Establishing intersubjectivity in cross-signing
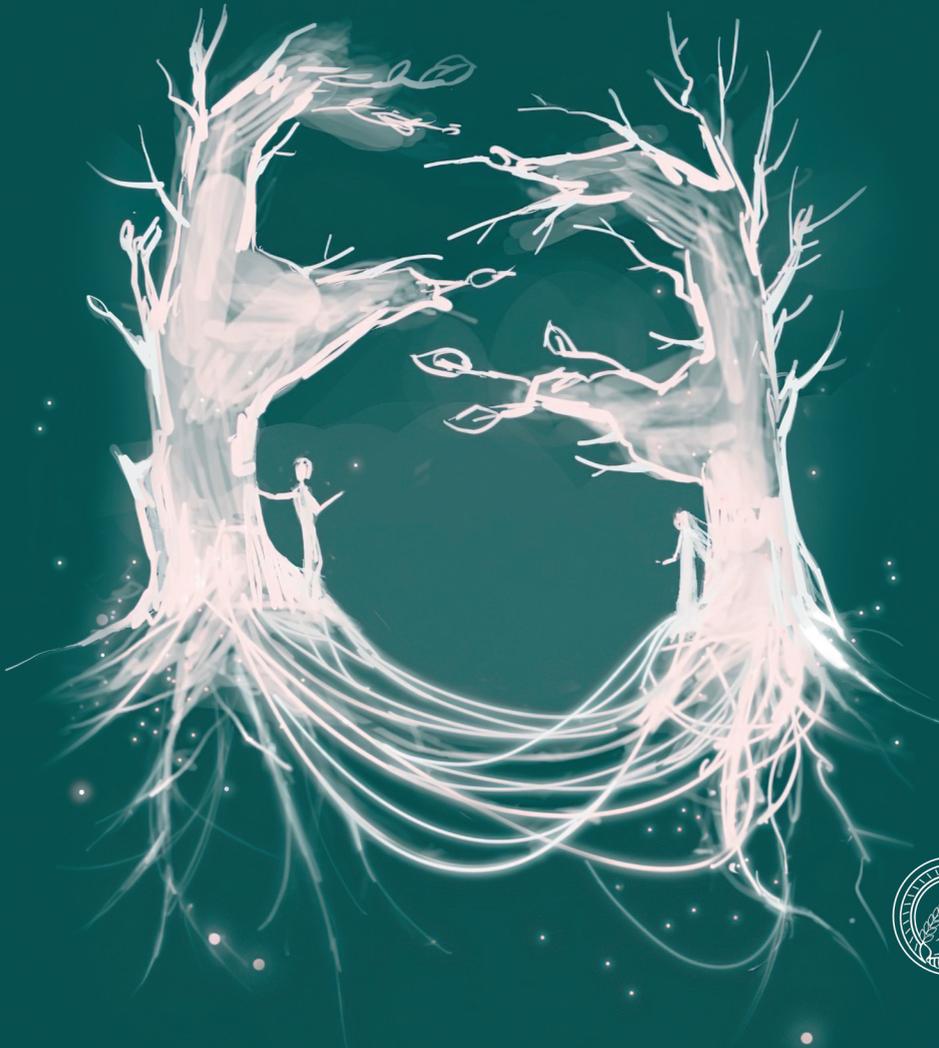
Kang-Suk Byun

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Preface: Motivation and aim of the thesis

This section is about my motivation and aim for writing this thesis. Some of this motivation came from my personal background, so the first part of this section offers a brief description of this. Before doing my BA Study, I had only used Korean Sign Language (KSL[1]). I learned it from my parents, who are deaf and used KSL throughout my childhood. All of my grandparents were hearing so my parents were raised using spoken language and oral methods of communication. Their own childhoods were very different to mine in this regard, as they had faced different attitudes to signing which were more discriminatory than what I experienced. Their opportunities to participate in genuine two-way interactions were limited because communication was often primarily directed to them rather than shared with them, and this communication was frequently inaccessible. I was not hampered by this lack of opportunity in my own youth because communication with my deaf parents was visual, reciprocal and fully accessible. My parents also taught me how to advocate for the use of sign language and how to understand and challenge audism[2], which is an advantage that they did not have themselves when they were growing up. This enabled me to be proactive in my communication with hearing

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[1] See Appendix E for abbreviations of other sign languages used in this thesis.

