

Preparation of elicitation material for word association task in Czech sign language

(scientific paper)

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Abstract: *Linguistic competence of every person consists of knowledge of grammar and lexicon. Lexicon is structured in such a way that enables fast retrieval of words, understanding word meaning etc. Word associations (WA) help us to understand organization of words in the mental lexicon. WA have been scarcely used in sign languages. As we plan a research of WA in Czech sign language, we need to make a list of suitable signs. Our paper describes the process of making this list, our resources and role of deaf consultants as vital part of the research preparations.*

Keywords: *Czech sign language, word associations, mental lexicon, elicitation material*

1 Introduction

Czech sign language (Czech SL) is the first language of many deaf Czechs. Czech, on the other hand, is their second language. Furthermore, since they don't hear Czech, they cannot acquire it spontaneously. It is a foreign language for them and many struggle with reading comprehension and written expression in Czech. In our study we intend to have a closer look at the way words and signs are stored in the mind of Czechs who are deaf.

In order to do that, we will use word association task. We will study associations in both Czech SL and in Czech; also, there will be a group of hearing Czechs who will perform the task only in written Czech. The paper presents introductory stages of the research. It explains the choice of signs for the task and the role of deaf adult consultants.

1.1 Linguistic competence, mental lexicon

Linguistic competence is knowledge we acquire when we learn a language. It is what we need to understand language and to produce it. Linguistic competence of every person consists of knowledge of grammar and lexicon (Fernández, Cairns, 2014).

Mental lexicon is the “word storage”. It contains information about word meaning and about its grammatical characteristics. For example, we know whether the word is countable or uncountable or which word class it belongs to. Meaning of a word in the mental lexicon is common for all who speak the language (Fernández, Cairns, 2014). Mental lexicon includes not only information about each word, but also helps us see the words in relationships to other words. This way we know which words have similar meaning, which ones can be used interchangeably and how the meaning of a word may vary according to context (Aitchison, 2012).

Mental lexicon is structured in such a way that enables fast retrieval of words and understanding word meaning (Nebeská, 1992). Every word can belong to several different groups based on various criteria, e.g., semantic fields, principal of coordination or subordination, pair organization, paradigmatic and syntagmatic organization (Nebeská, 1992). We use our mental lexicon knowledge to anticipate what words are likely to follow in a text or in speech (Ungvarsky, 2021). There are several theories and models that draw possible structuring of a mental lexicon. One example is *spreading activation theory* (Collins, Loftus, 1975). It says that words are interconnected according to semantics; when we activate a certain word in our memory, we partially activate those that are similar in meaning. *Model of lexical access* (Levelt, Roelofs, Meyer, 1999) works not only with word meaning but also with syntactic information, morphological and phonological form of words. To mention one more model, there is *multiplex model of mental lexicon* (Stella et al., 2018) – *multiplex* meaning there are more layers in the structure and each layer codes words according to different key. The organization and representation of words in the mental lexicon is still an interesting issue for psycholinguists; a lot is yet to be discovered.

1.2 Czech sign language research

In 1960, the American linguist William C. Stokoe published his work *Sign Language Structure*, where he presented the results of a large-scale linguistic analysis of American sign language (ASL) and demonstrated that sign languages of the deaf have all the necessary features of natural languages and are therefore full-fledged languages. These features especially involve the existence of double articulation (segmentation) in sign language, systematism, sign-based nature, productivity and the historical context of sign languages (cf. e.g. Černý, 1998; Karlík, Nekula, Pleskalová et al., 2002; Bímová, 2002; Slánská-Bímová, Okrouhlíková, 2008). These Stokoe's activities became an impulse for a lot of subsequent research focused on sign languages all over the world.

The Czech Republic launched research into Czech SL as late as 1993. The original goal of the research was tied to practice, as schools for children and youth with hearing impairment had begun to point out the inconsistency of signs of Czech SL and called for their unification and a general definition of which signs were “correct” and which not. The call concerning the lexical component of Czech SL cannot be fulfilled until Czech SL has been described in full, including all its components. The research is aimed at collecting all the data and provides a thorough description of Czech SL.

The primary objective of the research is a comprehensive description of Czech SL (the lexical and grammatical aspects). The methods of research and linguistic description of Czech SL are vastly different from methods used in the research of spoken languages due to the different mode of existence and specific features of sign language. Major difficulties in the research of Czech SL become apparent, according to Macurová and Bímová (2001), already during the collection of linguistic data. The best option would be to have a researcher who is a native speaker of the language under study. However, this is not possible in the Czech Republic due to the shortage of linguistically trained instructors of sign language. Elicitation method was therefore used to describe Czech SL, although it is problematic and its credibility questionable.

