

**The role of working memory
in acquiring new structures and lexicon
when learning English as a second language**

KAROLINA JANCZUKOWICZ

*Received 26.04.2021,
received in revised form 25.10.2021,
accepted 27.10.2021.*

Abstract

The following paper discusses working memory as it functions during the acquisition of a second language by children. It analyses the results of a study conducted over a 12 month period on a group of 12 Polish children ages 10 to 14, learning English as a second language. The focus of this longitudinal study was the role that the verbal working memory plays in the acquisition of new structures; namely, the extent to which processing new information in working memory is essential to learning grammar and the possibility of developing strategies of using working memory itself during the learning process. The method adopted was a comparison of several oral tasks, including repetition and postponed repetition. As the conclusion to the discussion, certain didactic implications are presented, such as the need to control and modify the didactic process as to the degree to which it relies on working memory.

Keywords

verbal working memory, short-term and long-term memory, sensory memory, reproductive vs. reconstructive memory, postponed repetition

Rola pamięci roboczej w pozyskiwaniu nowych struktur i słownictwa podczas nauki angielskiego jako drugiego języka**Abstrakt**

Artykuł omawia kwestię werbalnej pamięci roboczej wykorzystywanej w trakcie przyswajania gramatyki języka drugiego przez dzieci. Analizuje on wyniki badań przeprowadzonych w ciągu 12 miesięcy na grupie dziesięciorga dzieci w wieku 10–14 lat od lutego 2020 do lutego 2021, które uczyły się języka angielskiego. To badanie skupia się na roli jaką odgrywa werbalna pamięć robocza dla przyswajania nowych struktur; konkretnie stopnia w jakim pamięć robocza jest wykorzystywana w trakcie przyswajania gramatyki oraz możliwości rozwoju strategii nauczania, aby zwiększyć efektywność wdrażania nowych struktur. Badanie polegało na porównaniu rozmaitych ćwiczeń ustnych, w tym powtórzeń I opóźnionych powtórzeń. We wnioskach przedstawiono sugestie dydaktyczne związane z potrzebą regulowania stopnia obciążenia pamięci roboczej w trakcie wdrażania gramatyki.

Słowa kluczowe

werbalna pamięć robocza, pamięć krótkotrwała I długotrwała, pamięć sensoryczna, pamięć odtwórcza I rekonstrukcyjna (mechaniczna i logiczna), opóźnione powtórzenie

1. Introduction

During any language processing, verbal working memory, understood as a mental capacity to store and make mental operations on linguistic elements, plays a crucial role. Interestingly

enough, it is in the course of language learning that its role appears most important (Gathercole 2007). Second language learning, likewise, relies on our ability to hold and process elements of language in working memory, but the strain on it becomes far heavier because of the amount of linguistic information that may be new or uncertain. While extensive research into working memory has been conducted within the area of language processing, it has mostly focused on the use of the first language (Gathercole 2007) or the more general processes of an already bilingual mind (Kurcz, Okuniewska 2011). A further insight is still needed into the mental process of acquiring and internalising new structures or vocabulary from the point of view of verbal memory.¹ That is why the following paper analyses the stages that a newly acquired element follows in terms of different types of memory, and shows what the process reveals about the degree to which this element has been learnt.

2. Phases of memory – an explanation of key terms

In second language learning, the stages of semantic memory are analogous to other forms of language processing, i.e. sensory memory, short-term, working and long-term memory (Kurcz 1992). In this distinction, the most immediate sensory memory (the echo for auditory and the iconic for visual information) happens without any conscious processing of the information received. It is this stage of the reception of any incoming data that accounts for our ability to copy or repeat a word, or a series of numbers or letters right after hearing or seeing them, without really understanding them. However, in order to repeat a particular element, it first needs to be successfully recognised. As a result, when one is exposed to an unknown word in a second language, there appears the question as to the extent to which

¹ While such applied linguistic approaches as Arabski (1996) require modern development, an insight from the fields of both SLA and cognitive psychology is still needed (Wen 2012) as it would provide an opportunity for a more direct practical use.

not knowing the word one has heard may, or may not, hamper the sensory stage of memory.

