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The Effect of Preparation on the Quality of Sign Language Interpretation

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ABSTRACT

This article discusses the effect of preparation on the cognitive load of sign language interpreters and its relationship to the quality of sign language interpretation. Participants were all sign language interpreters working in Iceland. The data collected were both qualitative and quantitative, i.e. interviews, a questionnaire in connection with a special interpreting project and a specially designed interpretation test. The test was held to obtain statistical information on the effects of preparation on sign language interpretation and to get feedback from the interpreters themselves about what they consider important to prepare. The results of the study show that preparation both increases the interpreters' understanding of the topic and facilitates their presentation of the interpretation. These factors reduce the cognitive load and increase the quality of the interpretation. Statistical data showed that in unprepared interpretations almost 20% of the main points to be interpreted were lost, but only about 10% in prepared interpretations. The results indicate that it is important for sign language interpreters to have the opportunity to prepare before their assignments. Thus, in order to ensure the quality of interpretation it is important for the interpreters to receive the preparation they need.

INTRODUCTION

Sign language interpreters mostly do simultaneous interpreting, meaning that while interpreting they listen to, or watch, what is said in one language, interpret it into another language, using both their general and specific knowledge in both languages, and present their interpretation in that language. All this happens at the same time, resulting in a heavy mental load. This may lead to omissions or mistakes in the interpretation. Various research has shown how important it is for the quality of interpretations that interpreters prepare before their assignments (Díaz-Galaz et al., 2015; Gile, 1999; Lamberger-Felber, 2017). This article discusses research conducted among Icelandic Sign Language interpreters from 2019-2021 (Thóroddsdóttir, 2022). The aim of the research was to examine the effect of preparation on the mental load of interpreters and its relationship with the quality of sign language interpretation, with the purpose of enhancing the quality of interpretation. The research question was: What effect does preparation have on the quality of sign language interpretation?

First, the theoretical framework of the research will be explained; then, we will address the research itself, the participants, data collection, and data analysis. The limitation of the research will also be discussed, and finally the main results will be presented.

THEORETICAL FRAMEWORK

In this section the concept of interpretation will be defined. As the research highlights how factors related to the mental load affects interpreters in their work, John Sweller's Cognitive Load Theory will also be discussed (Sweller et al., 1998). Daniel Gile's Effort Model for simultaneous interpreting, which he uses to describe the interpretation process, will be explained (Gile, 2009), and since the research looked specifically at how preparation can affect the quality of interpretation, some similar research will also be described.

INTERPRETATION

Interpretation can generally be defined as the oral translation of what is said in one language into another language, for a person or persons who understand little or nothing in the original language (Laver & Mason, 2018). Within interpreting studies, interpreting is mainly divided into two categories: *consecutive interpreting* and *simultaneous interpreting* (Haraldsdóttir, 2012; Pöchhacker, 2004). Signed and spoken languages have a lot in common, as do languages in general, but in certain ways they are quite different, the biggest difference being their different modality. Spoken languages are communicated through voice and hearing, while sign languages use the body and sight (Brynjólfsdóttir et al., 2012; Jónsson, 2022). When two spoken languages are produced at the same time, it can be difficult to hear what is being said in either language. However, when one language is spoken using voice and the other silently with hands and body, as is the case in sign language interpretation, the languages do not interfere with each other. Because of this, sign language interpreters do most of their work as simultaneous interpreting, far more so than other interpreters (Pöchhacker, 2004; Roberson, 2018).

COGNITIVE LOAD

Interpreters who work in simultaneous mode are faced with having to work under a heavy cognitive load, because they must handle multiple stimuli at the same time. They have to listen to, or watch, what is said in the source language, weigh and evaluate how they can transfer both verbal and nonverbal meaning into the target language, at the same time as producing their interpretation in that language. In order to try to understand and explain that cognitive load, researchers within interpretation studies have looked to a theory that was put forward within psychology and pedagogy in the 1980s, called the *Cognitive Load Theory* (Sweller et al., 2019). With that theory, scholars tried to explain how the stress of processing information while learning can affect students' ability to process new information and construct knowledge. The theory assumes that individuals have two different types of memory -- working memory and long-term memory -- and that it is the limited working memory that constrains human cognitive processing (Baddeley, 2003; Sweller et al., 1998).

The *working memory* handles different cognitive tasks, which include gathering information through speech, hearing, and sight. Working memory is considered to be limited in size, capable of holding only about seven elements or items of information at any given time. However, part of the working memory is always used to process the information that is there, by organising, contrasting, and comparing it in some manner. This processing requires part of the working memory’s capacity. Therefore, it is believed that the maximum number of items of information a person can really deal with in their working memory at any given moment is two or

three items, unless the individual is simply memorising specific items. On the other hand, we use the *long-term memory* to store information that has previously passed through the working memory. In contrast to the working memory, long-term memory is considered to be unlimited. There *schemas* are constructed, which can be compared to a filing cabinet with many drawers where we organise our knowledge. These schemas enable the working memory to store knowledge and review our previous knowledge, making it possible for us to understand and define the things and concepts that are being discussed at any given time (Baddeley, 2003; Sweller et al., 1998).

These two different types of memories are dependent on each other. The working memory collects information, processes it, and then transfers it into the long-term memory, constructing schemas. When needed, the working memory goes back to the schemas to retrieve the relevant information. According to the Cognitive Load Theory, we should try to reduce the load on the working memory as much as possible, since it is limited. Instead, we should try to use the schemas and make the transfer of knowledge from them to the working memory as easy as possible. In this regard, it is important to realise that knowledge that is used often, or has been used recently, is generally easier to recall and activate than knowledge that is rarely used (Sweller et al., 1998; Gile, 2009).

