RAISING HANDSHAPE AWARENESS: USING THE HANDSHAPE INVENTORY FOR ICELANDIC SIGN LANGUAGE (ÍTM) IN EARLY INTERVENTION AND TEACHING OF ÍTM

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Abstract: Although previous research shows that the use of rhyme in early language stimulation has a positive impact on children's sign language development, this area of sign language acquisition has not been adequately researched. 90% of deaf children are born to hearing parents who barely know sign language before their child is born, and yet they are the primary language role models in their child's life. As L2 sign language users, hearing parents of deaf children teach language skills in their L2 to their deaf child who acquires sign language as one of their L1s. In this article, we focus on the potential application of the Icelandic Sign Language (ÍTM) handshape inventory in both early language intervention with signing children and in teaching ÍTM as an L2. We argue that the handshape inventory can be used as a teaching tool when teaching sign language as M2L2 to hearing adults and as a visual language stimulation tool for signing children (M1L1 or M2L1). The main purpose of using the handshape inventory is to raise phonological awareness of signing children and adults learning sign language. This can be done by explicitly teaching handshapes to adult learners and using signed rhymes in early language stimulation.

Keywords: ÍTM, phonological awareness, sign language handshape, early intervention

1. INTRODUCTION

Child language acquisition and language learning are long-term processes that do not occur overnight: they require language stimulation and a rich language environment. In terms of sign language, the process of language acquisition and language learning is even more complicated because the majority of deaf and hard of hearing children are born into hearing families, where the parents and other caregivers in the child's environment do not know sign language. When hearing parents choose to include sign language as one of the languages for their child, the parents themselves have to learn sign language as well, a process which involves learning a second language (L2) in a different modality from their first language (L1). The same applies to hearing family members, hearing preschool teachers and staff, as well as other individuals involved in the language acquisition of a signing child. This group of people are referred to as the *Hearing group*. Another group of individuals involved in language learning of signing children is the *Deaf Immigrant group*. This group comprises of Deaf immigrants who work at Sólborg Kindergarten, the only preschool in Iceland that offers a sign language environment, and who are also learning a second language, albeit not in a different modality. The challenge faced by both the *Hearing* and the *Deaf Immigrant* groups is how to create a rich language environment and provide language stimulation in a language that is not their first language and is also possibly in another modality. Both groups

learn sign language with the same goal in mind, i.e., in order to be the language role models for signing children, but the prerequisites for learning sign language are not the same.

This paper discusses the significance of the sign parameter *hand configuration* with respect to phonological awareness (PA) of both signing deaf children and L2 language role models. We argue that the handshape inventory for Icelandic Sign Language (ÍTM) is an appropriate tool for language stimulation of L1 signing preschool children, as well as the L2 learning process of hearing and Deaf adults. In addition, we argue that the use of the ÍTM handshape inventory is crucial for providing signing children with quality language input.

In this paper, we begin by discussing metalinguistic and PA with a focus on hand configuration before talking about language acquisition and learning, as well as the importance of early language stimulation. We then describe the sign language community in Iceland and introduce the ÍTM handshape inventory. We conclude by discussing the importance of the ÍTM handshape inventory as a teaching tool for children acquiring sign language as their L1, for adults learning an L2 (M1 and M2), and the inventory's importance as a visual language stimulation tool for signing children using rhymes.

2. PHONOLOGY AND LANGUAGE ACQUISITION

In this section, we discuss PA in language acquisition and learning with a specific focus on hand configuration and how hand configuration can be broken down into smaller units. In addition, we examine language acquisition and L2 learning in a different modality, as well as early language stimulation and exposure.

2.1 Phonological awareness

Being aware of one's language and how it can be used for different purposes in various ways is referred to as metalinguistic awareness. Bialystok (2001) describes metalinguistic awareness as being conscious of one's knowledge of a language and focusing one's attention on this knowledge. One

facet of metalinguistic awareness is PA. PA "refers to a metalinguistic awareness of the sound structure of a language" (Corina, Hafer & Welch, 2014:530). PA involves having knowledge of the sublexical structure of the words of a given language (Crume, 2013). More precisely, PA involves having skills that show a language user's sensitivity to the sound structure of word forms, as well as different aspects of word forms - from phoneme to syllable to morpheme to word (Corina et al., 2014). PA has been extensively studied amongst children who acquire a spoken language as their L1, but very little research exists on PA in signing children. While studies (e.g., Crume, 2013) have shown a connection between PA in children's sign language and the acquisition of literacy skills, a detailed discussion of this topic is outside the scope of our paper.

Sign language research and the comparison of signed and spoken languages has shown that the phonology between the two modalities is similar. In this context, sounds as such are not important, but rather the meaningless units that make up a word/sign and the phonological rules they are a part of (Petitto et al., 2016). A child in the critical period acquires the phonological units of their first language, either as sound or visual units. Thus, a child who receives sign language input early on in the critical period generally develops sufficient phonological knowledge, allowing for the development of segmentation and categorisation abilities. In contrast, a child who is exposed to sign language input later in the critical period can acquire visual sign phonology awareness from educational interventions and training (Petitto et al., 2016). This also applies to L2 learners of sign language, especially those learning L2 in a second modality (Chen Pichler, 2011) (see discussion in 2.2.2).

Bochner, Christie, Hauser & Searls (2011) discuss data showing that L2 language learners produce many more phonological errors than semantic ones, suggesting that sign language learners need to avail of more processing resources in order to recognise the phonological form of a sign than L1 signers. Thus, there is a difference between L2 learners and L1 signers in their ability to distinguish and learn phonological "precision". This suggests that L2 learners would ben-

efit from additional input on the phonetic level, for example, understanding how handshapes can be broken down into smaller units (see discussion in 4.2). Bochner et al. (2011) pointed out the need to explicitly teach PA to hearing L2 learners because it is difficult for them to distinguish between contrastive and non-contrastive differences when forming signs. Another example suggesting the need to teach PA to hearing L2 learners is the increased number of handshape substitution errors in forming signs with similar handshapes (Williams & Newman, 2016b). The same is also valid for Deaf L2 learners, as seen in Chen Pichler´s (2011) where subjects made many minor errors in handshapes, some involving the thumb (see discussion on the parameters of signs in 2.1.1).