The next stage is short-term memory (STM), that is, the stage in which we become conscious of the information received, but do not yet process it. In practical terms, our attention must be directed to a given piece of information to filter out the distracting additional elements, which, in turn makes us aware of the incoming information. During L2 learning, the awareness of each new item becomes complicated when a student comes across too many confusing elements. Each new unknown item distracts attention away from what has already been heard and makes it much harder to store the items in the STM. Experiments indicate that the capacity of the STM is 7 ± 2 elements of anything, be it a number, a word or a letter (Miller 1956); however, it was later discovered that recognisability and meaningfulness of the items stored have an influence on how much can be kept in the STM (Kurcz 1992).² This can further indicate that L2 words are less likely to reach the STM if they are not actively known.

Once we reach the stage where the elements need to be stored and attended to sufficiently long to conduct mental operations on them, (to calculate on them, use them for other purposes than originally intended etc.) we reach the stage of working memory. In second language learning, we make use of working memory in most learning situations, from making a passive transformation, to answering listening comprehension tasks, or in speaking – when embedding one clause into another, up to revising larger parts of material for exams. Gathercole (2007) claims that the verbal working memory becomes even more important in learning an aspect of language than it is in processing

² Cowan (2005) argued for three to five items, with the same proviso that the meaningful chunking of the elements, mental strategies or rehearsing the elements to be remembered can lengthen that number. It should be noted at this point that the term *working memory* does not have a consistent definition among different scholars, and what Cowan (2005) refers to as the *working memory*, in this discussion is part of the *STM*.

it. Learning an aspect of L2 relies on working memory even more.

In order to see how this reliance on the verbal working memory changes, depending on the structure of a sentence, be it in L1 or L2, we can compare the following two sentences:

- (1) Angela McCarthy will give a lecture on her new book at the local library.
- (2) Angela McCarthy, who has recently published a new book, will give a lecture at the local library.

We can immediately see that (2) requires working memory to a greater extent since the subject and the predicate of the main clause are separated by a relative clause, which forces the speaker and the listener to keep more items in mind before reaching the predicate.³

Let us now see the same sentence from the perspective of a Polish L2 learner, who might not be familiar with the word *lecture* in English. His or her attention becomes distracted by associations with the similar sounding Polish word *lektura* (meaning ‘required reading’) and can become confused by what, to his or her mind, might be a double appearance of the same meaning – ‘lecture’ (misunderstood as a ‘required reading’) and ‘her new book’. We can see how in learning a second language, the working memory is additionally burdened. Various obstacles, such as new meanings of words (but also unrecognised sound distinctions, unknown structures and numerous additional distractions) require much more of the working memory. Each confusing item is like an unknown variable X in a mathematical formula. Whenever more of those unknown elements appear, the number of variables multiply, contributing to what has been described by Penny Ur (1991) as a “compulsion to

³ In the present analysis, the *working memory* will be described in accordance with Baddeley (1986), where its crucial components: *central executive*, *phonological loop*, *visuo-spatial sketch pad* and *episodic buffer* contribute to its operation and connect it to the other stages of memory; namely, *sensory memory*, *STM* and *LTM*.

understand everything', i.e. a psychological need, when exposed to a second language, to decipher all of the elements before attempting to grasp the meaning of the whole utterance.

The last stage is the long-term memory (LTM), which requires the full internalisation of new notions into the cognitive structure in the case of semantic memory. In the case of procedural memory, its presence is displayed by a fully automatic performance, i.e. complete fluency combined with a good speed of production (the autonomous stage according to Anderson 1985). The first (semantic) aspect of long term memory is related mostly to the knowledge of the system – the linguistic competence, while the other procedural aspect is related to the communicative skills, i.e. the linguistic performance.

In teaching practice, it is rare for the taught material to reach the LTM directly. In the case of skills, it takes place through practice, by going through the cognitive and associative stages to the autonomous one (Kurcz 1992) and in the case of semantic knowledge it usually happens through a change in the cognitive structure (understanding) and repetition.⁴ In either case, the working memory needs to be engaged first, and the degree of its individual development (especially in its verbal aspect) may to some extent determine the efficiency of learning.

The study that has been conducted and is presented in this paper aims at verifying two questions; firstly, how much having a well-developed working memory (in the sense of having efficient strategies for using it) can help someone in learning a second language; and secondly, whether it is possible to develop those strategies without disrupting the process of L2 learning. In other words, the study aimed to discover if it is really worthwhile to turn attention to the development of verbal working memory in one's students and if so, how to achieve this.

⁴ Ausubel (1967) and Brunner (1971) described extensively the most efficient ways of changing the cognitive structure of learners and engaging the LTM by formulating the approaches known as *meaningful learning* and *discovery learning* respectively.

