

# EXPLORATORY STUDY OF SPOKEN AND SIGN LANGUAGE COMPREHENSION AMONG DEAF AND HARD-OF-HEARING ADULTS IN SLOVENIA

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**Abstract:** *The aim of this study was to explore spoken and sign language comprehension among Deaf and Hard-of-Hearing (DHH) adults in Slovenia.*

*A sample of 116 DHH participants from eleven Slovenian DHH associations completed a series of tasks that were used to measure their comprehension abilities related to spoken and sign language. The instructions were stratified into three groups according to the complexity of the language.*

*Positive correlations were established between the comprehension ability of spoken and sign language. Slovenian DDH participants differed significantly with respect to the following predictors of spoken and sign language comprehension: age at onset of hearing loss, degree of hearing loss, and age of sign language exposure.*

*The findings of this study provide a starting point for further research on the comprehension of spoken and sign language.*

**Keywords:** *Deaf and hard-of-hearing, spoken language comprehension, sign language comprehension*

## INTRODUCTION

Deaf and hard-of-hearing (DHH) individuals differ from each other in several factors, each of which (in its own way) affects their ability to communicate. DHH children are often at risk of developmental language delays that can have lifelong consequences on their learning and educational achievements. Hearing loss critically affects a person's quality of life and the intelligibility of spoken language. Deaf and some hard-of-hearing children are unable to receive speech information that is unimpeded by their hearing loss. As a result, their language acquisition is impeded. Due to the lack of contact with language, these children never acquire important language skills and lag behind in some other cognitive processes that would otherwise have developed automatically, except in the case of early cochlear implantation and successful rehabilitation. The issue of Slovenian sign language for the deaf and hard-of-

hearing is therefore not primarily a question of a person's right to use his or her first language, but, even more fundamentally, to acquire a language that he or she can use at all. Experts have noted that a child can acquire a language only within the critical period for language acquisition, or the window of opportunity for language acquisition (which opens from birth to puberty), and only with sufficient exposure to the language (Mayberry, 2010).

In addition, sign language proficiency in this population can be low because the hearing majority restricts the exposure of DHH individuals to sign language, or there are not enough opportunities to learn sign language until later in life, which prevents them from reaching their potential to learn any language.

The fact is that language fluency is a major factor that affects one's ability to learn about the world and is crucial for one's success in an aca-

demic environment. Language deprivation occurs when Deaf children are not exposed to sign language from birth and gain minimal information from spoken language. The negative effects of late linguistic exposure are present in either the sign or spoken language (Mayberry, 2010).

Late exposure has far-reaching consequences that are reflected in various areas of a child's development: social, cognitive, academic, behavioural and so on (Glickman, 2007; Anderson et al., 2015). Fully accessible language experiences in early childhood are key to prompting the developmental potential of DHH children (Hall et al., 2019). Providing access to sign language supports this goal. Despite evidence that sign languages are beneficial for DHH children, many researchers and practitioners (Hall et al., 2019) advise families to focus solely on spoken language. Accordingly, we must remember that communication skills that develop in childhood are the foundation for emerging language. The language development of deaf people, the choice and method of acquiring their first language, and the way they communicate depend on the first language of their parents' (spoken language or sign language), degree of hearing loss, age of onset of hearing loss, fitting of a hearing aid, regular use of these aids, and appropriate rehabilitation - or the age of sign language exposure. Thus, the language development of deaf children depends on the manner and time of acquiring a language that can be perceived. Studies on American Sign Language have confirmed (Boudreault and Mayberry, 2006; Mayberry, 2010) that late language experience and the subsequent delay in acquiring a first language in childhood has a significant impact on the ability to understand and express oneself in the language. These facts clearly demonstrate what is often overlooked in approaches to professional treatment of the deaf: early acquisition of the first language is a prerequisite for successful language learning, whether spoken or sign (Ramirez et al., 2013). Successful understanding of spoken or sign language is affected by several factors related to hearing loss. Knoors and Marschark (2012) pointed out that hearing parents of deaf children may not be able to learn American Sign Language

as fast as possible and sufficiently well for their children to benefit from sign language used in the home. Mayberry (2010) therefore mentioned the importance of an early or sensitive period for language acquisition. Therefore, first and foremost, parents and educators must ensure that a deaf child is immediately exposed to language. Although parents wish their children well, they often find themselves in distress when they make the decision regarding which method of communication is best for their child. Many times, they are advised by medical, speech, and language therapists, audiological, and early intervention professionals not to teach their deaf children sign language in order to prevent any interference with the acquisition of spoken language. Sometimes they are also instructed to consider sign language as a back-up language in case speech therapies do not work (Henner, 2016). However, research indicates that sign language acquisition does not interfere with spoken language acquisition (Davidson et al., 2013). Indeed, there is emerging evidence that sign language can be used as a back-up system and may actually facilitate spoken language development.