Handshape is one of the more complicated phonological parameters of signs and many studies have shown that both children and adults make more perception and articulation errors in handshapes. It is more difficult for adults to discriminate and identify changes in handshapes and movement than changes in location (Wilbourn & Casasola, 2007). It is more difficult for children to distinguish between minimal pairs with different handshapes and movement than between minimal pairs based on location (Hamilton, 1986). As a result, children make more errors in articulating handshapes than other parameters and are less likely to sense changes in handshapes. These errors could be occuring because it is more difficult for children to sense certain handshapes (Bonvillian & Siedlecki Jr., 2000, see also Wilbourn & Casasola, 2007 for an overview of research). Chen Pichler (2011) also pointed out that errors in handshapes are considered as non-native signs by signers (and non-signers).

In the next section, we look at the phonetic building units of signs with a specific focus on hand configuration.

2.1.1 Phonology: Hand configuration

Phonetics and phonology are associated with meaningless units of language and the relationships between them. Signs are made up of five basic units or parameters: *handshape* - the shape of the fingers and thumb; *place of articulation*/*loca-* *tion* - the location in space or on the signer´s body from where the sign is articulated; *movement* - the path movement of the hands and arms in space, as well as the internal movement of the fingers and/or thumb; *orientation* - the orientation of the hands, for example, facing of the palm upwards, downwards, and so on; and *non-manuals* - the movement of the face and body, for example, mouth components (Brentari, 2012). Typically, non-manual features function on a syntactic level (e.g.,) marking questions and negations (Brennan, 1992), or on a morphological level (i.e.,) bearing information about manner and degree amongst other things (Sutton-Spence & Woll, 1999), but also on a phonological level (Pfau & Quer, 2010). These five parameters can operate as distinguishing units between the meaning of two or more signs and can, in those cases, be considered parallel to phonemes in spoken language (Brentari, 2012).

The *hand configuration* category is made up of the shape of the hand and its orientation, and is considered the most complex of the parameters (Sandler & Lillo-Martin, 2006). Handshapes were previously considered to be holistic units (e.g., Stokoe, 1960), but in later publications, handshapes were seen as having an internal structure that could be broken down into *selected fingers* and *finger configuration* (e.g., Mandel, 1981; Liddell & Johnson, 1989; Sandler, 1989; Corina, 1990). In phonology, it is important to be able to talk about handshapes, not only as holistic units, but also as structures that can be broken down into smaller units since, sometimes, only one of these criteria are required to distinguish between different handshapes.

Finger selection determines which and how many fingers are important in the handshape. One or more of the four fingers may be selected, becoming more salient in a handshape, while the other fingers may not selected and remain in the background (cf. Crasborn, 2001; van der Kooij, 2002). Examples of handshapes (see Appendix 1, a handshape Inventory for Icelandic Sign Language) where different fingers are selected can be seen in the following: handshape 1.1 ⟨⟩ where all four fingers are selected, handshape 2.1. ⟨⟩ where one finger (index) is selected, and handshape 3.1 ⟨⟩ where two fingers are selected (index and middle finger).

By nature, languages include different types of phonetic variants that occur in articulation. As discussed above, these are variants in phonetic features of a sign - handshape, location, movement and orientation – that do not change its meaning, (i.e., they are not contrastive), and such variants are referred to as allophones. An example of an allophonic variation of handshapes in ÍTM occurs in the sign LOBSTER (see Appendix 3, Sign Images), which can be articulated without changing the meaning using handshape 3.3 (two selected fingers) or handshape 2.5 (one selected finger) (see Appendix 1). Thus, in this case, the number of selected fingers is not contrastive. However, if we look at the handshapes in the ÍTM sign BIRD (signed using handshape 2.4) and DUCK (signed using handshape 1.3), we see that the handshape difference is indeed contrastive, i.e., the change from one selected finger to four selected fingers results in a change of meaning, making these signs a minimal pair.

Some handshapes occur more commonly both within a sign language or in sign languages in general. Each sign language includes marked and unmarked handshapes, where the unmarked handshapes can be articulated and perceived more easily. Some of the criteria for unmarked handshapes are that they are "...maximally distinct, basic geometrical shapes" (Battison, 1978:36) and they occur more frequently in sign languages. In addition, they are easy to articulate and, as a result, are the handshapes that children acquire first. Sometimes, they are used as substitutes for handshapes that are more complicated to articulate, such as handshapes 1.1 , 1.10 and 2.1 (see an overview in Sandler & Lillo-Martin, 2006; van der Kooij, 2002). It should be noted here that although marked handshapes are thought to occur later in the acquisition process since motor skills are continuing to develop in younger children, they are less of a challenge for adult M2 language learners because their motor skills are already developed (Chen Pichler, 2009).

Although a thorough analysis of the phonemes and allophones in ÍTM has not yet been carried out, research conducted by The Communication Centre for the Deaf and Hard of Hearing in Ice- land suggests that the 33 handshapes in the inventory are phonemes of ÍTM (see discussion on the ÍTM handshape inventory in section 3.2). Further research is required in this area, but, for now, we can say that a small change in the handshape inventory (if it occurred) does not change the fact that it is important to distinguish between contrastive differences and non-contrastive variants, especially because the language learner needs to gain enough competence to recognise linguistic contrasts and look beyond the differences that can be explained as phonetic variants (within each category) (Bochner et al., 2011). Note here that categories in this context refer to the phonetic parameters of a sign: hand configuration, location, movement, and orientation. The phonetic categories of a handshape can then be divided into selected fingers and finger position, as discussed above. Different phonemes can be described using these categorical differences. In the ÍTM handshape inventory, handshapes have been categorised into four groups according to the number of selected fingers, i.e., all selected fingers, one selected finger (index), two selected fingers (index and middle finger), and other selected fingers (different combinations of the selected fingers).

In the next section, we discuss language acquisition and learning in the context of language modalities.

2.2 Language acquisition and language learning

In this section, we briefly discuss language acquisition (2.2.1) and language learning (2.2.2) in a different modality. Modality is the way in which a language is articulated. Sign languages are articulated in the visual/gestural modality (Wilbur, 2012), i.e., they are perceived visually using the hands, face and body as the articulators. Spoken languages are articulated in the aural/oral modality, i.e. they are perceived aurally, with the vocal organs (larynx, tongue, lips etc.) as the articulators. A person's first language, be it signed or spoken, is referred to as being in modality one (M1). If a person learns a second language in a different modality than their first language, it is referred to as being in modality two (M2). Thus,

when hearing parents of deaf children learn a sign language as a second language, they are referred to as M2L2 learners (i.e., learning their second language in a different modality). However, when Deaf immigrants learn the sign language of their new country as a second language, they are M1L2 learners (i.e., learning a second language in the same modality as their first language). Similarly, a hearing person learning a second spoken language is also an M1L2 learner since the second language is in the same modality as their first language.