3. The study and its participants

As has already been mentioned, 12 participants, between the ages of 10 and 14 (at the time of the study), were asked to perform various linguistic tasks over a period of twelve months between February 2020 and February 2021. There were six males and six females in the group. All were native speakers of Polish and they all were learning English as a second language. Their level of English ranged between A1 and B1,⁵ with three of the participants making sufficient progress over the time of the study to make a shift within the framework from A2 to B1. They displayed a variety of skills and handicaps which, to some extent, may have influenced the results of the study. Each of these factors will be addressed in the analysis of the results.

As has already been indicated, during any L2 production the level of knowledge of the second language considerably influences how much we burden the working memory, as each confusing word or structure places demands on it. Therefore, an additional task was undertaken, this time in the participants' native language, to verify the extent to which the observed results were the reflection of their verbal working memory and the extent to which they depended on their command of English. This task, conducted in the form of postponed repetition of one passage from the Polish translation of A. A Milne's *The House at Pooh Corner* [*Chatka Puchatka*] (1948) revealed discrepancies in one student as to the verbal working memory and their command of English, as was shown later during the actual study. Out of the five students who showed symptoms of certain learning deficits, such as dyslexia or attention deficits, four conducted the task with difficulties suggestive of weaker verbal memory (not being able to keep a longer Polish sentence in mind, replacing many phrases with synonyms, and changing the structures of the sentences heard). One child, however, showed no such problems in the Polish task, repeating all sentences correctly, with only two paraphrases of individual words.

⁵ *Common European Framework of Reference for Languages* (CEFR).

The fact that in the majority of cases (both with and without learning deficits) there was a correlation between the verbal working memory in the L1 and the students' ease of learning in the L2 (with one striking exception) may not only indicate the importance of verbal working memory as a factor in learning an L2, but also the presence of other important factors that are at play.

Among other things, this preliminary task in the students' L1 confirmed the earlier findings that such factors as dyslexia, attention disorders, etc. complicate the operations of the working memory. The *central executive*, the component of the working memory which coordinates various forms of attention, is inevitably forced to perform more operations when the speaker has attention deficits, while various forms of dyslexia involve difficulties in transforming spoken and written forms, where the *phonological loop* and *visuo-spatial pad*, (the remaining components of the working memory) are essential (Kurcz 2011: 99-100). The group included one participant diagnosed with dyslexia, one with attention disorders and one with both. Additionally, two participants who showed such consistent similarities in the types of mistakes they were making to those of the dyslectic subjects, were treated as such, under the assumption that, though not officially diagnosed, they did have learning deficits, similar to the subjects diagnosed with them.

The actual study was comprised of a variety of oral tasks that aimed to verify how well a particular learner of English coped with different aspects of memory, with a particular focus on working memory. The study's other aim was to examine the potential for change in this respect and the correlation between the degree of improvement of the working memory and the participants' command of English. The tasks included the following:

- repeating individual words, known and unknown earlier;
- reading sentences with known and unknown structures;

- repeating spoken sentences of varied length and complexity (postponed repetition);
- making grammatical transformations of written sentences of varied length and complexity;
- speaking with a varied degree of authenticity.

The tasks were organised in a rising order of the expected demands on the working memory as well as the command of English.

4. Types of memory and types of knowledge

When processing a second language, its different levels become revealed, i.e. various degrees of how active or passive a particular aspect of the L2 is. This feature is closely linked to the previously mentioned aspect of the working memory, i.e. the central executive, especially with regard to the coordination of attention. The active knowledge of a particular word or structure will be uttered correctly whether or not full attention is directed to it, while the passive knowledge can reveal itself when additional hints direct the students' attention to a particular structure.⁶

4.1. Distinguishing between phases of memory

The types of tasks mentioned above aimed at revealing two things; firstly, the phase of memory engaged at a particular point and secondly, the state of knowledge of a particular participant. As an illustration, when a participant was to read:

(3) he did not speak any foreign language

and instead said:

(3a) *he speak any foreign language,

⁶ Needless to say, other hints to help find mental links to retrieve a particular piece of information are frequently necessary; however, attention remains the prerequisite in these cases.

it suggested a lapse in the STM but, at the same time, could have indicated that the past simple and present simple tenses may not have become a part of the LTM and the active knowledge of the speaker's English. This, in turn, suggested a need to practice such a structure more. If that interpretation is correct, we could make a claim that the working memory was burdened in this case.