Comprehensive research of Czech SL is a long-term project. It is vital, however, the acquisition of high-level communication skills, as a full application of total and bilingual communication systems in the education of children with hearing impairment, requires excellent instruction material used for teaching the lexicon and, particularly, the grammar of Czech SL. Such textbooks are not available on the Czech market yet. On the other hand, some studies focused on the quantitative linguistic analysis of the Czech SL were published (cf. e.g. Langer et al., 2020).

Unfortunately, no relevant study focusing on frequency of certain signs or sign classes has yet been published (as it is the case of spoken languages with word classes and big datasets).

2 Word Associations

Our research goal is to study mental lexicon in Czech SL. For this purpose, we have decided to use word association (WA) task. This section explains what a word association task is, what is its current use in linguistic research and elsewhere.

2.1 Introduction of word association task

A common WA task means that **a person reads/hears a word and is asked to produce the first word(s) that come to their mind** (De Deyne, Storms, 2015) – these words are called *associations*. In this case, the task is called *free* word associations since there are no special requirements concerning the reactions apart from it being

a word (Novák, 1988; De Deyne, Storms, 2015). De Deyne et al. (2019) claim this task to be very suitable for understanding mental representations and processes in word understanding and in understanding language in general. Planchuelo et al. (2022) state that WA task can give us useful signals on the organization of mental lexicon.

Some languages have large databases of word associations (Dutch, Korean, Japan, English) (De Deyne, Storms, 2015). These include associations to more than 1000 cues (Jung, Na, Akama, 2010; Okamoto, Ishizaki, 2001; De Deyne, Navarro, Storms, 2013). These foreign databases are a very useful and reliable source for psycholinguists when assessing word associations (Planchuelo et al., 2022). In Czech, there are norms for free word pair associations. Author of these norms is Zdeněk Novák. His list of 150 cue words has been used to set norms for adults (Novák, 1988), later he created norms separate for man and women (Novák, 1992) and norms for children of five, seven, nine, eleven, thirteen and fifteen years of age (Novák, 1996).

There are different variants of the word association paradigm. For example, the task can be administered on paper and people are asked to write their responses down. This way, more people can work on it at the same time, even in the same room. Next, it can be administered individually in spoken words. In this case, participants give their answers orally. Also, there may be a limit on the number of associations (pair associations means only one association for each cue word) or no limit; or there may be certain specification of the response (De Deyne, Storms, 2015; De Deyne, Navarro, Storms, 2013; Mann, Sheng, Morgan, 2016; Novák, 1988).

Associations are then coded and analysed. Novák (1988) says that the easiest way to work with word associations is to give their list for each cue word based on the number of the responses. This way we can see which associations are most common for a certain cue word. Next, we can code associations to be paradigmatic or syntagmatic (Sheng, McGregor, Marian, 2006). The choice of coding always depends on the goal of our research.

Outside linguistics, we can find word associations to be used to understand customers' preferences and in marketing research. For example, Riquelme, Robert, Arancibia (2022) wanted to understand older peoples' perceptions about desserts. Even such research uses the characteristics of word associations that are studied by linguists. Word associations can reveal customer views and perception (by using episodic memory or ascribing a word certain emotional value). Associations can be also connected to the cue word by shared characteristics or by their tendency to appear frequently together (De Deyne et al., 2019).

Today word associations are used as a practical tool to investigate word representations in mental lexicon (De Deyne et al., 2019; Planchuelo et al., 2022). However, the task has been employed in research of semantic depth of children with developmental language disorder (Sandgren et al., 2021) and in research of language disorders in bilingual children (Sheng et al., 2012). Also, we encounter the word association

paradigm in research that studies second language acquisition (e.g., Clenton, 2015; Fitzpatrick, Izura, 2011).

2.2 Word associations in sign languages

Although there have been several WA studies in the population of people who are deaf or hard of hearing, most of the time it deals with spoken or written language. WA in sign languages has been extremely rare so far to the point that, as far as we know, there is only one study that used the WA task in population of bilingual deaf children.

This research was conducted by Mann, Sheng and Morgan (2016) and it was part of a larger linguistic study. WA was just one of several linguistic tasks. WA was chosen to understand lexical-semantic organization of mental lexicon in bilingual deaf children. The languages in question were American sign language and English. Deaf children in this research were all native speakers because they had at least one deaf parent; the children were 6–10 years old. There were two sessions, each for one language. For every session, there was a set of stimuli (cues) to which children responded in the same language as the stimuli. Responses were coded as paradigmatic or syntagmatic. As a control group, hearing children did the same task in English. Authors of the study focused mainly on associations related by word meaning.

Results indicate that language development of deaf children is in both ASL and English based on similar learning mechanisms. Regarding the comparison with the hearing group, it seems that semantic development of the first language (for deaf it is ASL, for hearing English) is surprisingly similar despite the difference of modality and other distinctive traits of the two languages (Mann, Sheng, Morgan, 2016).