Language acquisition refers to a child's ability to acquire a language naturally without being taught explicitly or in a formal way. Language learning, on the other hand, refers to adults and late learners learning a new language through educational methods. The similarity between first language acquisition and second language learning is that, in both cases, individuals need to gain skills and knowledge in language use (pragmatics), language structure (phonology, morphology, syntax, semantics), and vocabulary (Gass og Selinker, 2001). The difference between these two processes is the method used to learn the language and how long it takes.

2.2.1 Language acquisition (M1L1)

Child language acquisition is a long-term process that takes many years. Traditionally, the language that children learn first is referred to as their mother tongue (Thordardottir, 2007; Arnbjörnsdóttir, 2007). During the acquisition stage, children acquire their mother tongue quickly and unconsciously in a natural way (Sigurjónsdóttir, 2001). The same applies to simultaneous bilingual acquisition (Thordardottir, 2007). Although researchers (e.g., Butler & Hakuta, 2006; Sigurjónsdóttir, 2001) agree that there is a critical period or a target age for acquiring a first language, there is no consensus regarding the age at which acquisition begins in children, i.e., prenatally (May, Byers-Heinlein, Gervain & Werker, 2011) or at birth (Gass & Selinker, 2001). Furthermore, there is no consensus on when this critical period ends, e.g., at 5, 6, 12, or 15 years of age (Butler & Hakuta, 2006; Lenneberg, 1967; Johnson & Newport, 1989; Krashen, 1973).

A lot of research has been carried out on sign language acquisition in Deaf children (see for example Goldin-Meadow & Mylander, 1984; Bellugi, 1991; Poizner, Klima & Bellugi, 1987; Meier, 1991; Petitto, 2000 a, b). There is unanimous agreement that natural language acquisition occurs in the same manner in deaf babies and hearing children (Petitto, 1987, 1988, 2000a; Corina, Jose-Robertson, Guillemin, High & Braun, 2003; MacSweeney et al., 2002, MacSweeney, Capek, Campbell & Woll, 2008, MacSweeney, Waters, Brammer, Woll & Goswami, 2008; Neville et al., 1998; Anderson, 2006). Hearing (Kuhl, 2004) and Deaf (Petitto & Marentette, 1991) children learn language, spoken or signed, in a modality-independent way because of the brain's capacity to acquire language. In both cases, children start with babbling and end up with fully developed language skills. The conditions required for signing children to acquire sign language are similar to those needed for hearing children to acquire spoken language: language stimuli, input, language understanding, and language role models. These conditions need to be present so that a child can acquire sign language naturally. Here we are referring to the innate ability to acquire language from language role models in a natural environment, without being specifically taught and without being corrected (Chomsky, 1986; Lenneberg, 1967; Newport, 1990).

Given the same conditions, sign language acquisition of signing children includes the same developmental stages as hearing children's spoken language acquisition with one exception: sign language acquisition begins after birth compared to spoken language acquisition, which may start prenatally (Truby, 1975; Pind, 1987). Since 90% of deaf children are born to hearing parents (Goldin-Meadow & Mylander, 1984; Plaza-Pust, 2012) who do not know sign language, it is likely that these children will be linguistically deprived (Humphries et al.,2012), especially if their exposure to sign language occurs only after six years of age (Morford & Mayberry, 2000; Easterbrooks & Baker, 2002).

Results from several studies comparing children's acquisition of spoken and sign language

show that the modality of the language does not influence the first words/signs, even if the structure of the two language types is very different at later stages (Petitto, 2000a, b). The only thing that children need is to hear, or in the case of deaf children, to see, the language. It is clear that there is a critical period for acquiring sign language (Newport & Supalla, 1990; Meier, 1991; Mayberry, 1994; Boudreault & Mayberry, 2007; Emmorey, 2002), and it is therefore important that a child is surrounded by language during that period. Deaf children can gain certain skills in sign language independently of when they start acquiring the language. However, in order to achieve L1 abilities in the language, they need exposure to that language during the critical period (Meier, 1991). In other words, the exposure needs to start as early as possible (Newport & Supalla, 1990). Language acquisition is a process that follows certain conditions and is instinctive for all humans (Chomsky, 1972). In order for a child to acquire a language, they require a rich language environment. A child needs to hear (or see in the case of a deaf child) the language in the natural language environment, as well as be an active participant in communication within that environment.

Ruben (1997) argued that there is a critical period for the acquisition of phonology from age 6 to 12 months, i.e., a window in which children acquire the phonology of the target language. He went on to state that only if a child acquires the phonology of the target language within the first two years, they can go on to develop complex language abilities. In other words, if a child does not develop phonological skills during the first two years, they will not develop native language skills. Petitto, Holowka, Sergio, Levy & Ostry (2004) and Mayberry & Kluender (2018) showed similar results for sign language, i.e., that there is a critical period for the acquisition of sign language phonology. Thus, a critical period for phonological learning is independent of modality. Mayberry & Kluender (2018) pointed out that if a child does not receive phonological stimulation during the first years of life, it will result in drawbacks in language acquisition. Joseph (2011) lists a hierarchy of skills related to PA: rhyming, alliteration,

blending, segmentation, and manipulation. This paper focusses on one of the first skill that children acquire unconsciously – rhyming. According to Joseph (2011:1096), rhyming is "the most basic PA skill". The importance of rhyming in early language stimulation and the ways in which rhyming can enhance PA, specifically handshape awareness, is discussed in Sections 2.3 and 4.3.

In the next section, we turn our attention to how second languages are learnt in a different modality.

2.2.2 Language learning (M2L2)

Language acquisition is a natural instinct that we are born with (Chomsky, 1972), while language learning is a choice. Adults who learn a second language make a conscious choice to do so and need to consciously learn all the parts that children learn unconsciously during their period of acquisition. This can often be hard since the factors of language that need to be learnt are more complex in second language learning than in the natural language acquisition process. These factors include age at the time of learning the L2; the relation(ship) between the person's first language and the second language being learned; learner identity and the attitudes towards the language (Butler & Hakuta, 2006); working memory; vocabulary knowledge in L1; the context in which the language is learnt, e.g., formal vs informal; motivation for learning the new language; and the learning style of the learner. (e.g. Linck, Osthus, Koeth, & Bunting, 2014 ; Sparks, Patton, Ganschow, & Humbach, 2009 ; Ye & Zhou, 2009; Cummins, 1979, Chen Pichler & Koulidobrova, 2016). Fundamentally, language learning is the responsibility of the person learning the language.