[2] The word "audism" was first used to describe attempts to judge deaf people's worth and intelligence based on their use of oral speech, and can be generally defined the belief that hearing people are superior to deaf people (Humphries, 1975). It is understood as an assumption that deaf people's happiness depends on acquiring the cultural and linguistic fluency of a hearing person. Systemic audism requires deaf people to have the same standards, behaviours, and values as hearing people (Bauman, 2004).

people, and develop a solution-oriented approach to my interactions rather than allowing misunderstandings or communicative trouble to go unresolved.

In Korea, gesture is not generally seen as valuable and is rarely the subject of research. One of the few Korean studies on gesture is by Kwon (1998), who looked at gesture competence and interviewed Korean people who were learning French as a second language. They felt that the use of gesture with spoken Korean was not desirable, and that it was problematic for a fluent Korean speaker to use gesture, as gesture is associated with low levels of Korean fluency. However, they reported that using gesture when speaking French is normal and acceptable at any level of fluency. This attitude toward gesture makes it particularly challenging and fascinating for a deaf person to communicate visually with Korean non-signers, and this experience has created a foundation for my interest in the topic of cross-signing.

Another source of my motivation to investigate this topic is the research on International Sign, such as that by Mesch (2010), who interviewed people from a number of different countries who were working with the World Federation of the Deaf. She found that International Sign is not necessarily a full language, because it has a limited lexicon and variable grammar. At the time of writing, it is not considered to be a language in its own right, and more research is needed into its structures and vocabulary. However, because much of the research has investigated its linguistic features and to what extent it is a language, so far its features as a communication system, which it is now considered to be, have been under-studied. In other words, scholars have mainly examined the linguistic

features of International Sign such as its grammar, and few have looked into how it is used in interaction. The existing research has tended to consider production or comprehension in isolation from each other (Tirassa & Bosco, 2008). In the studies on IS comprehension, issues of expectation and belief do not tend to be addressed. Shared understanding is also rarely discussed. This thesis attempts to fill some of these gaps in the literature.

When I began getting involved in cross-signing data collection as a participant at MPI in the Netherlands for Psycholinguistics in 2004, I did not have much experience with cross-cultural communication. It was fascinating to observe the seeming ease with which deaf signers from various countries adjusted their communication to each other. Even International Sign research has been based mostly on the lexicon, and interaction-oriented studies are rare (Rosenstock & Napier, 2016). I started to realise the necessity of interaction-oriented research reflecting my experience. This was what first inspired my interest in this the questions that eventually became the topic of this thesis. Levinson (2016) argues that the grammatical complexities of individual languages are diverse, but turn-taking is innate and universal. Evidence of this includes the fact that babies are able to interact before they can speak or sign; that deaf children of hearing parents develop 'home sign' to interact; and that people often use iconic gesturing and pointing to communicate.

There is a common belief among many laypeople that sign language is universal because of its iconic motivation, and sign language linguists have expended a

great deal of effort to try to dispel this myth, often downplaying the role of iconicity in order to convey the fact that sign languages are unique and discrete. I also had this tendency in the past and challenge those who emphasised the iconicity of sign languages. But in cross-signing, exploiting visual iconicity is a crucial means of building shared understanding, e.g., checking for comprehension and offering solutions to communicative troubles. The study of cross-signing may offer a way to investigate metapragmatic abilities, to examine interlocutors' intentions. This study began because of a need to better understand how the metapragmatic approach can be applied to the phenomenon of international signing. The ready availability of two fascinating sets of cross-signing data, one generated by Zeshan and the other by Levinson, provided a further impetus for undertaking this thesis.