This study defines the comprehension skills of spoken and sign language in the Slovenian DHH population in relation to other factors that include both receptive and expressive skills of communication, and therefore, we used the term communication competence.

Predictors of communication competence associated with comprehension of spoken and sign language have changed over time. Various authors (Cupples et al., 2018; Davidson et al., 2013; Dornik, 2009; Harris et al., 2013) have come to different conclusions with respect to determining predictors of oral competence (literacy, speech, and oral language). In addition, several conclusions have been made regarding the predictors of sign language competence, but there is much less literature on the topic. Cupples et al. (2018), Davidson et al. (2013), Dornik (2009), and Harris et al. (2013) believe that the modality of communication of a DHH person has a significant impact on the development of their communication skills, especially oral competence.

Andrew et al. (2014) answered the question of whether the results of sign language competence tests can predict the results of oral competence in reading comprehension. They tested 51 DHH individuals using sign language and stratified them into two groups: sign language more competent and sign language less competent. The sign language competence of the subjects was tested on three levels: vocabulary in sign language, identification of the right sign in sign language, and understanding of the short story in sign language. Reading comprehension as a spoken language competence, however, was tested using a task in which subjects looked for pictorial pairs in written sentences. The results showed that 'sign language more competent' subjects performed better than 'sign language less competent' subjects in all tests. These research findings are proof that greater competence in sign language is a supportive predictor of better results on sentence comprehension tests, both at the level of individual words and at the level of syntax. This is in line with the theory that sufficient knowledge of the first language positively supports the knowledge of the second language through the process of transfer of linguistic elements. The research (Reading, Padgett, 2014) also showed that sign language is a strong predictor of the development of reading skills in a second language (spoken English). Scott and Hoffmeister (2017) studied the development of reading in DHH high school students. They tested the hypothesis that in DHH high school students attending educational institutions where sign language or sign language and spoken language are used, the academic level of English language proficiency (i.e., oral competence) is an important predictor of reading comprehension in addition to sign language proficiency (sign language competence). They found a statistically significant association between the academic level of English proficiency and fluency in reading individual words as a predictor of reading comprehension. However, knowledge of sign language has proven to be the strongest and most reliable predictor of reading comprehension in the same pattern. The research supports a model in which socio-demographic factors, sign language, and fluency in

reading individual words are the best predictors of reading comprehension in high school DHH individuals.

Henner et al. (2016) mentioned that language deprivation in early childhood and consequent ineffective language learning are rare, except in one population: DHH children who grow up without access to indirect language through listening, speaking-reading, or sign language are at a great disadvantage. Studies on DHH adults have shown that late learning of sign language is associated with persistent deficits. However, several aspects about language deprivation in DHH children remains unknown, and misconceptions about sign language continue to thrive.

Henner et al. (2016) examined two variables that depend on an individual's chronological age: whether the DHH individual learned sign language from birth and in the home environment with the help of one or two DHH parents, as well as their chronological age at enrolment in an educational institution for DHH persons. For those who had not learned sign language as a first language, the second variable is considered to be the year of the beginning of systematic exposure to sign language. The authors reported that both of these variables affect knowledge of sign language. The results in the tasks for examining these two variables decreased in proportion to an increase in the age of the DHH individual at enrolment in the school for the DHH population. Thus, the age at which a DHH individual enters an educational institution is inversely proportional to sign language competence. The results of DHH children enrolled in the school for the DHH population after the age of 12 years were even worse than the linear course of the above-mentioned proportion. Thus, non-native sign language users have a better chance of developing sign language before the age of 12 years than after. Parents of DHH children who do not use sign language at home can expect the best results in learning sign language from children, if the latter are included in a school with DHH native sign language users no later than at six years of age. Researchers (Henner et al., 2016) have found that learning sign language from birth has a positive effect on all children, re-

ardless of age at testing or age at enrolment in DHH schools. The results indicate a continuum of outcomes confirming that language experience is a continuous variable depending on maturity.