GILE'S EFFORT MODEL

Based on the Cognitive Load Theory, the French interpreter Daniel Gile put forward what he calls *the Effort Model for simultaneous interpreting* (2009: 158-169). There he deconstructs the interpretation process into four different efforts: listening and analysis, production, memory, and coordination. The aim is to paint a picture of the cognitive load that interpreters deal with in simultaneous interpreting. Gile believes that the heavy mental load interpreters face means that they often work at the extreme limit of their cognitive capacity, and that persistent errors in interpretation are due to the fact that the processing capacity of the interpreters' working memory is often fully saturated (Gile, 2009; Leeson, 2005). By developing the Effort Model, he tries to show where the cognitive load lies in the interpretation process and how that load can possibly be reduced to enhance the quality of interpretation.

In the first component of the Effort Model, *the listening and analysing effort*, the mental load consists of comprehending the source language. This involves everything from subconsciously identifying the words to making the final decisions about the meaning of the utterance as a whole (Gile, 2009: 160-162). In the case of sign language interpreters, this effort should be defined as *listening/watching and analysing*, since signed languages are visual languages (Leeson, 2005).

The second component of the Effort Model is *the production effort*, or the presentation of the interpretation in the target language (Gile, 2009: 163-165). The mental load in this effort consists of building up and presenting sentences in the target language that have the same meaning as what was said in the source language.

The third component is *the memory effort*, which is when interpreters recall and activate the knowledge they already have about what is being said (Gile, 2009: 165-166). The cognitive load in this effort consists of retrieving previous knowledge, words, and signs from the long-term memory. This knowledge is used by both previous components of the Effort Model; i.e., comprehension of the source language and production of the target language. In order to

understand what was said, interpreters weigh and evaluate what they hear/see in the source language, comparing it with their prior knowledge, and they also select what is appropriate to build sentences with the same meaning in the target language.

The fourth component is *the coordination effort,* which is when interpreters coordinate all aspects of the interpreting process (Gile, 2009: 168). Sign language interpreters work mostly in simultaneous mode, and in those situations all the components of the Effort Model are being used at the same time. The efforts intertwine but can require different amounts of energy at different points in time. The cognitive load in the coordination effort consists of focusing the attention between the different tasks of interpretation as needed, at any given moment. By activating and utilising all the components of the interpretation process appropriately, using the wide range of strategies available to them, e.g. paraphrasing or conscious omissions, the interpreters try to make their interpretation as effective and comfortable as possible (Leeson, 2005).

All four of these efforts of the interpreting process take place in the working memory. Each requires a certain amount of mental energy from the interpreter, but the total cognitive load at any given time is the combination of all of them (Gile, 2009). This means that if one of the efforts is using a large part of the working memory, less mental energy is available for the other components. However, if the load of one or more effort can be reduced, interpreters can use a larger part of their working memory for the others, as needed. The time pressure that interpreters work under in simultaneous mode can increase the cognitive load even more. If they fall behind in their interpretation they still need to keep listening to, or watching what is being said, meaning that more and more information is constantly being added to their working memory (Gile, 2009). The pressure increases even further considering that there is information in the interpreter's working memory in both the source language and the target language, as well as information from the interpreter's long-term memory in both languages.

From this it can be concluded that the simultaneous interpretation process puts a lot of strain on the working memory. As was mentioned before, the working memory is limited and can only process two to three items at any given moment. When the working memory and thereby the cognitive load is pushed to the limit -- i.e., when interpreters are at the limit of their mental capacity -- they are more likely to produce an incorrect or limited interpretation (Gile, 1998; 2009; Napier, 2004). Gile emphasises that good preparation before interpretation assignments can reduce the mental load of interpreters and hence contribute to better interpretation (2009).

PREPARING BEFORE INTERPRETATION

The main goal of preparing before interpretation is to try to minimise the surprises interpreters face while they are working. Preparation familiarises them with the discourse they will be faced with before the interpretation begins, making sure they know and understand even complicated concepts. In addition, they get a chance to anticipate problems that may arise during the interpretation and find solutions to them. These solutions include various linguistic interpreting strategies, such as paraphrasing, substitution, role shifting and simultaneous construction (Heyerick, 2021; Kauling, 2012; Leeson, 2005). By readying these solutions in advance, interpreters gain confidence and more peace of mind, which also lessens their cognitive load in the interpreting assignment. A discussion of some prior research on the effect of preparation on interpretation follows.

In 2015, research was conducted where the participants, both experienced and inexperienced interpreters, interpreted two lectures from English into their native language, Spanish -- that is, between two spoken languages (Díaz-Galaz et al., 2015). The accuracy of the interpretations was assessed by giving a score on a scale of 1-3 for three criteria: use of vocabulary and terminology, content, and absence of syntactic interference from the source language. Those scores were used to show the overall quality of each interpreter. The results showed that if the interpreters were prepared, their interpretation was better and more accurate. Interpreters with more experience had an average score of 2.62 in unprepared interpretations, but 2.81 in prepared interpretations (a higher score means higher quality). In the less experienced group, the average score was 2.10 in the unprepared interpretations but 2.48 in the prepared interpretations. Both groups therefore benefited from the preparation, and the interpreters with less experience gained more than those that were more experienced.