In the following discussion, we focus on the topic of learning sign language as a second language, and specifically on M2L2 learners - hearing people learning sign language as their second language (L2) in a modality different from their first language (M2) (Chen Pichler, 2009, 2011; Chen Pichler & Koulidobrova, 2016). M2L2 learners not only learn a new language, but also learn how to articulate a language in a new modality (i.e.,)

the signed modality. This includes learning to articulate signs using their hands, face, and body, as opposed to producing sounds with the vocal tract, lips, and tongue, as well as perceiving language visually as opposed to aurally.

Previous studies on M2L2 adult learners have shown that they do transfer gestural handshapes in spoken language to sign language (i.e., transfer phonological information), for example, handshape between M1L1 (their spoken first language) and M2L2 (the sign language being learned) (see for example Chen Pichler, 2011; Chen Pichler & Koulidobrova, 2016; Williams & Newman, 2017; Beal, 2020; Marshall, Bel, Gulamani & Morgan, 2020). These handshapes come from gestures that co-occur with spoken language and are different from handshapes in lexical signs, leading to an incorrect production of the lexical sign, i.e., the sign YES in ASL made with "fist" handshape ✊ instead of using the S handshape ✊ (Chen Pichler & Koulidobrova, 2016). Handshapes that are transferred are usually those that are unmarked within sign languages, i.e., easier to produce and perceive, and those that are acquired first (cf. section 2.1.1). Calabrese (2005) pointed out that a sound is unmarked if it is easy to articulate, for example, the front rounded vowel /ü/, which L2 learners find very difficult to pronounce. In the context of learning sign language as L2, this means that it is harder to learn marked handshapes because they are more difficult to articulate. Previous studies (Chen Pichler, 2011; Williams & Newman, 2016a) have concluded that, for M2L2 learners, it is very important to be trained in phonetic processing because new signs are more accurately learnt if the language learner can easily perceive the phonetic features of the sign (e.g. ,handshape markedness). Phonetic processing refers to the ability of the language learner to discriminate phonemes in a speech act and follow their use (Zatorre, Meyer, Gjedde & Evans, 1996). In other words, the learner is aware of how the sign looks after it is produced. Thus, phonetic processing is the way in which we perceive the sign. Beal (2020) suggests that M2L2 learners should be trained in PA, especially in rhymes, so they are more aware that a change in one parameter can lead to a change in the meaning of the sign.

The researchers mentioned above have stated that there is a lack of research on M2L2 acquisition in general. The M2L2 learning process of hearing parents of signing children has not yet been researched in detail (see Napier, Leigh & Nann, 2007 for an overview of the literature on teaching sign language to parents; for using CEFR (The Common European Framework of Reference for Languages) in teaching sign language to hearing parents see Snoddon, 2015; De Geus, Oyserman & Snoddon, 2015; Oyserman & de Geus, 2021). In addition, Oyserman, de Geus & Snoddon (2021) focused on the assessment of the sign language skills of parents based on CEFR. Nevertheless, there is a lack of research on the stages of M2L2 learning of hearing parents of signing children. Bochner et al. (2011) also showed that L2 learners of sign language, who have a spoken L1, have difficulties learning the phonology of sign language, Therefore, M2L2 learners should be trained, particularly to recognise phonological contrast. This might make their language learning process easier.

In the next section, we look at early sign language stimulation and exposure.

2.3 Early language stimulation

When we discuss language stimulation for children in sign language, we do so from a linguistic and pedagogical point of view, and on the assumption that the child grows up bilingually with either two sign languages or with spoken-sign language. The term "signing child" refers to a child who uses sign language for communication, independent of their proficiency in the language or their age of acquisition. "Signing child", thus, includes all signing children: children that grow up unimodal monolingual (M1L1), unimodal bilingual (with two sign languages; M1 L1-L1), bimodal bilingual (M1+M2 L1-L1) (for example, hearing children of Deaf adults and d/Deaf children who use amplification devices, but also learn sign language).

Research on spoken languages has found that, in terms of the language stimulation of bilingual children, the most important factors are commu-

nicative experience and social engagement (Hoff, 2006; Kuhl, 2004), quantity of exposure to the language learned (Huttenlocher, Haight, Bryk, Seltzer & Lyons, 1991), exposure quality (Hoff, 2006; Huttenlocher, Waterfall, Vasilyeva, Vevea & Hedge, 2010; Rowe, 2012; Hadley, Rispoli & Holt, 2017), and child participation/child language use (Hirsch-Pasek, Adamson & Bakeman, 2015; Donnelly & Kidd, 2021).

Through their work on spoken languages, Place & Hoff (2011, 2016) found that if language stimulation is provided by L2 language users, then the quality of the input is inferior compared to the input of L1 users. Hoff (2021) found that the language skills of L2 language role models affects the quality of their child directed speech. In other words, the language of L2 users is not as rich as the language of L1 users, leading to poorer quality of input. Sign language research shows similar results, i.e., sign language input from L1 users is considered to be of better quality (see for example van den Bogaerde, 2000; Janjua, Woll & Kyle, 2002; Singleton & Newport, 2004; Lu, Jones & Morgan, 2016;). The above-mentioned researchers have found that Deaf parents, especially Deaf mothers, use richer language and their input is more substantial compared to the input of hearing parents that are L2 users. However, Singleton & Newport (2004) draw attention to the fact that the child in their study surpassed insufficient input and outperformed her parents. The important thing is to use the language every day and to immerse the child in a ‚language bath'.

The importance of language stimulation in early intervention for signing children has been discussed extensively (e.g., Snoddon, 2008; Humphries, Kushalnagar, Mathur et al, 2017; Störbeck & Calvert-Evers, 2008; Yoshinaga-Itano, 2014; Napoli et al., 2015). This is because more than 90% of deaf and hard of hearing children are born to hearing parents (Goldin-Meadow & Mylander, 1984; Plaza-Pust, 2012), and Iceland is no exception (The National Hearing and Speech Institute of Iceland, n.d.). One of the many challenges faced by these families is the provision of sign language stimulation for the child due to the fact that sign language is a completely new language for these families. Early intervention is usually considered the most important approach for introducing sign language to parents (Strong, 1994; Störbeck & Pittman, 2008). One part of early intervention is sign language stimulation, where parents are guided step-by-step, with the final goal being that the child acquires a rich sign language. Good language development corresponds to rich language and the basis for that is children being able to access language (Snoddon, 2008).

In the next section, we look at the benefits of rhyme and rhythm as part of language stimulation and input.