Children who acquire sign language as a first language from birth pass through the same language acquisition stages and achieve the same cognitive milestones as children who acquire spoken language as their first language (Henner et al., 2016). The primary barrier to acquiring sign language as a first language is that 95% of deaf children are born to hearing, non-signing parents, who most frequently use only spoken language (Mitchell and Karchmer, 2005; Henner et al., 2016). Accordingly, many parents decide that the best option for their child is a cochlear implant. With the help of cochlear implants and early intervention, many Deaf children have increased access to spoken language. However, implants do not give sufficient support for spoken language acquisition to be successful for all deaf children (Mellon et al., 2015). In addition, it is important to state that there is considerable evidence that learning sign language does not interfere with learning spoken language.

Williams et al. (2017) emphasised that it is theoretically and pedagogically important to understand how modality (movement-visual or speech-hearing) affects second language knowledge in hearing adults. The authors pointed out that this can evaluate the importance of second language theory and help in planning the most effective way to teach a language that uses a different modality of communication. Their research was devoted to the study of cognitive-linguistic predictors that best predict successful learning of a second language with sign modality. The results showed that the knowledge of the vocabulary of a spoken language and the skills of phonetic categorisation are good predictors of the development of vocabulary and the self-assessed knowledge of the language. In addition, the authors pointed out that memory abilities did not significantly predict either of these two measures of ability (vocabulary or self-assessment of language skills). The research showed how the linguistic knowledge of the first language accurately predicts the learning

outcomes of the second language, regardless of the different modality between the two languages.

To learn to use language effectively, a child must be in constant contact with, accept, and respond to language during the first years of life. The development of spoken and sign language follows the same principles in deaf and hearing children. A study conducted in Slovenia by Pfifer (2016) showed that higher competence in sign language predicts higher competence in literacy and that early access to sign language has a positive impact on the linguistic competence of deaf children of all generations considered, especially those who were exposed to various early medical interventions, implantations, and school opportunities (Pfifer, 2016). Deaf children of deaf parents who are exposed to sign language at an early age achieve comparable developmental patterns to their hearing peers in social, linguistic and cognitive domains. It is therefore crucial for a child's linguistic and cognitive development that he or she is exposed to sufficient language experiences that he or she can perceive, from birth and continuously throughout the school years (Mayberry 1993, 2010).

The communication skills gap between hearing and deaf children widens if the deaf child is not properly rehabilitated or exposed to the language, further affecting subsequent development. These findings were written about many years ago by one of the most important Slovenian historical figures, Omerza (1964), who was a Slovenian speech and language therapist, a teacher of the deaf and hard-of-hearing and phonetician. Omerza (1964) wrote about the development, teaching and upbringing of DHH children less than a decade after WWII and thought about predictors for them. He stressed the importance of providing the child with an effective space for communication and intervention in the primary environment, in order to prevent the communication gap from widening over time. He summarised his thoughts on the development of receptive and expressive language skills in DHH children, highlighting the following factors as important: the degree of hearing loss, the child's age at onset of hearing loss, the education of the parents, and early intervention with lip-reading.

We must state that, in Slovenia, due to the small population size and the lack of extensive policies in the field of implementing Slovenian Sign Language in education, we are facing various challenges, all of which have impact on the comprehension competence of DHH individuals. Therefore, our research emphasises the importance of both sign language and spoken language in the field of working with DHH individuals. We would like to stress the importance of language exposure and the possibility to use sign language. This is also evident in our sample for the present study, which includes deaf individuals of various ages who have faced many challenges in their educational journey, most notably being forced to learn spoken language and being prohibited from using sign language when they were young.

### Research aims

The aim of this research study was to assess the comprehension of spoken and sign language instructions among deaf and hard-of-hearing (DHH) individuals in Slovenia. In addition, this study attempted to describe the correlation between spoken and sign language comprehension, taking into account predictors such as age at onset of hearing loss, degree of hearing loss, and age of sign language exposure to Slovene Sign Language (SZJ).