In Czech context, there were at least two studies we know of that used WA task in people with hearing impairment (Rádlová, 2005; Kozubíková, 2006). Both of them were works of students at Faculty of Education at Palacký University Olomouc. These studies fit in a type of research that primarily focuses on second language of the population, in our case, Czech (not Czech SL). Both students used Novák's set of 150 Czech words (Novák, 1988) and performed the WA task in written form. Each of them worked with different age group – Kozubíková (2006) with adults, Rádlová (2005) with pupils at secondary schools.

WA in Czech SL has not been used so far, therefore, there is no set of cue signs available. Since we want to study mental lexicon in Czech SL, we have decided to prepare a set of our own. Set of signs and of Czech words will be inspired both by Mann, Sheng and Morgan (2016) and by Novák (1988).

3 Our word association task

Next section explains the preparation of our set of cue signs, introduces our most vital resources and we describe the process it took to finalize list of 50 stimuli. Our population are pupils and students who use Czech SL in everyday life and study at secondary schools, high schools, and universities.

3.1 Resources

There were two major resources for our list of cue signs. These were study of Mann, Sheng and Morgan (2016) and a set of Czech words assorted by Novák (1988).

Mann, Sheng and Morgan (2016): their research design is very similar to ours. Therefore, we were hoping to be able to use some of their procedures when preparing our list. However, we knew that we cannot just copy and translate their set of cue signs because it was obvious that their set was intended for younger children in their cultural context.

Like in their study, we have decided to start with sign language and translate the signs to Czech for the written variant in Czech, and not vice versa. We did not want to start with Czech words and translate them to Czech SL because our main goal was understanding Czech SL mental lexicon. We wanted to make the list of signs as representative of the language as possible. And even though it was clear that there are limitations to this, we started with choosing signs of Czech SL.

Next thing based on Mann, Sheng and Morgan (2016) is the research design. They compared L1 (first language) and L2 (second language) in deaf bilinguals and L1 of hearing control group. We plan to do the same in our cultural and language context. Another thing we do similarly is the type of WA task that allows participants to respond with more than one association (maximum 3). We also take their structure of word classes included in the set of cue signs because so far, we do not have data for Czech SL that would be suitable basis to do it otherwise. This way we want to accomplish that our and their research findings could be comparable.

On the other hand, we do not adopt the number of cue signs. Mann, Sheng and Morgan (2016) chose 40 signs. Our set consists of 50 signs. We have decided on the number based on their research and on Novák (1988), who used 150 cue words. Mann, Sheng and Morgan (2016) used their set for younger children, and we knew that our participants will be older and probably well able to keep attention a little longer. Novák, on the other hand, used only free word *pair* associations. This meant that less time was spent on each stimulus than in our case (we want more than one association for each cue sign/word). These thoughts led us to the final number of 50 signs and 50 words (in the Czech version).

Mann, Sheng and Morgan (2016) selected signs from British Sign Language Vocabulary Test (Mann, Marshall, 2012) and adapted them to ASL. In Czech SL, there

are no such tests so far so we decided to choose signs similar to their signs, but more appropriate for our age group. We used their set and Novák's set as an inspiration.

We find it vital that during the process, we consulted the signs with adults who use Czech SL for over 40 years. This step was inspired by Mann, Sheng and Morgan (2016) but also respects the Position Paper on Research and Teaching of National Sign Languages (World Federation of the Deaf, 2023; online).

Concerning the administration of WA task, we will have videos of signs (same as Mann, Sheng and Morgan, 2016). However, we will not collect responses only by writing down glosses but we will use a video recording of the session. This is to ensure the possibility to analyse the data later and, in case of uncertainty, discuss with deaf consultants.

Second important resource of our set of signs is **Novák's set of 150 Czech words** (Novák, 1988). His work has some limits – e.g., it may be considered outdated, it does not take sign language into account and the task itself is slightly different to ours (Novák worked with pair associations). Still, the fact that his set does have norms and the fact that it is more appropriate to our cultural and geographic area makes his list of words a valuable resource. Novák (1988) describes the choice of words for his list thoroughly. Unfortunately, this process cannot be applied in our case. Novák used data about Czech language such as frequency of word classes and frequency of certain words. This makes his list very well balanced, and it can be representative of real language. As for Czech SL, we do not have any corpus (yet) so data concerning frequency or what is representative of the language are missing. This led us to accept structure of word classes proposed by Mann and Marshall (2012) for children 10 years old and older – 6:2:2 (nouns, verbs, adjectives, respectively). Actual signs were inspired by Novák's list, by the set of signs of Mann, Sheng and Morgan (2016) and some of our signs were changed or added according to our goal.