In another study, experienced interpreters interpreted three speeches from English into their native language, German (Lamberger-Felber, 2017). The results showed that 9 out of 11 interpreters (82%) performed better when prepared. One aspect the researchers examined particularly closely was interpretation of names and numbers. The results showed that in the speeches where the interpreters had received the manuscripts beforehand, 97.6% of the names and numbers mentioned were interpreted correctly. In the speeches that had not been prepared, only 85.7% of the names and numbers were interpreted correctly.

In Gile's 1999 study, participants interpreted the same speech twice (Gile, 1999). The first interpretation was then seen as a preparation for the second. Results showed that overall, the second interpretation was better than the first, but this varied between interpreters. Five of the eight interpreters had fewer errors in the second interpretation than in the first, although by varying amounts. Two of the interpreters did as well as before, but one of the interpreters actually made one more error in his second attempt. According to Gile, the fact that not all of the interpreters benefitted from their preparation supports previous ideas about interpreters often straining their working memory near their saturation level (Gile, 2009). The cognitive load is so heavy that the interpreters are not able to convey all the information correctly in the target language, despite having interpreted the speech before.

METHODOLOGY AND DESIGN OF THE RESEARCH

This mixed-methods research (Johnson et al., 2007) used both qualitative and quantitative data to shed light on the effect of preparation on the quality of sign language interpretation. It was conducted in three parts: semi-open interviews, a questionnaire and an interpretation test. Here the research will be explained, including its design and implementation and who the participants were. Lastly, the reliability of the research will be discussed.

PARTICIPANTS

The University of Iceland began teaching Sign Language Studies and Sign Language Interpretation as a BA degree program[1] in the autumn of 1994 (Guðmundsdóttir, 2012). By 2020 almost 60 sign language interpreters had graduated from the University. At the time of the research almost 30 of these sign language interpreters were working in Iceland. Their work is to interpret between Icelandic Sign Language (i.e. *íslenskt táknmál*, hereafter named ÍTM) and spoken languages, mostly Icelandic. About half of the interpreters working in Iceland, 14 interpreters in total, took part in the research in some way. The participants were divided into three categories according to their professional experience. Interpreters in the first category had more than 20 years of professional experience, the second category between 10 and 20 years, and the third category less than 10 years. Table 1 shows the number of interpreters in each part of the study, and their division according to their professional experience.

Table 1. Number of interpreters in each part of the study.

Experience	**> 20 years**	**10-20 years**	**< 10 years**
Semi-open interviews	1	1	1
Questionnaire	1	2	
Interpretation test	5	3	3

DATA COLLECTION AND ANALYSIS

This research began in the autumn of 2019 with semi-open interviews (Clarke & Braun, 2013) with three sign language interpreters who worked at the Communication Centre for the Deaf and Hard of Hearing (SHH) in Reykjavík. Through these interviews, which lasted about an hour each, an effort was made to highlight the interpreters' experience of their work, especially in relation to their preparation before assignments. A framework of questions was used to gain insight into certain aspects, e.g. about the interpreters' opinion on preparation and how they prepare, but the interviewees were also encouraged to highlight issues and any opinions that they felt were important to address. The analysis of the interviews was iterative, aligning with ideas of Grounded Theory (Charmaz, 2006). Each interview was transcribed and immediately coded manually, sentence by sentence. The codes used for this initial coding included words and phrases like *limit surprises, talk to colleagues, read, prepare vocabulary, more fluent if prepared*, identifying the interpreters' opinion on preparation and how they use their preparation time. The coding of each interview was used to prepare the next one, to comply with the core of Grounded Theory, i.e. simultaneous data collection and analysis (Giles et al., 2016). In addition, an interview was

[1] In Iceland the sign language interpreter education consists of 180 ECTS bachelor's degree, of which 120 ECTS are within Sign Language studies and 60 ECTS within Interpreting studies. https://www.hi.is/taknmalsfraedi_og_taknmalstulkun

conducted with the section manager of SHH's interpretation services, in order to try to understand the attitudes of the users of interpreters towards the interpretation service.

Once all interviews were complete, focused coding was done by comparing the codes emerging across all of them. The most significant or frequent codes were identified and used to construct themes around what the interpreters considered most important in their preparation and its effect on the quality of interpretation. These themes brought to light that interpreters can prepare many aspects of their work; e.g. the topics and vocabulary of what is to be interpreted, the different grammatical features of sign language, and the conditions of their work. Through this preparation, they can minimise the surprises they may have to face. Among other things, these themes were used to determine the questions in the questionnaire that followed.

Subsequently, a questionnaire (Karlsson, 2003) was sent out to the eight sign language interpreters who participated in special interpreting projects on behalf of SHH, related to the special circumstances that arose as a result of the Covid-19 pandemic in 2020. They involved interpreting information and press meetings of the Civil Defense and/or the Government of Iceland and interpreting the national evening news on the Icelandic National Broadcasting Service. Although the interpreters were in both cases interpreting live on television, their experience of these assignments were different, as there was little or no direct preparation for the information and press meetings, but they could prepare for the news to some extent. With the questionnaire, an effort was made to specifically investigate the interpreters' experience of having to come into an interpreting situation on live television, sometimes unprepared but sometimes having time and opportunity to prepare in some way. When analysing the replies, each question was examined individually and similar comments were collected into themes. The main themes centred around the need for cooperation between the interpreters and the work they had to put in to obtain information about what awaited them, if they had not received any preparation material. The data from the questionnaire were also compared with the interviews. The themes from the interviews and the questionnaire were used to design the interpretation test.