The following hypotheses were formulated:

H1: There is a positive correlation between the comprehension competence of spoken and sign language in DHH individuals.

H2: Younger DHH individuals have a higher average competence in spoken and sign language comprehension than older DHH individuals.

H3: Post lingual DHH individuals have a higher average competence in understanding of spoken language than prelingual DHH individuals.

H4: DHH individuals who were systematically exposed to SZJ before the age of six years have a higher average sign language comprehension competence than DHH individuals who were systematically exposed to SZJ after the age of six years.

## METHODS

### Participants

The sample included 116 DHH individuals from 11 DHH associations throughout Slovenia, aged 22 to 84 years. The average age of the test subjects was 57 years. The sample includes 53 men (45.7%) and 63 women (54.3%), which is consistent with the distribution of women in the survey of the entire population of Slovenia - 49.8% men and 50.2% women (Population structure, n.d.). Table 1 shows the data on the basic characteristics of the participants.

**Table 1.** *Characteristics of participants (n = 116)*

Variable	Description	Frequency	Percentage
Degree of hearing loss	Mild, moderate	91	78.4
	Moderately severe, severe or profound	17	14.6
	No data	8	7
Communication modality	SZJ	20	17.2
	Spoken language	18	15.5
	SZJ and spoken language	72	62.1
	No data	6	5.2
SZJ exposure	Before the age of 6 years	29	25
	After the age of 6 years	68	58.6
	No data	19	16.4
Onset of hearing loss	Prelingual DHH	72	62.1
	Postlingual DHH	39	33.6
	No data	5	4.3

According to the degree of hearing loss, the sample consisted of 72 (62.1%) prelingual Deaf persons and 39 (33.6%) postlingual deaf persons. This included just under two-thirds of those who lost their hearing before the age of three years and a third who lost their hearing after this critical period. This is key information, since language skills and association patterns in the brain develop, in most cases, by this crucial age.

Regarding the severity of hearing loss, the sample included 91 (78.4%) individuals with mild to moderate hearing loss and 17 (14.6%) with moderately severe, severe, and profound hearing loss. It can be assumed that persons with mild or moderate hearing loss need lesser amounts of help from the society, as they can rely on hearing residues and thus become involved in the hearing world.

The data on self-reported modality of communication showed that only 20 (17.2%) DHH individuals used SZJ exclusively, 18 (15.5%) used only spoken language, while 72 (62.1%) DHH individuals used both modalities of communication.

Information on parental hearing status was also important. In our sample, 103 (88.8%) DHH persons had hearing parents and 13 (11.2%) had at least one Deaf parent.

29 (25%) participants were systematically exposed to SZJ for the first time before entering school, i.e., before the age of six years. More than two-thirds of the participants (68 individuals - 58.6%) received communication in SZJ only after the age of six years. It should be noted that in the past, due to policy regulations, the use of gestures or sign language was prohibited. Even today, older DHH individuals speak of how they were excluded from society. Late exposure to SZJ in our sample is consistent with the age composition and circumstances of the time they were growing up.

It should be noted that the number of participants in the sample varies depending on the criteria considered for inclusion in the analysis in order to explain the differences between the two groups in terms of comprehension competence.

## Instruments

Two purpose-built questionnaires were used. The first questionnaire was used to obtain demographic and background data as potential factors influencing the comprehension competence of spoken or sign language. For the purpose of our research, an author-designed questionnaire was designed, along with non-standardised tasks and instructions for conducting the tasks.

The instructions for the sign language part of the tasks were translated into SZJ with the help of a DHH person in the presence of an interpreter. The SZJ instructions were then recorded with identical content and format. The order of the instructions was mixed, but identical for all test subjects. The tasks consisted of two pictures, which helped to examine the understanding of spoken and sign language instructions. Based on the results, conclusions were made on the comprehension competence of sign language and spoken language of DHH persons. The target appearance of the image drawn according to spoken instructions differs in content from the image drawn according to sign language instructions. The images, serving as test material, were drawn on a black-and-white background. Both sets of tasks for comprehension competence of spoken language and comprehension competence of sign language included 15 instructions with a maximum score of 60. Table 2 shows the structure of the tasks used to measure the comprehension competence of spoken language and sign language (complexity of instruction, number of conditions). The complexity of instructions increases by reducing the frequency of the occurrence of words used in the second and third sets of instructions, as well as by increasing the number of conditions to carry out the instructions properly.