2.3.1 Rhyme and rhythm

Language stimulation can occur in different ways, including through the use of rhyme and rhythm. Almost everyone remembers rhymed verses from their childhood. Signing children of hearing parents might not receive this through sign language, not because it is impossible to use rhyme and rhythm in sign language, but rather because those who are responsible for language stimulation are, more often than not, L2 users and they lack knowledge on how to use rhyme and rhythm in sign language (Moses, Golos, Roemen & Cregan, 2018). Therefore, it is difficult for parents and educators to stimulate the growth of phonological skills when they themselves as L2 learners may lack phonological awareness for sign language and they are not aware of the development in the phonological skills of children. At the same time, research suggests that children need to be taught phonological skills in a way that is clear and systematic (National Reading Panel, 2000). Joseph (2011) points out that educators cannot assume that children have grown up in a rich language environment and have, therefore, developed phonological skills.

Research involving hearing children has shown that rhyme and rhythm influences memory (Johnson & Hayes, 1987), enhances the ability to remember and recite rhymed verses and poems (Sheingold & Foundas, 1978), and increases vocabulary (Read, Macauley & Furay, 2014). Research has also shown that rhyme and rhythm im-

proves attention, attracts children's attention, and encourages communication (Vaiouli, Grimmet & Ruich, 2015).

Rhyme in spoken languages is a repetition of sounds used in different words in a sequence "Fat Rat ran to the can of jam". Rhyming is the ability to sense words that sound alike, group together words that have similar sounds, distinguish between dissimilar words, and recite word pairs that sound alike (Joseph, 2011). Rhythm in a poem is a pattern of stressed and unstressed syllables that make up the flow of a poem.

The field of rhythm and rhyme in sign languages and its impact on the sign language skills of children has not been studies in detail. In sign languages, a rhyme is a repetition of phonological parameters, i.e., handshape, location, movement, and non-manual markers (Blondel & Miller, 2001). Valli (1993) has made the claim that the handshape rhyme is equivalent to the concept of alliteration: "Alliteration may be the repetition of the first sound of several words in a line, compared to the handshape rhyme, that is, the repetition of the handshape of several signs in a line" (Valli, 1993:113), for example, when all hand configurations in more than one line show similar handshapes on both hands (Valli, 1990: 173). On the other hand, the characteristics of rhythm in sign are repetition of signs, signs with primary stress, and phrase-final signs, as well as changing the size and dynamics of movement (Allen, Wilbur & Schick, 1991; Valli 1993).

Holcomb and Wolbers (2020) examined the positive effects of using ASL rhyme and rhythm on child development. They concluded that using rhyme and rhythm in ASL can lead to metalinguistic awareness on different levels, i.e., individual, cultural, educational, and social. This is why it is very important to expose a child to language where rhyme, rhythm, and PA are at the forefront (Bryant, MacLean, Bradley & Crossland, 1990; Brown, 2014; Flett & Conderman, 2002; Goswami, 2003; Andrews & Baker, 2019).

In Section 3, we look at sign language acquisition and learning in the Icelandic context.

3. ICELANDIC SIGN LANGUAGE (ÍTM)

In this section, we introduce readers to the current status of signing children in Iceland through a brief overview of the Icelandic Sign Language (ÍTM) community and the status of Icelandic Sign Language (ÍTM). In addition, we explain the origin of the ÍTM handshape inventory.

3.1 Sign language community in Iceland

Icelandic Sign Language (íslenskt táknmál, ÍTM) is the only indigenous minority language in Iceland (Stefánsdóttir, Kristinsson & Hreinsdóttir, 2019): it is the first language of Deaf people and their children in Iceland. ÍTM was acknowledged as the first language of the Deaf, hard of hearing, and deaf-blind people with the establishment of Act No. 61/2011, Act on the Status of the Icelandic language and Icelandic Sign Language. The Act states that ÍTM is "the first language of those who rely on it for expressing themselves and communicating with others. It is also the first language of their children" (Article 3). The exact number of ÍTM language users is hard to estimate, but literature states that ÍTM is the first language of 250-300 Icelanders (Report of the committee on the legal status of Icelandic and Icelandic Sign Language, 2010:86; Brynjólfsdóttir, Jónsson, Þorvaldsdóttir & Sverrisdóttir, 2012; Thorvaldsdóttir & Stefánsdóttir, 2015; Stefánsdóttir, Kristinsson & Hreinsdóttir, 2019). In addition, there are about 50 Deaf immigrants in Iceland who use ÍTM (Stefánsdóttir, Kristinsson & Hreinsdóttir, 2019) and, as they all have a different L1, there are 13 foreign sign languages being used in Iceland today. Furthermore, Thorvaldsdóttir & Stefánsdóttir (2015) estimated that there are about 1000-1500 hearing L2 users of ÍTM.

Hereditary deafness barely exists in Iceland: it is found in only three families. In one family, it goes back at least three generations, while in the other two, it goes back only one generation (Zuckermann et al,2021). There are no Deaf children of Deaf parents of Icelandic origin who grew up monolingual, i.e., only with ÍTM. Although there is one Deaf family with Deaf children where both parents are of Icelandic origin, but one parent grew up unimodal bilingual and the other has another

sign language as L1 (ÍTM is L2). Signing children in Iceland acquire ÍTM either as M2L1-L1 (deaf children of hearing parents and hearing children of Deaf parents) or M1L1-L1 (Deaf children of Deaf parents from foreign origins). As of 2021, 95% of the signing children between the ages of 0-6 years were born to hearing parents (Regína Rögnvaldsdóttir, Director of Special Education at Sólborg kindergarten, personal communication). Thus, currently in Iceland, similar to other countries, more than 90% of deaf children are born to hearing parents (Goldin-Meadow & Mylander, 1984; Plaza-Pust, 2012). These parents learn ÍTM as a second language and they are sign language role models for their children, who also have sign language role models at their kindergarten.

In Iceland, children generally start kindergarten when they are two years old. Deaf and hard of hearing children, however, get an exemption and, if their parents choose to, they can start kindergarten at 12 months. This is because these children need a sign language environment and language stimulation. There is one kindergarten in Iceland, Sólborg, that specialises in providing an educational sign language environment for Deaf and hard of hearing children. Sólborg is an inclusive school and accommodates 75 children aged 1-5 or 6 years old (in Iceland, children start primary school when they become 6 years old). The approach used in Sólborg is of a bilingual environment where the learning of hearing, Deaf, and hard of hearing children takes place through Icelandic and Icelandic Sign Language. The educational environment takes into consideration the developmental stages of the children and their specific needs, e.g., play material and acoustics. The goal is to create a language-rich environment in the classroom with Deaf staff as sign language role models in each class containing Deaf students. There are four classes at Sólborg and the children are generally divided into classes according to age. On average, there are only about 7.5-11% signing children at the school at any one time, including Deaf children, hard of hearing children, children with cochlear implants, and hearing children of Deaf adults. In order to create a richer sign language environment, the signing children are placed together in a class despite their age differences. Today, most of the teachers and staff are hearing - M2L2 users of ÍTM. The Deaf staff are both M1L1 and M1L2 users (Regína Rögnvaldsdóttir, personal communication).