In the second part of the study, which took place in early 2021, an interpretation test was specially designed and conducted to examine the value of preparation for sign language interpreters and to measure its direct effect on the quality of interpretation. During its design, the aforementioned interviews and questionnaire were used as a base, along with other interpretation tests with a similar purpose.[2] The goal of the test was for all participants to interpret the same texts, some of them prepared and others unprepared. A total of 11 interpreters volunteered to take part in the test. This comprised just over a third of sign language interpreters working in Iceland at the time, both employees of SHH and interpreters who worked outside that organisation.

The test only included simultaneous interpretation from Icelandic into ÍTM, as that is by far the most common working area of the sign language interpreters in Iceland. There were a total of eight source texts to interpret in the test. The texts varied: four were from an Icelandic history podcast, one was taken from a formal speech given by the president of Iceland, but the other three were written by the first author. The criteria in selecting or writing the texts was that they needed to include different challenges in interpreting, challenges mentioned by the interpreters in the

[2] e.g. Díaz-Galaz et al. 2015; Gile 1999; Lamberger-Felber 2017.

interviews and the questionnaire, when they talked about their preparation. These challenges included e.g. topographical signing space, dense texts, proverbs and foreign names (see Table 2). All the interpreters interpreted all eight texts in the same order. However, of these texts, each interpreter received four for preparation a few days before, but had to interpret the other four texts without preparation. It was up to each interpreter to determine how to prepare. The participants were divided into two groups, A and B. The interpreters in group A all got the same four texts to prepare, including the first text in the test. The interpreters in group B also got the first text, but then the other texts they got to prepare were different from group A. The last text was not prepared by either group. Table 2 lists the texts in the order in which they were interpreted, the expected challenges and what texts each group got to prepare.

Table 2. Texts, their source and expected challenges in interpreting.

Name of text	**Source of text**	**Expected challenges**	**Prepared by which group**
Diphtheria in Alaska	Historical podcast	Topographical space, Foreign names, Classifiers	A B
Valdimar and Valdemar	Original text	Similar sounding name, Role shifts Proverbs, Poem	A
Korean Air 858	Historical podcast	Topographical space, Dense text, Enumeration	B
The Qumran Caves Scrolls	Historical podcast	Foreign names, Unusual vocabulary, Classifiers	A
Diddi and Didda	Original text	Similar sounding names Role shifts, Classifier, Agreement verbs	B
Formal speech	Opening of the Parliament 2019	Formal text, Dense text, Enumeration	B
Europe	Original text	Topographical space, Enumeration, Signs for countries, Classifiers	A
The FIFA corruption scandal	Historical podcast	Dense text, Enumeration, Signs for countries	

The reading of all the texts was recorded and combined into one audio file, which was 24 minutes and 45 seconds long, with a few seconds' pause between the texts. This audio file was what the participants listened to and interpreted in the test. The interpretations were recorded on a video format, and those recordings analysed in two ways.

The first analysis of each recording took place immediately after it had taken place, when the first author and the respective interpreter watched their recording together and discussed it. When needed the playback of the recording was stopped to give room for discussions. These analytical conversations lasted from thirty minutes to one hour and forty five minutes, depending on what the interpreters wanted to bring into the discussion. These initial analyses were conducted to investigate which aspects of the interpretation test the interpreters themselves identified had gone well or poorly, and why. This dialogic space provided an opportunity to gain deeper insight into the interpreters' own perspectives and experiences of what influenced various aspects of their interpretations. The discussions were recorded and transcribed immediately. From this analytical process, themes were highlighted about the preparation of the interpreters and their analysis of their own interpretations.

After this initial analysis with the interpreters, the first author analysed statistically all the recordings from the interpretation test itself. The analytical process at this phase focused on how much of the primary information, or the main points of the source text were lost in the interpretation into the target language. Before starting the analysis, the first author had assessed what she deemed to be primary and secondary information in each text. This criteria was used to determine the quality of the interpretations and remained the same throughout the analysis process. An example of how this was determined can be seen here at the beginning of the original text *Europe*, where the main points, i.e. primary information, are shown in bold:

> No country in **Europe** has **borders** with as many countries as G**ermany**, **a total of 9 countries**. But **Austria**, which borders Germany, is not that far behind with **8 countries**. They are, apart from Germany, the Czech Republic, Hungary, Slovakia, Slovenia, Italy, Liechtenstein, and Switzerland.

The first author deemed that there are three main points here: 1) the subject is borders in Europe, 2) how many countries Germany has a border with, and 3) how many countries Austria has a border with. The rest she deemed secondary information.

During the analysis process all the recordings were split up by texts, and all the interpretations of any single text were analysed together. The first author watched each interpretation individually, one after the other. If she judged that any main or secondary information was missing from the interpretation, she stopped the video and noted that point. In order to keep track of how much information was lost in the interpretation, separate frequency tables were prepared for each text, divided by interpreters. This statistical information was used to compare how much of what the first author deemed to be main information was lost in prepared and unprepared interpretations. Statistics were compared between prepared and unprepared interpretations for each interpreter individually, between groups formed according to the interpreters' professional experience, and among the group as a whole.

ETHICAL ISSUES AND LIMITATIONS

The research was conducted according to the Code of Research Ethics published by the University of Iceland (2020). These ethics are based on certain values, including the researcher's honesty and quality of the scientific work. They also require that the participants are shown respect, that their well-being is the guiding principle of the research, and that the researchers make sure that the

participants are not harmed by their participation. Accordingly, every effort to serve the anonymity of the participants was made.