I returned to the Netherlands again in 2014 and by this time, I had developed a more confident and proactive approach to cross-cultural communication and a scientific interest in it as my chosen PhD topic. During my doctoral studies, I had many opportunities to attend meetings and conferences and collect data all over the world. This included going to Germany, the UK, France, Belgium, Italy, Sweden, Nepal, the Czech Republic, Egypt, Brazil, China, and Japan. When I was away from the Netherlands, I also took the opportunity on a number of occasions to have my hair cut. This gave me more practice with cross-cultural interaction. While impromptu conversations with non-signers can be challenging and short due to the tendency to abandon the communication when it becomes difficult, the context of having one's hair cut means that both parties are under more pressure to

sustain the interaction. Rather than trying to write back and forth, I tended to rely on gestures in these interactions, knowing that they had to be transparent and intuitive enough for the barber to understand what I meant. This forced the barber into a more visual orientation, and enabled us to engage in communicative collaboration.

Our language processing and subjectivities were often different to each other, with the barber having relied primarily on aural access to language, and me having relied on visual access. But we were able to collaborate and help each other achieve our communicative goal. Our interaction involved joint attention on the topic of haircutting, as well as visual communication including gesture and classifiers. In doing so, we developed common ground through a process of grounding (Clark & Brennan, 1991) that involved repeated checking of understanding on both sides. There were many failures in this process as well as successes, and this made the process highly engaging and illuminative in terms of my research.

This context of haircuts has been noted by other deaf people as providing interesting scenarios for discussion about cross-cultural communication. The former president of the World Federation of the Deaf (WFD), Colin Allen, posted a story on Facebook about getting a haircut and the communication that was involved. He had asked for a certain amount to be cut off using a gesture as depicted in Figure 0.1, which shows the length he was directing the barber to cut. This differs from the way this is portrayed in sign language, which is shown in Figure 0.2, depicting the current length (left-hand image) and the length that he wanted the barber to leave

(right-hand image). The barber understood the gesture (0.1) to convey how much hair to leave, not cut, resulting in a haircut that was far shorter than what Colin had wanted. This occurred despite other barbers in Colin's experience understanding the gesture as intended, and demonstrates that two people can have wholly different understandings of a particular form. In this case, neither interlocutor recognised there was any issue or misunderstanding and no repair was attempted until it was too late. A lack of grounding may have contributed to this outcome.

Figure 0.1.
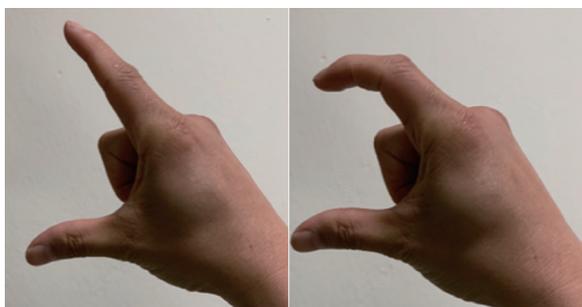
Figure 0.2.

When I was visiting Egypt, I had the chance for some late-night discussions with a group of deaf peers at around 9 or 10pm. Among the group, it came to my attention that there was a deaf barber. I was interested in the prospect of having him cut my hair, and he agreed to do so that evening despite the late hour. At about midnight, I went to his house for my haircut and described precisely the cut that I wanted. It was a somewhat complicated cut, with different lengths on the sides and top, but he understood my explanation despite using a different sign language than me. This experience was unusual among the many times I had had variable success

communicating with non-signing barbers.

1. General Introduction

1.1. Cross-signing and its context

It is a widespread belief among laypersons that sign language is the same throughout the world, and many people tend to be surprised to discover that the concept of a 'universal sign language' is a myth; while a common sign language might be in evidence within one country, a great range of different sign languages are used across the globe and they are mostly mutually unintelligible. Contact between signers of different languages has increased considerably over the past few decades, due to two factors: the rise of international travel, and the proliferation of remote online communication. These have given deaf people more opportunities than ever before to encounter other sign languages and attempt to communicate with peers from other cultures (Hiddinga & Crasborn, 2011; Bauman & Murray, 2009). Some signers may use American Sign Language (ASL) as a lingua franca, particularly those that have attended Gallaudet University[3] in Washington, DC (de Clerck, 2016).