However, if this type of mistake coincided with other mistakes of the same type, i.e. omissions of words resulting in mistaken forms in past simple negations, it gave grounds for claiming that the learner failed to actively know the past simple tense. If mistakes persisted, in spite of drawing his or her attention to it, the problem in question was most likely the passive knowledge as well. In such cases, conducting exercises which would burden the working memory would have been of no use, since its full demands were placed on understanding the structure and not on remembering actual sentences.

4.2. Reconstructive and reproductive type of memory

Another way of verifying the phase of memory was to compare the results of subjects' tasks against the type of strategy they involved when retrieving a particular word, phrase or sentence from their memory; namely, whether the subjects employed *reconstructive* or *reproductive* memory. Reconstructive memory is employed when we store certain abstract principles which lead us to the original matter to be recalled, while reproductive memory happens when we store an image or a given material in exactly the way we saw, heard or read it (Reber 1985: 431). Typically, the reconstructive memory coincides with more mistakes or differences from the original but also with longer retention while the reproductive memory means repeating something verbatim, exactly the way we heard or read it; not necessarily with understanding. As a result, the material stored in this way is easier to forget.

5. The findings

In the case of the tasks conducted in the study described here, the reconstructive memory would be employed when the subject focused on the meaning of the text to be repeated, which provided him or her with links to the original material. The reproductive memory was mostly revealed in the focus on words rather than meaning, which led the subject to produce nonsensical, ungrammatical utterances, without realising it. Since reconstructive memory coincides with the necessity to conduct mental operations on the text to be retrieved, the symptoms of using reconstructive memory (such as focusing on the meaning of the original text) were indicative of the working memory. Using the reproductive strategy could have been symptomatic of the sensory memory or the STM. As in the preliminary task in the L1, such symptoms were synonyms and paraphrases. However, in the case of a second language, which posed far more lexical and structural difficulties, a few additional strategies were noticed, such as simplifications and omissions.

5.1. Simplifying structures

Simplifications occurred when the subject recognised or guessed at the meaning but did not have the active knowledge of the structure used, and so replaced it with the one he or she knew. An example of this situation was repeating the sentence:

(4a) After I had sat down, he said that business was very bad.

as

(4b) *After I sat down, he said that business is very bad.

This shows that the subject retrieved the meaning but was not familiar with the past perfect tense or the rules of reported speech, so he or she used the known structures instead. Other

examples of this phenomenon in the case of the same and other students were: replacing future continuous with future simple, *if* with *when* in the case of the first conditional, or instead of saying *began to unload – unloaded* etc.

An important feature of this type of mistake is that the student recreates a meaningful utterance with the knowledge that he or she has. Although in a number of cases this strategy coincided with other problems, resulting in serious mistakes, this attempt can still be interpreted as a successful way of coping with gaps in knowledge and memory. As such, it should be understood as an efficient strategy of using the working memory.

5.2. Omitting a word

Another very typical mistake was omitting a problematic structural element, e.g. instead of saying *open up* saying *open*, instead of *admitting to – admitting* etc. While many of these changes occurred in the case of prepositions or even adjectives, the most intriguing (and also the most frequent) occurring omission was the omission of articles. This phenomenon occurred in all types of tasks, not only in speaking or oral transformations, but even in reading individual sentences. In several cases, the omission occurred three times in a row in the same sentence even after the instruction was given to pay attention to individual words when reading.

Apart from a possible lapse in the STM, namely failing to consciously register this word, one factor leading to such an omission could be the absence of articles in Polish – the L1 of the subjects of the study. The fact that some students failed to repeat it so consistently indicates that most likely it is not part of the cognitive structure of these students. They have heard the explanation of what articles are; however, no successful change occurred in their conceptual framework. As a result, they seem to be blind (when reading) and deaf (when listening) to it. In the context of these findings, it becomes a hopeful phenomenon when, in repetition tasks, certain students start inserting

articles where they have heard nothing, as it suggests that this part of speech is beginning to form itself in the conceptual framework of their grammar.

An important conclusion to be drawn from this type of mistake is that even though the participants seem to have failed to repeat an element of the utterance, they still managed to recreate it in a way that made sense to them. In this way, they showed symptoms of using the working memory and revealed which structural or lexical elements they still needed to work on.

5.3. Postponed repetition as a speaking task

Certain types of mental operations occur when attempting to say something of your own, rather than merely repeating an artificially created sentence. It can be seen that the brain activity changes from surface operations to deeper layers of the cortex with both hemispheres, rather than only the left one, becoming involved (Grabowska, 2011). That is why some exercises that were conducted aimed at the types of speaking activities which would vary in range from fully automatic to authentic.⁷ When mistakes occurred in them, it was possible to verify the type of memory involved and the linguistic competence of the students.