The first author designed and led the research work. She is a trained sign language interpreter and has worked within the profession for over 10 years. Researchers can be one of the most important research tools in any qualitative research effort, because their experience and knowledge of the subject makes them better able to impart meaning to the interviewees' answers and understand what they are trying to convey (Kvale & Brinkmann, 2009). This applies in this research when, e.g., the participants talked about the preparation of certain grammatical aspects of sign language and different types of interpretation. On the other hand, the researchers must also be aware that their ideas and past experiences may cause them to enter the study with certain expectations and beliefs that could hinder their neutrality and therefore affect their interpretation of the results (Svavarsdóttir and Halldórsdóttir, 2021). The first author kept this dual position of the researcher in mind throughout the entire research process.

In order to gain the distance, she needed not to be blinded by her own opinions and to work with the various issues she faced in her research, she held regular meetings with the second author, who entered into the design and implementation of the study as a critical friend (Costa and Kallick, 1993). The second author is a professor in the School of Education at the University of Iceland. She completed a bachelor's degree with a minor in Sign linguistics. For her PhD she conducted self-study within deaf education focusing on the ideological journey she as a hearing teacher needed to undergo, to base her educational practices on the linguistic and cultural resources of students whose first language is the Icelandic Sign Language (Gísladóttir, 2014; 2017; 2022). This experience allows her to step into the research process as a critical friend, ready to lend the first author an ear, ask provocative questions and encourage the researcher to think critically about the design of the study and explore the data from different angles (Samaras, 2011). Throughout the research process the two authors created a space for dialogue, reflection and speculations about different aspects of the work (Russell, 2011).

All the participants in the research have gone through the same education and training as sign language interpreters at the University of Iceland. The interpreters who graduated in the first cohort of students have largely been responsible for teaching the later cohorts, and many of them have been involved in the on-the-job training. In this way, the community of sign language interpreters in Iceland has developed its own specific professional culture. This fact could affect the result of the research, as there might be less diversity in attitudes and methods of preparation than otherwise. More than half of the participants worked at SHH when the research took place, and both the first interviews and the questionnaire took place only within that organisation. The influence of the interpreters who worked there is therefore quite significant, which can cause the results to be even more uniform. However, the participants in the interpretation test, by contrast, included both employees of SHH and interpreters who work outside that organisation.

The interpretation test, that was specially designed for the study, was limited in a few ways. For example, all the texts were written texts, their reading played from an audio file in the test, but there is quite a difference between written and spoken discourse. Spoken discourse can be spontaneous and disconnected, whereas written discourse is considered to be more logical and formal, using longer sentences and the ideas can be planned in order to capture a scene (Jakhar et al., 2020). The nature of the texts, their complexity or density was not taken into account in the statistical analysis, but as was stated earlier the source texts varied. Even though every effort was

made to make the texts that the two groups, A and B, received as similar as possible, there was a difference. For example, only one of the groups prepared a formal speech, but as 'balance' the other group was given an original text laden with proverbs and a poem to prepare. This difference between groups could have affected the statistical results from the test. Besides, the fact that only a small number of participants, i.e. eleven interpreters took part in the test, means that the statistics need to be taken with a grain of salt.

Before starting the statistical analysis of main points lost in the interpretations, the first author had assessed what she deemed to be primary and secondary information in each text. This was a subjective assessment -- it is not certain that any two people would assess this aspect the same way. There can even be a difference in how the same person assesses a text at different times. The important thing is that at the beginning of the analysis, predetermined criteria were used regarding which items were the main points of the source texts and which were secondary information.

One of the issues that the first author considered was who should evaluate the interpretation test. ÍTM is not her first language, and she wondered if it would be better to get a native speaker to evaluate the quality of the interpretation. However, her experience has taught her that no one is better equipped to evaluate interpretation between two languages than an interpreter who has knowledge and experience in interpreting between those languages. This follows Gile's dictum that whoever evaluates the quality of an interpretation must be well versed in the grammar and structure of both languages (Gile, 2009). Since the first author has knowledge of both Icelandic and ÍTM and is aware of the difficulties that can arise when interpreting between the languages, she considered herself qualified to evaluate the interpretation test. To ensure consistency, she prepared qualification criteria that helped her identify across all the interpretations whether the interpreters had delivered certain main points.

RESULTS

This chapter describes the main results of the research. The effect of preparation on interpretation is discussed, especially in relation to reducing the cognitive load that sign language interpreters handle in their work. This discussion draws from both the opinions expressed in the interviews and from the quantitative data gathered in the interpreting test. Finally, the role of the individuals who use interpreters is discussed in connection with the preparation.

PREPARATION AND THE COGNITIVE LOAD

Sign language interpreters constantly deal with many stimuli in their work. They listen to, or watch, what is said in the source language, translate it into the target language with help from their prior knowledge, and present the interpretation in that language, all at the same time. The cognitive load is therefore high. All the participants agreed that preparation had a positive effect on their interpretation performance. In the interviews it came to light that the interpreters feel both calmer and more balanced in interpreting situations if they know what is going to happen and what is expected of them. It gives them a certain head start and better control over the situation, which leads to better interpretation. In the recordings from the interpreting test, this increased calmness and sangfroid could sometimes be detected in the body language of the prepared interpreters. The interpreters even noticed themselves that they looked more relaxed when they were prepared, or as one put it, "more fluent, smooth and faster".