Given the above-mentioned information, hearing parents, hearing teachers, and Deaf immigrants working at the kindergarten need to learn ÍTM as either an M2L2 or as an M1L2. The Communication Centre for the Deaf and Hard of Hearing offers courses in ÍTM as L2 for families of deaf children, for hearing teachers and staff of signing children, and for the general public. The first course in ÍTM as L2 for Deaf immigrants was conducted in the autumn of 2021. Research on ÍTM and the development of associated teaching material is carried out at the Communication Centre for the Deaf and Hard of Hearing. The University of Iceland also offers an undergraduate degree program in Sign Language Studies and Interpretation and fosters research on ÍTM.

3.2 Handshape inventory for ÍTM

The handshape inventory for ÍTM is a result of the work of signers and researchers at the Communication Centre for the Deaf and Hard of Hearing in Iceland. This inventory includes 33 phonemic handshapes of ÍTM. Even though further phonetic analysis could change the picture a little bit, we can, for now, assume that these handshapes are the phonemes of ÍTM. The description of these handshapes is built on an analysis of the lexicon of ÍTM and includes signs from the frozen (core) lexicon. Signs in the frozen lexicon draw from the phonological inventory of a given language and are often less iconic than signs in the productive (non-core) lexicon that use visual motivation and the signing space to a greater extent, sometimes violating the phonological constraints that are present in the frozen lexicon. Classifier predicates are part of the productive lexicon, whereas the frozen lexicon consists of signs found in a dictionary (SignGram Blueprint 2017).

Apart from these 33 phonemic handshapes, there are a small number of handshapes that are part of the manual alphabet or number signs. These hand-

shapes only occur in signs that are made from lexi-calised fingerspelling or signs formed as initialised signs, such as the T-handshape in TEAM (see discussion on this in Brentari & Padden, 2001 and SignGram Blueprint, 2017). In addition, there are a small number of handshapes that occur in loan signs from other sign languages, such as the handshape in NAMIBÍA. Finally, there could be additional handshapes that only appear in 1-2 signs each. Thus, we focus on the 33 phonemic handshapes that make up the handshape inventory of ÍTM.

The need for the handshape inventory was raised in an ÍTM class where learners have, until now, required an overview of the (most common) handshapes in the language. There is a certain overlap between the inventory and the manual alphabet in ÍTM, where some handshapes occur in both places. Similar to other sign languages, the manual alphabet is derived from the written system of the surrounding spoken language, in this case, Icelandic, whereas the handshape inventory is built only on the lexicon of the sign language involved.

The result of the work on the inventory includes two versions, both including the 33 handshapes. The first (see Appendix 1) is aimed for adult learners and researchers of ÍTM, while the second one is for children (see Appendix 2). The first version has two appearances, A (not presented in this paper) and B (Appendix 1): A is for research purposes and is built exclusively on Ham-NoSys (Smith 2013). As a result, the handshapes are grouped together according to ÍTM phonology. Appearance B is also built on HamNoSys, however the categorisation of the handshapes is informed by research on ÍTM language learners and what they perceive as the logical or natural grouping of the handshapes, resulting in a developmental element in the order of the handshapes. When we discuss the handshape inventory in this paper, we are referring to appearance B. For the time being, the handshapes have been given numbers rather than names (e.g.,) from the manual alphabet or a descriptive one. The second version of the handshape inventory is the handshape poster designed for children. It was designed in a way that it would catch a child's eye and the handshapes appear in a random order.

In Section 4, we discuss the importance of the ÍTM handshape inventory as a teaching tool for children acquiring sign language as their L1, adults learning an L2 (M2 and M1), as well as a visual language stimulation tool that uses rhymes to teach signing children.

4. DISCUSSION

As discussed in the previous sections, language acquisition takes place in different ways in children and adults (see 2.2). The ultimate aim for both groups is the same (i.e.,) to become competent language users. Being a competent signer includes, amongst others things, possessing sufficient handshape awareness.

As mentioned above, over 90% of deaf children are born into hearing families. The parents learn sign language and are therefore L2 learners. At the same time, they function as a (sign) language model for their signing child. The input that the child receives can vary depending on the language skills of the parents. The situation in Iceland is unique because most signing children of hearing parents begin their language acquisition process in ÍTM between the age of 0-3 years (Koulidobrova & Ivanova, 2020). Very few signing children of hearing parents from other countries start language acquisition at such an early age (Lu, Jones and Morgan, 2016).

Although handshape inventories have been described for many sign languages, the inventory for ÍTM is very recent. The motivation for the description of the ÍTM handshape inventory was that it would help address the needs of the many different groups of learning ÍTM.

In this section, we describe the handshape inventory, focusing on the use of this inventory as a tool and resource for teaching L2 learners, as well as a resource for L1 signers and for the early language stimulation of signing children.

4.1 ÍTM handshape inventory and L1

Signing children acquire ÍTM naturally by observing the use of the language in their surrounding environments (see discussion in 2.2.1 and

3.1). The quantity and quality of the input in the child's environment is directly related to stronger language acquisition and awareness.

In Iceland, there are very few language stimulation tools in ÍTM for the youngest group of children (age 0-6 years). In order to address this deficit of language stimulation tools, the Communication Centre for the Deaf and Hard of Hearing designed the handshape poster that includes the 33 ÍTM handshapes. In the poster, the handshapes were randomly organised (i.e., not grouped according to selected fingers), but presented in a clear layout that could be easily recognised by children, with bright colours and the handshape in focus. Moreover, the sign chosen was of an object that appeals to children and commonly occurs in their environment. As we see in Appendix 2, the poster includes a drawing of an object accompanied by the handshape used in the sign for that object along with the word in written Icelandic. It was considered important to include the Icelandic translation for the sign in clear font to explain the sign that was being referred to. The aim of this design was to make the language come alive in the children's eyes. The availability of the poster in their environment provided signing children with a tool to refer to when they played with the language. Note, however, that the handshape poster does not include any rhymes, but is instead intended to raise handshape awareness. Children first need to be able to distinguish between different handshapes before being able to play with rhyming words.

We believe that by looking at pictures of objects, along with the handshape of the sign, and using that as a basis to elaborate on other signs that have the same handshape, children begin to unconsciously gain insights into how a sign is built. This also helps them develop their PA through natural interactions, without the need for direct teaching (see 2.1).