The situation for spoken language users is slightly different, as many might tend to first rely on English or another worldwide language as a lingua franca. If their interlocutor does not know English, they would need to draw on iconic gesture

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[3] Gallaudet University is a federally chartered private university for the education of deaf and hard of hearing people. Gallaudet University is officially bilingual, with American Sign Language (ASL) and written English used for instruction and by the college community.

or from any sparse knowledge they may have of each other's native languages. If they are using online or written communication, they might consult automatic translation tools. Automated translation is not yet available for sign languages, as the technology for this is still in its infancy (Vendrame et al., 2013). However, signers from different cultures can make use of the webcam for face-to-face discussion, and this often leads to successful interaction as deaf signers usually have a very determined attitude toward making communication work.

The first time that one meets a signer from a different linguistic background online, or indeed face to face, can be quite challenging in terms of adapting and accommodating each other's lexicon and agreeing on shared communication. But this group tend to be compelled by this challenge and eager to surmount obstacles to establish a common repertoire and mutual understanding (Zeshan, 2015; Chapter 2). Their communicative interaction can be called "cross-signing". Cross-signing refers to the incipient communication between two or more sign language users who do not have a language in common and have not agreed any conventions for their interaction. Much cross-signing, even in the very early stages, is quite successful because the interlocutors can begin understanding each other in very little time (Zeshan, 2015). In other words, the participants are able to make cross-signing work. This study thus takes for granted the utility and value of cross-signing (see Chapter 6), and looks into the possible means by which the interlocutors make it work, rather than evaluating how worthwhile it is as a form of communication.

Given the rapid changes in technology and transport that are enabling frequent cross-cultural communication, it is an auspicious time to investigate the phenomenon of cross-signing, which allows signers to build an understanding when they share minimal or no language at the outset (Zeshan, 2015; Chapter 2). It is worth noting that not all signers have international experience, and that although some signers are aware of a few lexemes from other sign languages due to increased international contact, this does not mean that they share a language in any real sense.

It is also important to clarify the nature and status of cross-signing, as the literature on this behaviour is extremely sparse and it has only begun to be empirically researched very recently (but see Zeshan, 2015; Crasborn & Hiddinga, 2015; Kusters et al., 2017; Bradford et al., 2019; Zeshan, 2019; Rathmann, 2020). Cross-signing must be distinguished from International Sign, usually described as a semi-conventionalised interlanguage resembling a pidgin. There is existing literature on International Sign (Rosenstock & Napier, 2016; McKee & Napier, 2002; Allsop, Woll & Brauti, 1995), largely limited to studies on its morphology, sociolinguistic aspects, and lexicon, especially the origin of items in its lexicon. It has been perhaps more difficult for researchers to explore the comprehension or understanding of International Sign. Only a few scholars (e.g., Rosenstock & Napier, 2016) have looked into this.

This thesis addresses the paucity of research on cross-signing by examining how

cross-signers develop a shared system of communication, and the processes that drive their interactions and innovations. This research into cross-signing can also be used to shed light on the earliest stages of language evolution in general. Specifically, the thesis focuses on three main research questions:

1. How do cross-signers interact with each other and build successful communication?

2. What characterises formal features or representation in cross-signing, and why are cross-signers able to use these to gradually achieve understanding?

3. What enables cross-signers to rapidly build their communicative efficacy over time?

1.2. How cross-signing relates to similar phenomena

A jargon is a type of language that is used when people without any language in common try to communicate. It has basic grammar, iconic time order, and dependence on the context/situation and pragmatics (Mühlhäusler, 1997). This is the stage before pidgin. There is a lot of mixing at the jargon stage, with a very small number of words (small lexicon). When 'stabilisation' happens (people accept/ agree language norms/rules), a pidgin may develop. A pidgin is a new mix of two languages (Wardhaugh, 2006), e.g., the first French people to arrive in Louisiana, USA, created a pidgin by mixing French with Native American languages. It is a

facilitative language and it has a simplified grammar (e.g., no 'to be' copula, no

gender marking, no number marking, and no possession marking). This is the stage

after jargon but before creole. Some people overlap the terms 'jargon' and pidgin'.