The participants talked about the importance of being able to reduce the cognitive load they experience in their assignments, for example by preparing. When they analysed their own interpretation in the interpretation test, they described the effects of preparation on their cognitive load in a variety of ways. Among other things, they said that preparation created "space and room in the brain" and that if they were prepared, they had "more peace" to do their work. One of the interpreters described the importance of preparation for interpreting as being similar to the difference between using a familiar versus an unfamiliar computer program. In the former case, everything works easily, or as the interpreter put it, we "know what it is and know where it goes." In the same way, if interpreters have prepared for an interpreting task, it is as if they have something familiar in their hands and know how to deal with it. If no preparation has taken place, it is as if the interpreters have to use a new and unknown program, which requires a lot of mental effort. With preparation, the cognitive load therefore becomes less, and the interpreters have more space in their working memory and more confidence in delivering their interpretation.

When analysing the data, it came to light that there are mainly two things that the interpreters are trying to prevent by preparing. First, they are trying to prevent anything from catching them by surprise, because surprises, ranging from discourse to conditions, can increase their cognitive load. They are also trying to make sure they do not lag too much behind the speaker. There are many reasons why interpreters might lag behind in simultaneous mode, such as if the source language is spoken quickly, if they have difficulty understanding what they hear or see, or if they have difficulty building appropriate sentences in the target language. When this happens, they still need to continue listening to, or watching, what is being said, while continuing to interpret. That is the nature of simultaneous interpreting: More and more information is added to the working memory, which is already stretched to the limit. This can cause "your brain to boil slightly over," as one participant put it.

If this happens, interpreters may try to keep up with the speaker by skipping -- i.e., not interpreting, some of the information that is presented, even though the aim is always to interpret everything that is said. To be able to make conscious omissions in these situations, interpreters need to know what the main points are that they should definitely keep in their interpretation. In one part of the interpreting test administered, a clear example of how preparation can help with this could be seen. The example is a fragment of a text that enumerates some of the passengers on board an aeroplane. At the end of the list, two Japanese individuals are mentioned. Later in the text it becomes clear that of all the passengers, only the Japanese people are important for the story. They are therefore the main point or primary information, but all other passengers are secondary. Most of the interpreters had fallen behind in their interpretation by the time they got to this part of the test and had to choose something to skip in order to keep up with the reading. All the interpreters who had prepared the text made a conscious omission, making sure to include the Japanese individuals, skipping some information about the other passengers. Of the interpreters who had not prepared the text, half omitted to interpret that two of the passengers were from Japan. Instead, they interpreted secondary information about the occupation and residence of other passengers, information that turned out to be of little importance. As a result, the quality of the interpretation was diminished.

MEASURABLE EFFECTS OF PREPARATION ON INTERPRETATION

One part of the research involved using a specially designed interpretation test to look at whether preparation had a measurable effect on the quality of sign language interpretation. The quality of

the interpretations was assessed based on whether the main points of what was said had in fact been interpreted into the target language. The test involved interpreting from Icelandic into ÍTM; prepared and unprepared interpretations were compared. The nature of the texts, their complexity or density was not taken into account in this analysis.

The results of the interpretation test are here presented in three tables. Table 3 shows the results for the whole group of participants, including how many main points were lost in all interpretations, in the unprepared interpretations, and in the prepared interpretations.

Table 3. Number and percentage of main points lost in the interpretation test.

	All interpretations	Unprepared interpretations	Prepared interpretations
Number of main points	1023	552	471
Number lost	154	109	45
Percent lost	15.05 %	19.75 %	9.55 %

The total number of main points each interpreter had to interpret was 93, and since there were 11 interpreters, there were a total of 1023 main points. Out of these, a total of 154 items were lost in the interpretations, or about 15%. Of these 1023 main points, a total of 552 had not been prepared. Of those, 109 were lost, or almost 20%. However, the interpreters had received 471 main points for preparation. Of those, 45 were lost, or almost 10%. This shows that preparation had a significant effect on the quality of interpretation: In unprepared interpretations almost 20% of the main points were lost, but less than 10% when the interpreters were allowed to prepare.

When analysing the interpretation test, the effect of the preparation was also examined with regard to the interpreters' years of experience. The participants were divided into three categories according to their professional experience. Interpreters in the first category had more than 20 years of professional experience, the second category between 10 and 20 years, and the third category less than 10 years. Table 4 shows the percentage of main points lost in all interpretations, in the unprepared interpretations, and in the prepared interpretations, grouped by professional experience.

Table 4. Percentage of main points lost in the interpretation test, grouped by professional experience.

Professional experience	All interpretations	Unprepared interpretations	Prepared interpretations
>20 years (5 interpreters)	15 %	19 %	12 %
10-20 years (3 interpreters)	5 %	8 %	2 %
<10 years (3 interpreters)	24 %	34 %	13 %

The table shows that the group that lost most main points in all of their interpretations, 24%, was the group with the least professional experience. The statistics also show that this group gained most from the preparation. In unprepared interpretations this group lost approximately a third of the main points, or 34%, but they managed to reduce the loss of main points to 13% with preparation. The group with the most professional experience performed significantly better than the least experienced group in unprepared interpretations, losing about 19% of the main points. In the prepared interpretations, however, these groups were almost on equal footing. The most experienced group lost 12% of the main points, while the least experienced lost 13%. Therefore, it seems that this most experienced group gained less from the preparation than those less experienced. The interpreters in the middle group also benefited significantly from the preparation, missing only 2% of the main points in the prepared interpretations, but about 8% with no preparation.