4.2 ÍTM handshape inventory and L2

As explained in Section 2.1, the handshape is one of the most complicated parameters of a sign. Signers make more mistakes both performing and perceiving handshapes than with other parameters. However, instruction and training can help signers improve their skills with respect to all sign parameters, especially the handshape parameter (Ortega & Morgan 2015).

The tradition in sign language teaching in Iceland has been to teach L2 learners the manual alphabet as soon as they start studying ÍTM. The argument for this is that when learners become acquainted with the manual alphabet, they can have conversations with L1 signers and ask for new signs by fingerspelling the word they are missing a sign for. Sign language teachers believe that the L2 learner will acquire the language faster by using this method (Julia G. Hreinsdottir, Teaching Program Director at the Communication Centre for the Deaf and Hard of Hearing, personal communication).

As discussed in Section 3.2, the manual alphabet is a way to code written language into a signed one. These manual letters denote corresponding letters in the Icelandic written alphabet and are not representative of the phonology of ÍTM. We believe that the L2 learner would acquire a better knowledge of and "feeling" for the parameters of a sign if they start with the handshape inventory rather than the manual alphabet. Hence, they will be able to learn the language on its own terms rather than in terms of the spoken/written language.

L2 learners can be stratified into those who have a spoken language as their L1 (M2L2 learners) and those who have a different sign language as their L1 (M1L2 learners). M2L2 learners cannot transfer phonological knowledge from their first language since it is a spoken language and has a different modality. M1L1 learners, on the other hand, can transfer phonological knowledge. Interestingly though, research has shown that M2L2 learners transfer handshapes from gestures that co-occur with their spoken language (see 2.2.2).

L2 acquisition occurs differently compared to L1 acquisition (see 2.2). Since L2 learners do not perceive handshapes categorically as L1 signers do, it is necessary to train them specifically to identify this categorical difference, as well as to highlight the importance of producing a correct

handshape. The difference between two contrastive handshapes can be minor. It can, for example, lie in the position of fingers as in the signs NEVER (which includes handshape 1. 1) and DIGESTION (which includes handshape 1.11), or in the number of selected fingers as in the signs BIRD (which includes handshape 2.4 , and DUCK (which includes handshape 1.3). Since minor differences can be contrastive, precision is important. Drawing the attention of L2 learners right from the beginning to the categorical difference could lead to a better understanding of the issue. Consequently, L2 learners are more likely to produce correct handshapes when talking to children. As a result of this, having a visible tool with the most common handshapes grouped together in a logical way can be an effective learning instrument for L2 learners, leading to faster learning and better signing. Therefore, we believe that the ÍTM handshape inventory has the potential to be an effective tool for teaching and learning.

4.3 ÍTM handshape inventory as early intervention tool

In Iceland, parents are the main sign language role models for their signing children. Other role models include L1 and L2 signing/speaking staff and teachers at the kindergarten. Previous research (see Section 2.1) has argued that it is important to acquire PA during the critical period for children, as well as during the language learning process of adults. As noted in Section 2.1, signing children can develop categorisation skills, including PA, if they receive sign language input early on in the critical period, or, in the case of late exposure, with training. The same applies to L2 learners. They have difficulties distinguishing contrastive from non-contrastive differences when forming signs, but this can improve with training (see discussion in 2.1). Studies show that both groups find it very difficult to acquire handshape parameters (see discussion in 2.1). This also applies to ÍTM acquisition according to unpublished data from the Communication Centre for the Deaf and Hard of Hearing (Ivanova, personal communication), confirming that specific training in handshape awareness is imperative. The paradox that early

learners in Iceland face is that a lot of their main language role models are L2 users, both Deaf and hearing. Teachers and staff at the kindergarten, as well as parents, are expected to act as language role models from whom children can acquire phonological awareness, either unconsciously or through specific training (cf. discussion in 2.3.1). However, depending on their proficiency levels, those who are L2 users might lack the necessary phonological skills for ÍTM.

Studies have also shown that early intervention for signing children can lead to better skills in sign language (see Section 2.3). As part of the early intervention process for ÍTM in Iceland, signing children get to start kindergarten a year earlier than what is normal for hearing children. Parents are taught ÍTM both at home and in family classes along with other families of signing children. Deaf staff and teachers at the Sólborg Kindergarten attend a course on storytelling in ÍTM for children (the latter two provided by the Communication Centre for Deaf and Hard of Hearing). Furthermore, the Sólborg kindergarten provides ÍTM classes during work hours for their hearing staff members.

As explained earlier, most L2 users, both M1 and M2, are sign language role models for signing children in Iceland since every year only 2.5% of a child's peers in the kindergarten are Deaf children of Deaf parents. In addition, these L2 users start learning the manual alphabet in the first sign language class rather than receiving a specific training on handshapes used in signs. Therefore, the sign language environment can be seen weaker than an environment with more L1 signers, both adults and peers of the children. Considering these facts, it is clear that different approaches are required for teaching ÍTM as L2 as well as teaching language learners how to communicate with the signing children in a richer ÍTM. When L2 language role models are taught the handshape inventory in a conscious way, the children can subconsciously learn from their language role models. In other words, conscious teaching of sign language to L2 language role models should filter through into more substantial input of ÍTM for the children. If the teaching and learning processes

of the L2 learners include working with rhymes, their PA cues will be strengthened and this in turn will be carried on to the children that are subconsciously acquiring PA cues. People are likely to have PA in their L1, as well as a reduced version of PA in their L2 or L3 (even lesser PA in another modality). Once again, this highlights the importance of teaching the handshape inventory to L2 learners. The goal is that they gain PA as soon as possible, both for the perception (distinguishing between signs) and production of signs.

Rhyme and rhythm are considered to be strong devices in the process of language stimulation for children. Research (see Section 2.3.1) has shown that rhyme and rhythm can contribute to language development and strengthen PA. The aim of the handshape inventory and the handshape poster is to make the handshapes come alive for children and their parents/caregivers. The children can play with different handshapes and try to think of signs that have the same handshape as the one they see on the poster. Children are able to do that from when they are 2.5 years old (first authors´s observation on child language acquisition). When the handshapes are readily available via the poster, it makes playing with language easier both for children and adults. Therefore, looking at the handshape inventory can make it easier for L2 users to think of signs with similar handshapes. L2 users can slowly learn to identify what handshape to look for. On the SignWiki (2012) website, for example, it is possible to look up signs according to handshape. Selection of a handshape generates a list of all signs with that handshape (i.e., when you choose the handshape B, the reader gets a list with signs in written Icelandic alphabetical order that include the chosen handshape). The more signs that the parent/caregiver learns, the broader their vocabulary becomes, thus increasing their chance of thinking of signs that rhyme. Using this method, the L2 learner can learn to discriminate between handshapes, although further research is required to confirm this. Rhymes in ÍTM, and other sign languages (Valli 1990), are built on the frozen lexicon, as well as the productive lexicon. For example, a Deaf father uses rhyme in a con-

versation with his Deaf son (https://is.signwiki.org/index.php/Rím_á_ÍTM - göngutúrinn):

(1) TREE HELLO // INDEX-you WALK TREEright TREEleft TREEright // SUN the-sun-shines-on-me CLOUD blue-sky feeling-the-fresh-breeze

There is a tree. Greetings. You go for a walk through the tree tunnel. The sun shines down on you, a single cloud on a blue sky and you feel the fresh breeze on your face.