Linguists study which language gives more words to the pidgin (i.e., which is the

'lexifier language'); for example, English is the lexifier language for Chinese Pidgin

English. This depends on the power in the real-life context. In balanced power

situations, a pidgin might have two lexifier languages. A creole is a mix of two

languages in the second generation (Wardhaugh, 2006), e.g., the language that

pidgin speakers' children use. It has grammar and is a native language. It becomes

the real language of a community.

When a deaf person encounters a hearing person who does not know sign

language, they will rely on many semiotic resources (texts, gestures, facial

expressions and speech – all to convey meaning), and this is in combination with

gestures used by the hearing person. Iconic characteristics of sign language

may be employed, making it possible to use a repertoire, that is, translanguaging.

Translanguaging constitutes using two or more languages, not separately, but

mixed/together, for learning and self-expression (Kusters et al., 2017). For example,

this involves mixing the languages in different ways when writing, signing, gesturing,

speaking, showing, etc. This mode of interacting also uses expressions based on

experience of behavior, such as borrowing or mime (Kusters et al., 2017). From

a young age, many deaf people enter into coordination such as translanguaging

so that hearing people encountered in daily life can understand their intentions

more easily. In such an interaction, the deaf person naturally co-ordinates with the hearing person to solve their coordination problems (Schelling, 1960, cited in Clark, 1996). Whenever two people have common interests or goals, there is a problem of coordination, and each action depends on the action of the other. To reach their goals, they must make joint efforts to coordinate their actions. Parents of deaf children, for example, often create home signs with their deaf child in addition to gestures in order to aid understanding. Communication itself with a hearing person who participates in translanguaging can also be achieved in the process of finding common ground for mutual recognition (Lewis, 1969; Clark, 1996). In a conversation with a hearing person, the attempt to allow the hearing person to participate independently is a joint action so that the hearing person is not blocked from participating in the conversation due to not knowing sign language. This is also exemplified in a study of children at a deaf school in Nicaragua, who developed their own sign language at the school. They would regularly perform coordination by altering their signing when they returned home so that their parents could more easily understand them, because their parents only knew how to gesture, not how to use a full sign language (Coppola, 2002: 23). People use ALL of their linguistic knowledge in translanguaging and all their semiotic resources, such as images, text, gesture, gaze, facial expression, speech, body posture, objects and the environment, for meaning-making, but is different to the cross-signing studied here.

International Sign (IS) is the common term for a form of communication that has developed over the years and decades mostly at international meetings and

conferences (Mesch, 2010). In other words, IS applies to the form of international

signing that is used by people with regular exposure to international-level meetings.

This type of signing is not used in day-to-day life for most deaf people. It is often

used in presentations and lectures, as well as for conversation. Mesch (2010) states

that the IS lexicon draws on three different sources: American Sign Language

(ASL) as one of the main (lexifier) languages; whatever signs seem most iconic

or available at the time to the interlocutors (e.g., signs from their own languages);

and signs made up on the spot during a conversation, which may not exist in any

national sign language. The IS lexicon (i.e., the established conference vocabulary)

has about 2-3,000 items, which is limited; however, its grammatical structure,

including extensive use of classifiers, is quite complex (Mesch, 2010).

International Sign (IS) has also been described by Webb & Supalla (1994: 182) as a

pidgin with limited vocabulary and complex grammar, but one that is "more complex

than a typical pidgin and indeed is more like that of a full sign language"(see also

Supalla & Webb, 1995). Webb and Supalla (1994) analysed presentations given by

Deaf people in IS, focussing on five types of negation markers. They found that each

was "used with remarkable consistency and structural regularity" (Webb & Supalla,

1994: 181). Mesch (2010) analysed questionnaires of 16 questions, which had

been sent out to WFD (World Federation of the Deaf) experts in sign language, sign

linguists and interpreters in the World Association of Sign Language Interpreters

(WASLI) in 16 countries during spring 2007. Responses to the survey questionnaire

were received from 24 of 35 respondents in 12 countries: Australia, Brazil, Finland,

