05

3.2.3. Correlation between extralinguistic variables and speech fluency measures

As seen in Table 9, which describes the correlation between the extralinguistic variables and speech fluency data, there was a negative significant correlation between LOR and articulation rate (r = -.303, p < 0.5).

Table 9
Correlation between extralinguistic variables and speech fluency measures
Tablica 9
Korelacija između izvanjezičnih varijabli i mjera fluentnosti

	Speech rate	articulation rate	phonation time_	number of silent pauses per minute_	mean length of pauses_
Age	.079	-.062	.117	-.047	-.110
LOR	-.131	-.303*	.186	-.209	-.021
FOU	.138	-.090	.240	-.246	-.145

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)
Note: LOR=Length of residence, FOU=frequency of use

4. DISCUSSION AND CONCLUSIONS

The goal of this study was to find out the extent of language attrition of Russians living in Hungary and to show which extralinguistic variables are associated with attrition. Language attrition can manifest itself at each language level, but the earliest and most salient signs usually occur at the lexical level, which was the main focus of the present study. The target group (N = 50) was compared to an age- and education-matched control group (N = 50) who are functionally monolingual in Russian to see whether there is any difference between their performance. To explore the extralinguistic factors, the SPBQ was used, and besides demographic data, the frequency of L1 use and attitudes towards the L1 were assessed. The group averages were not high on any of the measures (FOU = 0.52, attitude = 0.56) and the analyses of the individual items revealed the reasons for the low ratings. In terms of FOU, the participants mainly use Russian to keep in touch with relatives, but in Hungary the language used in the family and with friends is predominantly Hungarian. Their attitude toward Russian is generally positive, but language transmission to the next generation is only moderately important to them, which is not surprising, as in most voluntary migrant groups total language shift happens in three generations (Lieberson, 1980).

In order to see the extent of language attrition, the semantic and letter fluency tasks were used as well as a story-telling task to elicit spontaneous speech. The control group significantly outperformed the attrited group on both verbal fluency tasks, a finding which coincides with previous results (Schmid & Jarvis, 2014) and confirms that lexical access is affected by the change in language dominance, hence the participants produced fewer words. The lexical diversity of the participants was operationalized by the sophisticated type-token ratio, and it was found that the control group performed better and that this difference was marginally significant. These findings confirm our assumption and are in line with previous results showing that even L1 maintainers in an L2 environment are outperformed by non-attriters (Schmid & Köpke, 2007). In the bilingualism and language attrition literature, it was found that bilinguals perform slower on language tests (picture naming, verbal fluency) and during spontaneous speech production (Gollan et al., 2005; Bergmann et al., 2015). This can be explained by cross-linguistic interference, which is present even when the bilingual uses his/her L1 (Kroll et al., 2012). In an environment where the L2 is frequently used and for a prolonged period, L2-L1 interference becomes more pronounced (Botezatu et al., 2020).

It was assumed that the monolingual control group perform with faster speech rates and articulation rates and with less dysfluencies. As shown in Table 8, the control group was slightly faster in their speech and articulation rate, while the attrited group performed more hesitation markers. However, none of these differences were significant, which does not convincingly confirm our assumptions. Finally, the correlations between the extralinguistic variables and outcome measure show that age is negatively and non-significantly related to lexical diversity (STTR). In other words, lexical diversity in the L1 decreases by age. The length of residence shows no relationship with the lexical measures but is negatively and significantly related to articulation rate, while frequency of L1 use positively and significantly correlates with letter fluency. None of the extralinguistic factors explain the variability in the outcomes according to the multiple regression analyses.

To conclude, based on these empirical results, it is apparent that the studied Russian group in Hungary show signs of attrition in how they access the vocabulary items in their L1 as well as in their lexical diversity, but that their fluency seems to be intact. The participants in the study are post-puberty migrants, and as such, they seem to be protected against dramatic changes in their L1 proficiency (Pallier et al., 2003; Pierce et al., 2014). Speech slows down with a prolonged length of residence, but frequent L1 use contributes to lexical access. This latter finding can be explained by previous findings that the use of two languages requires inhibition, which leads to improvement in cognitive control (e.g. Bialystok et al., 2008).

This study follows a cross-sectional design which is a limitation in most attrition studies. It is important to note that language attrition is a process, and therefore, it should be investigated longitudinally and from a dynamic perspective (Herdina & Jessner, 2002) by looking at the subsystems of a multilingual language system which interact between themselves and with the surrounding environment. Hopefully, this cross-sectional study will give us a clearer picture of the language attrition of Russians living in Hungary and the role of extralinguistic variables that can serve as a starting point for designing such a longitudinal study. This leads us to another limitation of the study: the differences between monolinguals and bilinguals does not necessarily reflect the extent of attrition in the target group. Future research in language attrition should address these methodological issues.

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Leksičko dosjećanje, leksička raznolikost i govorna tečnost u jezičnom propadanju materinskoga jezika

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Dugotrajna izloženost stranom jeziku mijenja način uporabe i obrade prvoga jezika (L1), a taj se fenomen naziva jezičnim propadanjem (Yilmaz i Schmid, 2018). Cilj ovoga istraživanja jest istražiti razmjere jezičnoga propadanja među Rusima koji žive u Mađarskoj te ispitati kako tom procesu pridonose izvanjezične varijable poput duljine boravka u Mađarskoj, dobi, učestalosti uporabe prvoga jezika te stavova prema jeziku. Osim upitnika, u istraživanju su za utvrđivanje leksičkoga dosjećanja korišteni i zadatci semantičke i čitalačke fluentnosti, a za mjerenje leksičke raznolikosti i govorne fluentnosti korišten je zadatak pripovijedanja. Rezultati su pokazali da je kontrolna skupina (monolingvalni Rusi koji žive u Rusiji) bila bolja od eksperimentalne skupine na varijablama leksičkoga dosjećanja i leksičke raznolikosti, dok se govorna fluentnost u eksperimentalnoj skupini čini očuvanom. Nijedna od izvanjezičnih varijabli ne objašnjava razmjere propadanja, no učestalost uporabe jezika povezana je sa zadatkom čitalačke fluentnosti, koja zahtijeva inhibiciju.

Ključne riječi: *stavovi, učestalost uporabe, jezično propadanje materinskoga jezika, duljna boravka, leksičko dosjećanje, leksička raznolikost i govorna tečnost*