3.2 Process

Process of making our elicitation material consisted of several steps. We needed to decide the number of signs, their structure (mentioned earlier in this article), choose actual signs and film the material. A vital part of the process were consultations with native signers and with Czech SL teachers who use the language on everyday basis.

We have already explained how we came to the final number of 50 signs and their structure of 6:2:2 (nouns, verbs, adjectives). Choice of actual signs was motivated by Novák's list (in our final list, 27 signs are equivalents to his cue words and 2 more signs are similar but modified), by Mann, Sheng and Morgan's list of signs (we have 10 signs of equivalent meaning; one of them overlaps with a word from Novák). 12 signs are of our own choice to meet the required number of signs in each word class. This final list of 50 signs is a result of a longer process we describe further on.

First, we needed to pick signs and prepare them into a format that could be assessed by our deaf consultants. After choosing our core set of 50 signs (30 nouns, 10 verbs and 10 adjectives according to the 6:2:2 structure) we also added alternative signs. These were our reserve in case some of our original signs would be found unfit for the task (unknown signs, conflicts in meaning etc.). The core set and alternative signs also included regional variants to determine which one would be best to use or whether it would be best not to use the sign altogether. The total number of signs was 90. We made a video of each sign. Then we matched every sign with a number to have a reference with no hint of the sign's meaning. All signs were put together in one longer video. Number of a sign always appeared first and then there was a sign itself; organized from sign number 1 to sign number 90.

We prepared a table to collect **assessment of the signs**. For each sign, our consultants were asked to fill in **meaning/s** of the sign, estimate its **frequency of use** (1–5; 1 *not used at all*, 5 *used very often*), **iconicity** (1–3; 1 *form and meaning of the sign are not connected*, 3 *form of the sign clearly refers to its meaning*) and **familiarity to pupils and students** who use Czech SL (1–5; 1 *unknown sign*, 5 *all of them would know the sign*). There was space for any additional comments and notes for every sign, but this part was optional.

Our consultants are 2 women and one man, all are deaf and use Czech SL from childhood. They are employees (teachers or assistants) at schools for children with hearing impairment in Bohemia and Moravia, all of them use Czech SL actively for over 40 years. Both their proficiency in Czech SL and their acquaintance with school children make them perfect for evaluation of our set of signs. They received a link for online video and an assessment table by e-mail and were asked to complete the table by themselves. This way they could decide on when they do it; they were allowed to split the task in several sessions if needed. After completing the table, they sent it back to us.

Analysis of their responses proved to be extremely valuable. It covered crossing out the signs that were unknown or had questionable meaning. Some signs were identified as regional variants (both in comments and in not being recognized by consultants from different region); we removed these from our list, too. In terms of estimated frequency of sign use, iconicity and familiarity to pupils and students, most of the signs scored high in all characteristics which means we have probably targeted mainly core lexicon. Based on our analysis we chose final set of 50 signs.

Having the 50 signs, we needed to determine their **order**. To avoid priming effect, signs were arranged in such a way that the neighbouring signs are as little related as possible (e.g., BREAD-DOCTOR-CAT-LEARN etc.). We present the set of chosen signs (in English glosses) in Table 1.

Table 1: *List of cue signs according to their word classes*

Nouns			Verbs	Adjectives
FATHER	BIKE	FOOTBALL	WRITE	YOUNG
MOTHER	CORKSCREW	BOWLING	SHOUT	OLD
DOCTOR	SCISSORS	COLOUR	LEARN	CLEAN
BOY	SHOES	MUSIC	SEE	DIRTY
WATER	SCARF	COURSE	ASK	RICH
BREAD	YEAR	LOVE	SAVE	SAD
CAT	DAY	CONDITION	WAIT	BEAUTIFUL
BUTTERFLY	HOLIDAY	CAKE	KNOW	NEW
TABLE	SCHOOL	PLANE	SEARCH	FAST
LAMP	SHOP	ELECTRICITY	START	WHITE

4 Future steps

Having the elicitation material ready, our next step is collecting the data from respondents at schools. Videos of cue signs were made into a PowerPoint presentation that will be easy to use. Signs can be played by pressing a space bar. Apart from working on the material itself, we ensured to have instructions for the task translated in Czech SL (for both versions of the task – in Czech SL and in Czech), same as was the case of a questionnaire for anamnestic data. Next, informed consent needed to be translated, too. To address our potential respondents, we made a short video about the research. It is in spoken Czech, interpreted to Czech SL. Attached to the video there is a transcription in written Czech. Our goal is to make it accessible to all who might be interested.

When we have the data, we will analyse it, again, with consultations of deaf adults where necessary. We want to learn more about the way signs are stored in mental lexicon of native speakers of Czech SL. Our research is first of its kind in using WA for studying mental lexicon in Czech SL. We believe that it will be beneficial to research of Czech SL, and it may inspire future researchers in the field of (sign language) linguistics.

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