Denmark, Germany, Italy, Japan, Netherlands, New Zealand, Sweden, United

Kingdom and USA. Some interpreters from South Africa and Kenya were involved

through WASLI. The findings indicate that most of the respondents do not agree

that International Sign is a pidgin or a creole. A typical pidgin is a combination

of two or more languages, and pidgins tend to have a large vocabulary and a

simplified grammar – the exact opposite of IS. IS is most likely not a creole either

because creoles are defined as communication systems that are passed on through

generations, transmitted by the parents and naturally acquired by children, and this

is not the case for IS. Some researchers have argued that more research is needed,

especially on face-to-face communication and describing IS in different parts of the

world. IS's level of conventionalisation is lower than that of national sign languages,

but higher than in other kinds of 'cross-signing' (ibid.). IS is described by Mesch

(2010) as a language-like, dynamic and complex communication system that is

used in specific settings and results from intensive contact between national sign

languages. It shares elements from signers' own signed languages, shared spoken

languages, gesture, and visually-motivated iconicity (Hiddinga & Crasborn, 2011).

The study of cross-cultural signed communication has also been furthered by

Zeshan's (2015) work on 'making meaning'. She coined the term 'cross-signing'

to refer to the first-time communication of individuals with no language in common.

She describes how the individuals each have their own 'multilingual-multimodal

space', and how they gradually negotiate a 'shared space' in which they construct a

shared repertoire of forms and meanings. The types of communication in the visual-

gestural modality are summarised in Table 1.1. They are distinguished from each

other by function using the following values:

+ : feature always applies   **–** : feature does not apply

+/– : depends on the situation   **?** : unknown

Table 1.1. Types of visual-gestural communication

	Gesture	Home sign	Emerging SLs / "communal home sign"	Deaf community Language	Cross-signing	International Sign
First or only language for the person	–	+	+	+	–	–
Co-use of speech due to language contact situation	+	+/–	+/–	+	+	+
Co-use of literacy due to language contact situation	–	–	+/–	+	+	+
Substantial time depth	+	–	+/–	+	–	+
Substantial level of conventionalisation	+/–	?	+/–	+	–	+
Only used in contact situations	–	–	–	–	+	+
Intergenerational transmission	+	–	+	+	–	–

The first row in Table 1.1 shows that cross-signing cannot be considered as a

person's 'first or only language'; this also applies to International Sign. This is

because both of these would always be encountered after and in addition to a

person's native or home-country sign language. Typically, engaging in these types

of communication requires international travel, which is much more likely to be an

activity of adults who are fully fluent in one or more languages. Likewise, gesture

cannot be a person's first or only language, though this column refers to gesture as used by hearing people (who would tend to have a spoken language as their first or only language); however, this phenomenon is outside the scope of this study. In contrast, it is certainly possible for an emerging communal sign language or home sign (e.g., the unique language developed by a deaf child and hearing parents) to be the first or only language for an individual.

The second row shows whether each of the various types of visual-gestural communication can feature the use of speech-derived elements, i.e., mouthings (see Chapter 3 for more on this phenomenon). Cross-signers and users of International Sign may frequently use mouth patterns derived from spoken words as a tool to clarify meaning and bolster the communication. The occurrence of mouth patterns or speech in home sign varies a great deal, depending on the child and the language backgrounds and communicative practices of their family members, but the earlier stages of home sign do not tend to feature mouth patterns simply because it takes time for a deaf child to learn spoken language. Children may start to use home sign well before they learn speech, rendering it unlikely for them to be able to utilise mouth patterns based on speech when they are very young. Hearing people using spoken languages of course frequently speak when they gesture, and deaf signers using national sign languages often articulate mouth patterns, especially with noun signs (verb signs tend to be accompanied by mouth gestures such as pursed lips, which provide adverbial information, showing, for example, speed or intensity (see Crasborn et al., 2008).