A very useful task for this purpose was the postponed repetition task. Postponed repetition is a type of exercise in which the subject hears and repeats a sentence which is too long to retain in sensory memory or the STM. In the L1 the strategy that the speaker uses to retrieve missing elements is mostly that of focusing attention on the meaning and using reconstructive memory. The lapses in memory reveal themselves in the use of

⁷ The exact distinction of speaking as divided into authentic and automatic, together with the criteria that it involves, can be found in Wenzel (2001). In this study, the criterion that mattered was the degree to which the speaking is focused on the language or on the message that it carries. In the case of postponed repetitions we are clearly dealing with message-centred utterances if we compare them to regular repetitions and with more focus on language if we compare them with spontaneous speech.

synonyms and paraphrases.⁸ In the L2, the strategy can differ depending on the individual. The deciding factors should be subject to further research; however, the present study shows these factors to be among other things: the level of the L2, the sense of security in one's own abilities and the individual level of verbal working memory.

However, in one case it was observed that a student was able to change the strategy after an indication from the researcher to focus more on the meaning of what she was to say and not on the actual words. Until that point, she had been unsuccessfully trying to repeat the text verbatim and was becoming lost after three or four words; however, after the suggestion to focus on the meaning, she was able to repeat compound sentences, though with the characteristic replacements, suggestive of the reconstructive memory.

All in all, the types of mistakes made during that exercise resembled those that occurred during spontaneous speech, with several important differences. The mistakes common for both spontaneous speech and postponed repetition were simplifications, omissions and various grammar errors (e.g. in tense constructions, prepositions, word replacement etc.). What differed was a narrower range of both vocabulary and structures in free speech, and a much greater reluctance to speak in free speech. Both of these differences indicate that the postponed repetition is a desirable tool in learning to speak; nevertheless, on certain occasions the students experienced a block and were unable to repeat anything during the postponed repetition task. Each time the reason was the confusion as to the structures used (e.g. the student was unfamiliar with the passive voice and could not repeat anything because of it). Alternatively, the student chose to try repeat the text in spite of not understanding the essential elements, which resulted in meaningless utterances consisting of the last two or three words heard or of several words taken

⁸ The preliminary task of the L1 postponed repetition in which the participants repeated heard sentences from a passage in *Chatka Puchatka*, consistently showed this tendency.

out of context uttered at random without any apparent care as to the content.

5.4. Didactic implications

During the course of the study, several solutions were tried out in order to verify what can be done to improve the amount of information processed during a given task or even throughout the whole lesson. Additional observations were conducted to check what strategies students employed intuitively in order to put less effort into the working memory and what could be done to counteract them.

One of the strategies used to ensure that the participants employed the working memory in a more efficient way was to keep delaying certain tasks for ever more extended periods of time. As an example, an activity that required conducting transformations at the sentence level could be done orally, with the understanding that the child would have to write down the exercise after finishing it orally. This was intended to direct their attention to the need to keep the various elements in their mind for as long as they could.

To illustrate how important this seemingly minor change in conducting their activities was, suffice it to say that when they conducted the tasks without any hint as to what to focus their attention on, they failed even in the more basic repetition exercises. This direction of attention did not always come directly from the instructor. In the course of the study, they learnt what to expect at which point of the meeting and at times directed their attention appropriately themselves. Nevertheless, given all direct and indirect cues as to what to focus their attention on, their use of the working memory increased considerably.

Another example of a typical situation where we can modify the degree to which the student avoids or tasks the working memory is fulfilling any one sentence exercise. A procedure noticed in some participants was to read the part of the sentence that had already been provided, give a solution to the task and

move on to the next task. Avoiding reading the whole sentence with the solution included thus allowed them to use less working memory. That was so because the first time they only read the parts of the sentence, and the STM was sufficient for it (they did not have to process the information, they only had to read it word by word), then they focused on the task and provided the solution. In such cases, depending on whether the task was so hard that they were forced to handle it in portions or if it was sufficiently doable to deal with it as if it was an element of actual communication, one could make different modifications. One thing that could be done was to ensure that they could repeat the whole sentence, and only if the task turned out to be too difficult, to allow them to do it the easier way.