The father chooses signs with the same handshape: 5 handshape (1.7 in the handshape inventory) for the rhyme and signs which are from both the frozen and productive lexicon. The signs from the frozen lexicon with 5 handshape are TREE and HELLO. Other signs from the frozen lexicon are WALK, SUN and CLOUD. The signs from the productive lexicon with 5 handshape that are used as a classifier are 5cl the-sun-shines-on-me, 5 cl blue-sky, and 5 cl feeling-the-fresh-breeze. An additional sign from the productive lexicon is the index handshape. The signs rhyme because of the chosen 5 handshape. As the example shows, the same handshape can be found in both frozen and productive signs, and the father, who is an L1 signer, makes use of them. This example is further evidence of the need to teach L2 learners the handshape inventory since it can help them develop handshape awareness for sign formation and handshape production. This can also lead to the use of handshapes in the way the L1 signer does in the above-mentioned example, as well as increase overall proficiency in sign language.

A few years ago, researchers at The Communication Centre for Deaf and Hard of Hearing investigated the possibility of translating the storybook „The Cat in the Hat" by Dr. Seuss from Icelandic into ÍTM in such a way that the rhyme carried over. The goal was to develop material for language stimulation in ÍTM that included rhyme. They quickly realised, however, that this type of translation did not work, i.e. it was not possible to keep the rhyme between the two languages. The rhythm was there, but not the rhyme. This led to the realisation that they needed to think about the handshapes in signs that rhyme. The outcome

was that translating rhymes from spoken language is not suitable for the development of language stimulation material. Such material must be formulated in the language that it is being used for, in this case ÍTM. Teaching parents about the handshapes in the handshape inventory and how to rhyme in ÍTM can create opportunities for parents/caregivers to expose their children to quality language inputs, most importantly, in terms of the sign language rather than the spoken language. Increased handshape awareness among parents will, hopefully, lead to increased handshape awareness among children as well, which in turn leads to children using the language more fluently. As the Icelandic proverb says "Children learn what they see others do around them", if the input is of good quality, the output will also be of good quality.

5. CONCLUSION

This paper focuses on the potential positive contribution of the ÍTM handshape inventory with respect to language stimulation for L1 and for L2 users. The main purpose of using the handshape inventory is to enhance metalinguistic and PA in L1 and L2 users. We were able to show that the handshape inventory is a highly appropriate tool for this purpose.

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Appendix 1. Handshape inventory for Icelandic Sign Language

A HANDSHAPE INVENTORY FOR ICELANDIC SIGN LANGUAGE
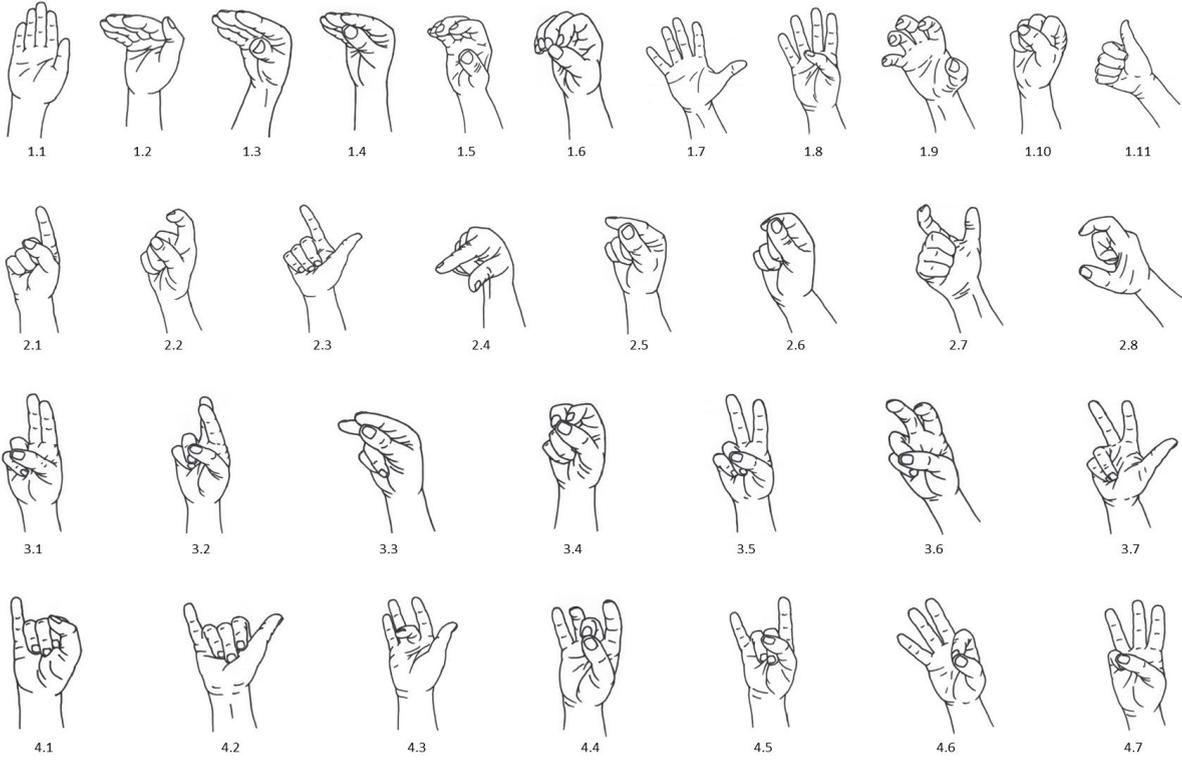
Appendix 2. Handshape inventory poster developed by The Communication Centre for the Deaf and Hard of Hearing in Reykjavik, Iceland

Appendix 3. Representative images of different signs

LOBSTER

BIRD

DUCK

YOU

ADMIT

SPIDERMAN

TEAM

NAMIBIA

NEVER

DIGESTION

TREE

HELLO

WALK

SUN

CLOUD