In the third row, it is shown that both cross-signing (see Chapter 3) and International Sign (see Hiddinga & Crasborn, 2011) make use of literacy-based communicative strategies, such as tracing written letters in the air or on the palm. It is not clear to what extent this occurs in home sign or emerging sign languages; however, it is possible to assert that signers who have had the opportunity of learning written literacy are likely to draw on it in their communication (Zeshan, 2015).

The fourth and fifth rows, which refer to time depth and conventionalisation respectively, are related to each other and show the same indications apart from that for home sign, because home sign has little time depth. At present more research is needed to determine what levels of conventionalisation are to be expected in various home-signing contexts. It is accepted that International Sign has both time depth and conventionalisation and has been called a pidgin (see Supalla & Webb, 1995, and section 1.1). Some of the gestures of spoken language users are also highly conventionalised with considerable time depth. On the other hand, cross-signing has neither feature, although its idiosyncrasies and multitude of variants reduce somewhat over time (see Chapter 4 on language evolution). In the context of this thesis, cross-signing particularly refers to the early stages of cross-cultural communication, e.g., the first few weeks of cross-cultural signed communication can be referred to as cross-signing. This thesis is just a first step toward understanding how time depth and conventionalisation apply to cross-signing, as this issue requires further investigation.

The sixth row shows which types of communication only occur in contact situations and reveals that none of them do except for cross-signing and International Sign. Whilst gesture is used in cross-signing and International Sign, and not in contact situations only, its contact function unfolds when a deaf person proceeds to communicate with a hearing person who does not know/use sign language. This occurs because deaf people do not live only in the Deaf community; they function also in the mainstream society around them with hearing people, hence the gesture is occurring in a contact setting. Conversely, the gesture that accompanies spoken communication by hearing people is not occurring in a contact setting. Hearing parents of hearing children will use some natural gesture with their child alongside speech, but parents of a deaf child will need to develop a system of communal home sign. Home sign and cross-signing are essentially temporary forms of communication, though home sign will remain in the family for a longer period and, in a small close-knit community, will result in contact signing. However, it is worth noting that home sign can influence national sign languages, as the children grow up and contribute the forms from their unique home sign lexicon to the repertoire of the local deaf community. Emerging sign languages, Deaf community sign languages (referred to hereafter as 'national sign languages', and gesture can all be transmitted and can influence each other; for example, the gestures used by hearing parents are transmitted to deaf children, who may articulate signs based on these gestures when they use their local community sign language.

1.3. Comprehension in International Sign versus cross-signing

International Sign (IS) and cross-signing cannot be clearly and straightforwardly separated as distinct entities. It can however be argued that at a first meeting, signers who do not share a sign language and are not familiar with International Sign will be using cross-signing and not International Sign because they have yet to establish any forms or structures with each other. Upon subsequent meetings, they continue to use cross-signing. When they have agreed conventions and developed intersubjectivity, a gradual common basis of cross-signing is established, but this continues to occur in a one-to-one setting or a micro-community and a permanent product does not develop, unlike International Sign, which is diffused over a wider user community of users and occurs in the process of internationalisation. In the process, a defining feature of International Sign is the wider community of its users, as they interact with each other at international deaf events, such as WFD, EUD, or Deflim, where the ever-changing customs of International Sign occur.

Whynot (2016) looked at the comprehension of International Sign to ascertain how immediately recognisable it is, given the purported visually iconic motivation of many of its signs. The method of the study involved filming presentations at an international deaf event, and then selecting clips of individual lexical signs from these films to show to a sample of deaf signers from five different countries, to see how well they could understand the signs by asking them what each sign meant. The notion of 'comprehension' here is interesting. Firstly, knowledge of what a

particular form or sign means does not automatically mean that 'comprehension' of the full content was in evidence; this requires context. In contrast, cross-signing communication is not normally a vehicle for the comprehension of individual signs, nor for comprehending extended and complex rhetoric. Rather, it is a tool for dynamic face to face exchange for those who have no shared language; it is a way for them to reveal and recognise intent and meaning within emergent communication, again making context essential in any investigation of this behaviour. Cross-signing seldom involves word-for-word translations, but often exploits dynamic explanations and innovations in the conveying of concepts. Cross-signers draw on a vast array of communicative resources in their interactions, which are often contextual.