6. Concluding remarks

From the above discussion, one can infer several conclusions. The most important of these would be that firstly, the capacity of the verbal working memory and a learner's command of English are two related, but separate phenomena. Secondly, that the mistakes which occur during the acquisition of new structures can be either a symptom of the individual working memory capacity or of the actual state of a learner's knowledge. Thirdly, the fact that even minor changes in the order of the activities or the manner in which a teacher conducts them can considerably modify how much the working memory is being used.

The next outcome of this discussion should concern the extent to which a teacher should burden or lessen the effort within the working memory capacity, not making it unnecessarily easy at times, at other times, however, not mistaking the difficulty of the language level with futile complications which do little more than provide distractions away from the linguistic teaching point. Noticing this difference not only in one's own teaching, but also in external tests and coursebooks is another potential outcome of this paper.

Lastly, the importance of controlling the difficulty level of the language as opposed to mere confusion and burden on the working memory can be seen in other aspects of second language teaching, such as listening or reading comprehension, not only in the acquisition of grammar. The practice of eliciting in general can be seen from the perspective of working memory, when, rather than presenting new material we try to activate memory traces from the long-term memory. Most of the paper relied on understanding the working memory as a process involving mental operations on new material (Baddeley, 1986) while the working memory can also be understood in terms of linking the processed information with the LTM (Cowan, 2007). Since the aim of this paper was to show the practical relevance of verbal working memory in ELT rather than to participate in an ongoing discussion regarding the exact understanding of the term, both aspects of this notion can be seen as equally relevant and contribute to the improvement in SLT to an equal level.

References

- Anderson, John R. (1985). *Cognitive Psychology and its Implications*. New York: Freeman.
- Arabski, Janusz (1996). *Przyswajanie języka obcego i pamięć werbalna*. Katowice: Wydawnictwo Śląsk.
- Ausubel, David P. (1967). *Educational Psychology*. New York: Holt, Rinehart and Winston, Inc.
- Baddeley, Alan D. (1986). *Working Memory*. Oxford: Oxford University Press.
- Bruner, Jerome S. (1971). *O poznawaniu: Szkice na lewą rękę [On Knowing: Essays for the Left Hand]*. Warszawa: Państwowy Instytut Wydawniczy.
- Common European Framework of Reference for Languages: Learning, Teaching, Assessment* (2001). Strasbourg: Cambridge University Press.
- Cowan, Nelson (2005). *Working Memory Capacity*. Hove, East Sussex, UK: Psychology Press.

- Gathercole, Susan E. (2007). "Working memory and language". In: M. G. Gaskell (ed.). *The Oxford Handbook of Psycholinguistics*. New York: Oxford University Press, 757–769.
- Grabowska, Anna (2011). "Mózgowe mechanizmy komunikacji językowej z perspektywy neuroobrazowania". In: Kurcz, Ida, Hanna Okuniewska (eds.). *Język jako przedmiot badań psychologicznych. Psycholingwistyka ogólna i neurolingwistyka*. Warszawa: Wydawnictwo SWPS „Academica”, 308–347.
- Kurcz, Ida (1992). *Pamięć, uczenie się, język*. Warszawa: Wydawnictwo Naukowe PWN.
- Kurcz, Ida (2011). "Charakterystyka kompetencji językowej – reprezentacje umysłowe". In: Ida Kurcz, Hanna Okuniewska (eds.). *Język jako przedmiot badań psychologicznych: Psycholingwistyka ogólna i neurolingwistyka*. Warszawa: Wydawnictwo SWPS „Academica”, 80–106.
- Miller, George A. (1956). "The magical number seven, plus or minus two: Some limits on our capacity for processing information". *Psychological Review* 63: 81–97.
- Milne, Alexander A. (1948). *Chatka Puchatka [The House at Pooh Corner]*. Trans. Irena Tuwim. Warszawa: Spółdzielnia Wydawnicza "Wiedza".
- Reber, Arthur S. (1985). *Dictionary of Psychology*. Harmondsworth: Penguin.
- Ur, Penny (1991). *A Course in Language Teaching: Practice and Theory*. Cambridge: Cambridge University Press.
- Wen, Zhisheng (2012). "Working memory and second language learning". *International Journal of Applied Linguistics* 22/1: 1–22.
- Wenzel, Ryszard (2001). *The Education of a Language Teacher*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.

Karolina Janczukowicz
ORCID iD: 0000-0001-8933-7088
Instytut Anglistyki i Amerykanistyki
Uniwersytet Gdański
ul. Wita Stwosza 51
80-308 Gdańsk
Poland
karolina.janczukowicz@ug.edu.pl