**Table 2.** *Structure of instructions*

Complexity of instructions	Number of instructions	Number of conditions	Score (max)
Simple instructions	5	3	15
Composed instructions	5	4	20
Complex instructions	5	5	25

The words in the first set of instructions appear very often in the Slovene spoken language, while the words used in the second set appear less often, and those in the third set appear rarely. The vocabulary of both sets of instructions (for testing spoken and sign language comprehension competence) was systematically chosen so that the frequency of occurrence of words would be comparable in both sets. Suppose the set for testing spoken language comprehension competence contains a simple instruction associated with the word “boy”. In that case, the simple mirror instruction in the background for testing sign language comprehension competence will have the word “girl”, which is as standard in written Slovene as the word “boy”. This achieves comparability of the complexity of both tasks. The KRES reference corpus was used to select words according to the frequency of occurrence in spoken Slovene (Logar Berginc et al., 2013), which enables the best linguistic comparability of both tasks - the task of spoken and sign language comprehension competence. Norms for the frequency of individual words in the spoken Slovene language are challenging to determine, as the frequency depends on the particular communication situation (Marušič, 2007).

## Procedures

A request for cooperation was emailed to the eleven DHH associations in Slovenia. All participants were informed of the topic and purpose of the study before the beginning of testing. The questionnaire was anonymous, individualised, and voluntary. Prior to the practical test, DHH individuals completed a questionnaire related to their background data. An interpreter or other persons qualified to interpret in Slovene sign language were always available for further explanation where necessary. This was followed by tasks

of oral and sign language comprehension competence for all participants. The sign language comprehension task was provided in the same way as the spoken language comprehension task - via a pre-recorded video. It should be emphasised that our tasks aimed to compare spoken and sign language comprehension competence. The score was calculated for each set of instructions (spoken language simple instructions, spoken language composed instructions, spoken language complex instructions, sign language simple instructions, sign language composed instructions, and sign language complex instructions) according to the number of recognised conditions. Comprehension competencies of individuals were compared based on a subset of background data variables.

Spearman’s rank correlation coefficients were calculated to test the association between spoken language and sign language comprehension competence. Because the data were not normally distributed, the non-parametric Mann-Whitney *U* test was used. Effect size *r* was calculated for pairwise comparisons of groups using the *z*-statistics of the Mann-Whitney *U* test. The data were analysed using SPSS 22.0 (for Windows), and the selected statistical significance level for hypothesis tests was  $p < 0.05$  or  $p < 0.01$ .

## RESULTS AND DISCUSSION

### Correlation between the comprehension competence of spoken and sign language communication of DHH individuals

Table 3 shows the correlation between the comprehension competence of spoken and sign language communication of DHH individuals. Based on the given task, the participants who were more competent in spoken language were generally also more competent in sign language.

**Table 3.** Correlation between spoken language (SL) and Slovene sign language (SZJ) and communication competence (CC)

	SL simple	SL composed	SL complex	SZJ simple	SZJ composed	SZJ complex	SL total	SZJ total	CC total
SL simple	-	0.404**	0.419**	0.233*	0.211*	0.213*	0.478**	0.253**	0.434**
SL composed			0.814**	-0.030	0.207*	0.060	0.906**	0.135	0.479**
SL complex				0.098	0.283**	0.192*	0.978**	0.248**	0.587**
SZJ Simple					0.717**	0.684**	0.073	0.812**	0.676**
SZJ Composed						0.818**	0.277**	0.929**	0.856**
SZJ Complex							0.165	0.926**	0.795**
SL Total								0.231*	0.588**
SZJ Total									0.895**

Note: \*  $p < 0.05$ ; \*\*  $p < 0.01$

Research by Andrew et al. (2014), Harris et al. (2013), Reading et al. (2014), Stone et al. (2015), Scott et al. (2017), and Twitchell (2014) also emphasised sign language competence as an important predictor of the effectiveness of oral language competence development in DHH persons. The correlation between spoken and sign language competence was also demonstrated in the correlation analysis in the present study. Thus, our findings confirm the claims of the above-mentioned authors regarding the effects of sign language competence on spoken language competence and vice versa. In fact, a positive proportional correlation between spoken and sign language communication skills is probably observed due to the fact that a good basis (quality language foundations) is primarily important for any communication skill (especially linguistic). As Dornik (2009) has already pointed out, the effectiveness of communication is important firstly for the successful development of language, and then for the modality of communication.