Table 5 shows the same information as in the previous tables, but this time for each interpreter separately. It shows the percentage of main points lost by each interpreter in all interpretations, in the unprepared interpretations, and in the prepared interpretations.

Table 5. Percentage of main items lost by each interpreter in the interpretation test.

Interpreter nr.	Professional experience	All interpretations	Unprepared interpretations	Prepared interpretations
1	>20 years	9 %	17 %	0 %
2	>20 years	19 %	23 %	15 %
3	>20 years	14 %	13 %	15 %
4	>20 years	13 %	12 %	15 %
5	>20 years	23 %	29 %	16 %
6	10-20 years	8 %	15 %	0 %
7	10-20 years	3 %	4 %	2 %
8	10-20 years	5 %	6 %	5 %
9	<10 years	24 %	40 %	7 %
10	<10 years	18 %	21 %	15 %
11	<10 years	30 %	42 %	18 %

The table shows that interpreters gain very different amounts from their preparation. Of the 11 interpreters, 9 produced a better interpretation with preparation than without. In all professional experience groups, individuals who gain a lot by preparing can be found. The interpreter that gained the most (nr 9) was one of the interpreters with the least experience. That interpreter lost about 40% of the main points in the unprepared interpretations, but only about 7% in the prepared interpretations. Two interpreters managed to make full use of their preparation and did not lose any main points in their prepared interpretations. One is in the most experienced group (nr 1), while the other has 10-20 years of professional experience (nr 6). However, two interpreters in the most experienced group (nr 3 and 4) performed better in their unprepared than in their prepared

interpretation. It is worth reminding that the participants were divided into two groups across the professional experience groups, A and B. The individuals in group A got the same texts to prepare, and the individuals in group B the other texts. Every effort was made to keep the difficulty of texts as evenly divided between the groups as possible, but it became clear that one group gained more by their preparation than the other. All the individuals that gained most were in the same group, and all the individuals that gained the least were in the other group.

The results of the interpretation test supports the opinions the interpreters expressed in the interviews: Preparation has a positive effect on the quality of interpretation, and much less information is lost if the interpretation is prepared. However, it depends on the individual interpreter how well they manage to use their preparation.

THE ROLE OF INTERPRETER SERVICE USERS IN THE PREPARATION

The participants talked about doing everything they can to act professionally in any interpreting situation. In that context, they talked about the importance of not revealing in their body language any strain they are feeling. This part of the interpreter's professionalism, amongst other things, can have the effect that interpreter service users are not aware of the high pressure that interpreters work under, and therefore may not realise that preparation can make a difference.

Both in the interviews with the interpreters and with the section manager of SHH's interpretation services, it became clear that it can be difficult to get material for preparation from prospective clients, even when requested. The section manager believes that there are several reasons for this. First, prospective clients may worry that their material will "go astray." This, however, is a complete misunderstanding according to the manager, as all material received by the interpreting service is treated as confidential. He also pointed out that clients are often preparing their material right up to the last minute, and for a long time only have a rough manuscript or bullet points in hand, which they do not consider good enough for use in preparation. The section manager then tries to explain to the clients that such material can in fact be very useful for interpreters, as it is more important for interpreters to know *what* the speaker is going to say than *how* they are going to say it. With bullet points and a rough script, interpreters can identify both the terminology and discourse of what they will be interpreting and what the main points of the discussion are. Other things are less important, or as the section manager said, it doesn't matter to the interpreters how a speaker "reads the room and what they decide to add to or omit from a script."

The section manager also pointed out that for some projects, SHH sets certain conditions for preparation so that interpretation can take place at all. This applies, for example, if the interpreters have to interpret from or into a foreign spoken language, most often English. SHH then gives a certain deadline to prospective interpreter users for submitting preparations, but otherwise reserves the right not to provide interpretation. This is in accordance with the International Standard for Interpreting services[3] that amongst other things states that, when interpreters are engaged they should receive relevant background documents/texts and a timeframe should be decided concerning when those documents are to be received. Under certain

[3] ISO 18841:2018. https://www.iso.org/standard/63544.html

circumstances, interpretation assignments are therefore not carried out by interpreters working at SHH unless preparation material has been received in time. This work policy shows how important preparation is for the interpreters and the quality of their work.

DISCUSSION

Sign language interpreters work under a heavy cognitive load. This cognitive load can easily become too much for interpreters, which can lead to information being lost in their interpretation. The aim of the research described in this article was to examine the effect of preparation on the cognitive load of sign language interpreters and its relationship with the quality of interpretation. The purpose was to improve the quality of interpretation. Throughout the research it became clear that all participants were aware that they sometimes work at the extreme limits of their mental capacity. Their experience of this could be heard, for example, in the interviews after the interpretation test, when they used phrases such as "the brain is starting to boil over," and "this is too much." In his Effort Model, Gile divides the interpretation process into four efforts: listening and analysing, presentation, memory, and coordination. Looking across the data collected through the lens of the effort model, it could be seen that the participants' discourse revolved around these different efforts, without the interpreters ever talking about the model itself. All the efforts were mentioned in the interviews in one way or another, when the sign language interpreters described the cognitive load of their work. It also came to light that preparation can reduce the load for all of them.