Studies in American Sign Language have confirmed (Boudreault and Mayberry, 2006) that late language experience and consequent delays in first language acquisition in childhood significantly affect the ability to understand and express oneself in language. These facts clearly show something that approaches to the professional treatment of the deaf

often overlook: early acquisition of the first language is a prerequisite for successful foreign language learning, whether spoken or sign language (Ramirez et al., 2013). It is thus not so important in which language (spoken or sign language) we communicate, but how well we master it. If an individual masters their first language well and starts learning a second language only later or learns it with less intensity, they will learn the second language more easily and effectively, as they will transfer good language and communication bases from the first language to the second one. These include, among other things, the skills of encoding and decoding characters, grammatical knowledge, experience in filtering and supplementing incomplete signals, and much more. Some basic communication skills, which are not language-specific but specific to all communication systems, are transferable from one language to another. If an individual has a broad vocabulary in the first language, they will also look for words or phrases in the second language to express that same personal vocabulary. They will be motivated to find or describe the chosen concept, as they are accustomed to it from the first language and need it for effective expression. Meanwhile, a person with a small vocabulary in the first language will simply be satisfied with the equally limited vocabulary in both languages, as this is their personal



“norm” (i.e.) they are used to it, they know it, and it is enough for them. There is no need to expand the vocabulary in the second language if they do not already know or need a concept in the first language. These basic language or communication tools are probably the best predictor of an individual’s communication competence in any given language.

**Differences in communication competencies in relation to chronological age**

Comprehension competencies (CC) of individuals were compared according to a subset of

the background data of participants. Comparison of test subjects by age was performed in controlled groups - in relation to the same age at onset of hearing loss (prelingual) group and the same degree of hearing loss (from moderate to severe hearing loss) group. The sample consisted of 63 participants who met the above criteria. The Mann-Whitney U test was used to determine whether the comprehension competence of spoken and sign language of DHH individuals differs between chronological age groups (Table 4).

**Table 4.** Differences in communication competencies (CC) by chronological age

		N	Mean ranks	Mann-Whitney U	Z value	p
Total spoken language	Under 57 years	40	36.59	276.5	- 2.622	0.009*
	Over 57 years	23	24.02			
	Total	63				
Total sign language	Under 57 years	40	36.73	271.0	- 2.700	0.007*
	Over 57 years	23	23.78			
	Total	63				
Total CC	Under 57 years	40	38.04	218.5	- 3.448	0.001*
	Over 57 years	23	21.50			
	Total	63				

Statistically significant differences were found between participants of different ages on all tests of communication competence (Table 4). Our results show that age has a statistically significant effect on the understanding of spoken or sign language, as well as on overall communication competence. The size effect index also showed that the size effect was medium-sized (size effect for total spoken language was 0.330, for total sign language was 0.340, and for total CC was 0.434).

Comparison between groups with the same age of onset of hearing loss (postlingual) or with the same degree of hearing loss (mild to moderate) were not possible due to the small number of participants in each group. The present study compared participants by age in order to roughly establish how communicatively skilled younger (under 57 years) DHH individuals were in comparison to older individuals (over 57 years). Par-

ticipants under the age of 57 years were found to be slightly more adept at the spoken and sign language areas of communication skills than older participants. Better oral skills of the younger participants could be attributed to the relative unpopularity of hearing correction in the older generations in general, since the older generation may not have had a hearing aid prescription at a young age or they grew up in a social environment that did not trust them or even rejected them. Among the older generations, there is still a stigma around hearing correction in some places today. Among the Deaf in the Deaf community, there is still a widespread belief that wearing hearing aids is uncomfortable, impractical, shameful, or even a sign of rejection of the Deaf culture. Many older participants did not wear hearing aids and were inhibited for a long time in homes, kindergartens, and schools from using and learning the

SZJ, even though it was often the first and only language they really understood and were able to use to its full potential as a means of communication. The development of basic communication and language basics in these individuals was thus torn between publicly “forced” spoken language, which was not fully accessible to the senses, and sign language, which was not systematised, let alone systematically taught, or used as a language of instruction. Older generations (those born before WWII and before the beginning of the efforts of the Slovene Association of Deaf and Hard of Hearing for wider teaching of the SZJ, and the fight for the legalisation of SZJ users’ rights) had fewer opportunities to develop, cultivate, and use their first (sign) language until many years after being diagnosed with a hearing impairment. Unfortunately, poor communication basics in association with the first language always has an effect on reducing the communication potential of the same person in the second language as well.

In this respect, the younger generations are privileged to live in an inclusive world, where they are brought up in much more tolerant social environments in their early years. The acceptance of SZJ, the respect for the rights of SZJ users, and teaching and access to sign language has led to the appropriate development of the language skills of DHH persons. The awareness of parents of DHH

children has also improved in recent decades, and the general increase in the education of the entire population has contributed to the early involvement of DHH children in speech and language therapy and ‘surpedagogical’ interventions. Parents of younger generations are also informed that knowledge of SZJ (as a natural and more effective first language of a DHH person) is useful for the development of a child’s language system. This has probably contributed to the use of SZJ as early as possible and consequently to a better understanding of sign language.

### Differences in communication competencies in relation to the age at onset of hearing loss

Comprehension competencies of individuals were compared according to a subset of the background data of participants. Comparison of test subjects was performed in controlled groups, both in relation to the same degree of hearing loss and age at onset of hearing loss (i.e.) prelingual and postlingual deafness. The sample consisted of 39 participants who met the above criteria. A Mann-Whitney U test was used to determine whether the comprehension competence of spoken and sign language of DHH individuals differed between the two age at onset of hearing loss groups (Table 5).

**Table 5.** Differences in communication competencies (CC) by the of age of onset of hearing loss

		N	Mean ranks	Mann-Whitney U	Z value	p
Total spoken language	Prelingual	23	15.89	89.5	-2.700	0.007*
	Postlingual	16	25.91			
	All	39				
Total sign language	Prelingual	23	20.83	165.0	-0.543	0.587
	Postlingual	16	18.81			
	All	39				
Total CC	Prelingual	23	18.85	157.5	-0.757	0.449
	Postlingual	16	21.66			
	All	39				

Among the participants, there were statistically significant differences between prelingual and postlingual deaf persons in total spoken language, in favour of postlingual deaf participants. The postlingual deaf individuals showed significantly better performance in solving tasks on the spoken language comprehension task. The result of the size effect index (size effect is 0.432) also shows that it is a medium-sized effect. Prelingual deaf individuals, however, outperformed them in solving the instructions for sign language comprehension, but this relationship did not show a statistically significant advantage. Prelingual deaf individuals also performed better in the combined test results on a test that included both spoken language and sign language comprehension competencies, but again, there were no statistically significant differences.

In the spoken language comprehension competence task, postlingual deaf participants performed better than prelingual deaf participants. The latter were better at testing the sign language comprehension competence. Dornik (2009) and Omerza (1964) emphasised the importance of age at the onset of hearing loss for the development of communication skills. Dornik (2009) also emphasised the importance of a critical period that constitutes the prelingual developmental stage. Hearing loss that occurs after the end of a child's prelingual developmental age (an impairment that occurs after the age of three years) is much more conducive to learning spoken language than in people who were previously deaf. The results also showed that postlingual deaf participants had better oral communication competencies than the prelingual deaf. Interestingly, the reverse was also statistically significant: prelingual deaf participants had significantly better sign language communication competencies than the postlingual deaf participants. Thus, our findings highlight a trend that prelingual hearing impairment predicts better sign language communication skills, as well as postlingual impairment in oral communication.

This result assumes that humans are social beings attuned to the need for social interaction. However, successful interaction requires successful communication. It makes sense that a DHH person would instinctively strive to use the communication system that is most accessible to them and thus most effective. Due to sensory hearing impairment, DHH persons, regardless of hearing aid correction and professional intervention, are not optimally equipped for auditory-oral communication on a daily basis. Therefore, the most practical solution is to use a communication system that is accessible to them. In this case, it is often sign language or a combination of both. Omerza (1964) described that the gap in communication skills between a DHH child and hearing peers widens over time if the child is inadequately (re)habilitated, or if he or she does not receive appropriate intervention and communication tools in the home environment. He emphasised the importance of a child receiving an effective communication tool in the early environment.