The first part of the Effort Model is concerned with *listening and analysing*. The mental load in this effort comes from listening to, or watching, what is said in the source language and analysing its meaning. In this research, signs of this effort could often be seen in the interpreters' words. An example is when one of the interpreters said, during analysis of their simultaneous interpretation, that at a certain point understanding had taken "a lot of energy." As a result, there was less energy left to attend to other aspects of the interpretation, and the interpreter therefore lagged behind. Other interpreters mentioned that sometimes they had difficulty understanding what was said in the source language. One said that sometimes the interpreters were "suspected of hearing badly," which could happen "when the brain starts to boil over a bit, then you start not hearing properly."

These results are in line with what other scholars have pointed out: in situations where understanding takes a lot of energy, the mental load of the interpreters becomes so great that they cannot hear clearly or analyse what is being said. This can lead the interpreters into guessing, or as one of them said: "you only hear what you think you know." A clear example could be seen in the interpretation test, when one of the participants misheard and/or misunderstood the place name *Brest* and interpreted it as the Icelandic word *breskt* (meaning from Britain), a common word that sounds quite similar in Icelandic. Interpreters who had prepared for this text did not make this mistake, as they knew from their preparation that Brest was a place name and interpreted it as such. From this it is clear that with preparation, interpreters can better understand the discourse they are stepping into and better hear and see what is being said. This preparation makes them less likely to misunderstand and makes it possible for them to understand even complex and rare concepts without difficulty. Preparation can therefore reduce the cognitive load on the first effort of the Effort Model.

The second effort is *presentation*. The cognitive load in this part consists of making sentences in the target language that have the same meaning as those presented in the source language. Spoken and signed language differ in many ways, for example in terms of sentence structure and the use of signing space. This can place extra strain on sign language interpreters, as well as other interpreters that interpret between languages that have a different sentence structure, as they may have to construct sentences in the target language that are very different from the same sentences in the source language. In the research, as in other studies, evidence could be seen that grammatical elements, for example, that differ between the languages can increase the mental load of the interpreters. When some participants watched their interpretations in the interpretation test, they talked about the mental load that they had experienced when they were building up the signing space without preparation, how a large part of their energy was spent on solving that part of their presentation, and how less energy was left to attend to other aspects of the interpretation. With preparation, however, interpreters are able to take notice of grammatical differences between the languages they are interpreting between beforehand, and find solutions to problems that can arise. In this way, preparation reduces the cognitive load of presenting the interpretation.

Memory is the third effort of Gile's Effort Model. The mental load consists of the interpreters going back to their long-term memory and retrieving previous knowledge about what they are interpreting. It could be seen that the participants associated this effort mostly with the vocabulary to be used in the interpretation, in both languages. In the long-term memory, the relevant knowledge, words, and signs are stored in schemas, and when needed the working memory retrieves them from these schemas. Schemas that are often used, or have recently been used, are easier to activate from the long-term memory than those that are used less. If interpreters can prepare for their assignments, they can recall and activate in advance the relevant words and signs. Preparation can therefore lessen the cognitive load in this effort.

The fourth effort is concerned with *coordination* of all the efforts. When analysing the data, it was at first difficult to put a finger on how this effort appeared in the interpretation process. However, the analytical process revealed that everything that surprised the interpreters in their work, ranging from discourse to conditions, can increase their cognitive load. This could be heard, for example, in the interviews when the participants said that if something surprised them, it could "complicate one's work." This is especially true for interpreters with less professional experience. If something unexpected happens in an interpreting situation, the coordination effort of the Effort Model has to step in and help the interpreters. They need to adapt, for example by changing which effort gets to use the biggest part of the working memory at any given moment. If interpreters have deliberate strategic plans ready, e.g. concerning paraphrasing or conscious omissions, as the example of the Japanese tourists required, they can move them into action when needed, using the coordination effort with minimal exertion. Interpreters' knowledge of what awaits them, which can be gained through preparation, reduces the possibility of unexpected situations arising. Preparation can therefore lessen the cognitive load in this effort.

CONCLUSION

Overall, the results of the research show that preparation can lessen the load on all the efforts defined in Gile's Effort Model and thus the overall cognitive load of interpretation. If interpreters know in advance what will be talked about, they understand better what is said, and therefore the effort of listening and analysing will be less. Preparation also reduces the load on the memory,

which is the part of the interpreting process that relates to recalling knowledge and activating it, as the interpreters can activate the information they need from the long-term memory before the interpretation begins. Similarly, preparation eases the strain in the presentation of the interpretation, as the interpreters can prepare not only the words and signs but also the grammatical features that they will probably have to use in the target language. Preparation also eases the burden on the coordination, as it reduces the chance of something surprising the interpreter. All of this reduces the overall cognitive load of the interpreters and increases the quality of their interpretation.

The research provided insight into the work and minds of sign language interpreters in Iceland and the cognitive load that their work entails. The aim was to try to understand what effect preparation has on sign language interpreters and the quality of their interpretation. As the results of the research show that preparation increases the quality of interpretation, interpreters should be motivated to attend to this part of their work, and those who teach interpreting should be encouraged to train students in this important part of the job.

It is the responsibility of the interpreters to make these preparations. However, they can only do so if the clients ensure that they provide the information that the interpreter needs. Therefore, the key to the preparation of any interpreter lies in the hands of the clients. Interpreters are the tools that make communication and information exchange possible between different linguistic and cultural worlds. As with all tools, they work best when they are properly used and well-oiled. One of the things that can oil this particular tool is if the interpreters are capable of preparing before their interpreting assignments, because then they can reduce their cognitive load. All prospective interpretation clients should therefore see the benefit in providing the interpreters with any requested information. It must be the goal of everyone involved, not only the interpreter but also those who want to convey information or receive it, that the interpretation between the languages goes as well as possible.

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