### **Differences in communication competencies in relation to the age of sign language exposure**

Comprehension competencies of individuals were compared according to a subset of the background data of participants. Comparison of test subjects was performed in controlled groups, with the same degree of hearing loss and age of SZJ exposure. The sample consisted of 62 participants who met the above criteria. A Mann-Whitney U test was used to determine whether the comprehension competencies of spoken and sign language of DHH individuals differs based on the age of SZJ exposure (Table 6).

**Table 6.** Differences in communication competencies (CC) in relation to the age of Slovene sign language (SZJ) exposure

		N	Mean ranks	Mann-Whitney U	Z value	P
Total spoken language	Before age 6 years	23	29.24	396.5	-0.759	0.448
	After age 6 years	39	32.83			
	All	62				
Total sign language	Before age 6 years	23	37.48	311.0	-2.005	0.045*
	After age 6 years	39	27.97			
	All	62				
Total CC	Before age 6 years	23	34.54	378.5	-1.020	0.308
	After age 6 years	39	29.71			
	All	62				

With respect to age of SZJ exposure (before and after age 6 years), participants differed significantly in sign language communication. The result of the size effect indicates a low effect (0.255).

Participants who first began to be systematically exposed to the SZJ before the age of six years had significantly better statistically sign language results in the test category than participants who systematically used SZJ later (in primary school or later). There were no statistically significant differences between participants in the oral language and communication competence tasks in total regarding the time of onset of the first systematic exposure to SZJ.

Henner et al. (2016) clearly highlighted the disadvantage of DHH children's language deprivation in early childhood as a negative factor for developing their communication competencies, both oral and sign language competencies. They proposed the sixth year of life as a milestone for the systematic exposure to sign language in order to provide the best possible opportunities for the development of sign language competency. The authors also highlighted that the effectiveness of the communication method we choose is of key importance in linguistic communication experience. If for a DHH child the Slovene sign language is the most effective way of communicating with the home environment, then the earliest possible quality and regular exposure to the SZJ is crucial for the development of their communication competencies in general, not just sign

language ones. A child will draw knowledge and mechanisms for the development of the second language from the language skills of their first language. Good knowledge of the SZJ in a DHH person, whose first language is the SZJ, will thus have a positive impact and encourage the development of spoken and written Slovene. Most Slovenian children attend primary school at the age of six years. The age limit of six years was used in the present study as a turning point, since it is the time by which a DHH child should be enabled to communicate effectively in sign language. It was confirmed that the participants who were systematically exposed to SZJ for the first time earlier (before the age of six years, i.e., at home or in kindergarten) showed significantly better developed sign language communication competencies than their colleagues who encountered the SZJ for the first time during or after primary school. A well-developed first language thus promotes a good development of an individual's communication competencies in general and the present study confirms a statistically significant positive association between early exposure to the SZJ and sign language competence of DHH participants. It can therefore be concluded that the early inclusion of DHH persons in the SZJ promotes successful communication as a whole.

## CONCLUSION

According to the Slovene Association of the Deaf and Hard of Hearing (Gluhost, n.d.), there are approximately 1,500 deaf people in Slovenia.

Our sample has a professional value since it included 116 persons, which represents a relatively large sample of DHH persons when we consider the entire population of deaf persons in Slovenia.

The study examined only some of the predictors of spoken and sign language comprehension, such as chronological age, age at onset of hearing loss, self-reported modality of communication, and the age of Slovene sign language exposure.

In summary, our results show differences between the communication competencies of DHH individuals, when compared in controlled groups by the mentioned variables. Exposure to language, whether spoken language or sign language, has a positive impact on the development of language skills. Despite the statistically significant positive

correlation between communication skills in spoken and sign language demonstrated in the present study, we cannot generalise the results to the whole group of deaf and hard-of-hearing people without further analysis.

Due to the methodological challenges and limitations, we emphasise that different subgroups of deaf and hard-of-hearing individuals should be compared and contrasted in controlled groups with a similar background using multiple background data variables. This is important since many studies have indicated the interaction of multiple factors that may influence the understanding of both spoken and sign language.

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