By studying people's reactions to listening to clips of spoken conversations, McGregor (1983) found how much the individual listener's understandings and perceptions can differ, and how much they relate what they are hearing to their own experiences and background knowledge. Their lack of knowledge about the specific context of the discussion they are listening to permits them to make all sorts of assumptions and mental oscillations as the conversation progresses. There is no way for such an eavesdropper to develop any shared understanding with the people whose dialogue they are accessing, and of course no means for any of the speakers to check the overhearer's understanding or address any trouble in the interaction, which increases the scope for divergent and erroneous interpretations. Thus, an overhearer's comprehension is likely to differ substantially from that of

an active interlocutor. This points to the importance of examining how the listener/ watcher, i.e., recipient, understands the message, and how the dynamic nature of the speaker-hearer relationship affects the interaction and its ultimate success in facilitating shared understanding and achieving some sort of communicative goal. Therefore, the inclusion and recognition of conversational context in studies of emergent communication such as cross-signing is vital.

A similar kind of 'overhearing' study was carried out by Schober & Clark (1989), where addressees' and overhearers' comprehension of American English were tested and compared in equal conditions. The speaker, addressee and overhearer were from the same culture but none had met each other before. They could all see each other. The overhearer had the advantage of being able to rewind the clip to check for any audio that s/he missed. However, despite this, the overhearer's comprehension was much weaker than that of the addressee. This means that even the ability to literally go back in time to re-check the precise message results in an understanding that is far inferior to the level of comprehension gained by being an active interlocutor. It is for this reason that this thesis examines how cross-signers develop a shared system of communication and explores the processes that drive their interactions and innovations. With its specific focus on how successful communication is built, this study identifies the formal features in the cross-signing used by the participants and provides a comprehensive understanding of how cross-signers gradually achieve communicative efficacy over time.

Cross-signing potentially offers a window into the past of IS, i.e., an approximated illustration of how IS may have started in the past out of many face-to-face conversations until it became a pidgin with many users. There is perhaps a developmental path from cross-signing to IS, resulting from many years of cross-signing and eventual diffusion over a wider user community.

1.4. Interaction and Intersubjectivity

Tirassa & Bosco (2008) state that intersubjectivity means "the capacity to share and bring about joint collaborative actions with a partner". They argue that a mentalistic theory of communication is needed because behavioural and contextual theories are not robust enough: 'sharedness' or mutuality is in the person's mind, not in the environment. So, a communicative action always has meaning based on the addressee's beliefs, not on objective reality. For instance, if a speaker says, "it's going to rain", they may mean 'take a taxi instead of walking' but the other person may think they mean 'please take out your umbrella'. In interaction, a person will typically be thinking about what the other person knows or believes, and disambiguate utterances based on their beliefs about the other person's beliefs (Smith, 1982). If the speaker and listener express something that connects them face to face in the same space and time, the listener can imagine various hypotheses. What meaning does the speaker's facial expression imply? What kind of place is this? Where is the event? What is the environment in which you are talking? Conversational people look at each other whilst conversing but is there

any common ground or common knowledge between them that is revealed in the expression? The speaker knows that the listener is looking at the things that lie between the speaker and the listener, and the listener also knows that the speaker is looking. The fact that they see, know, understand, and share with each other is also mutually known by the speaker and the listener. Smith (1982) states the following conditions for mutual knowledge:

- Person A must know the same information as person B

- Person A must know that person B knows the same information

- Person B must know that person A knows the same information

- Person A must know that person B knows that person A knows the same information

- Person B must know that person A knows that person B knows the same information…

- Etc…

In addition to mutual knowledge, mutual expectation is relevant to intersubjectivity. There will be concordant expectations that the speaker has the same experience as the listener and that there will be a basis for coordination, leading to successful reciprocity (coordinated action). For example, two drivers can have the expectation that they will both be driving in the left lane on the roads. With regards to concordant expectations during signed interaction, a deaf person will also proceed with some knowledge about another sign language user's background. On interacting, the

cross-signer expresses iconicity that the recipient may more easily understand, rather than producing arbitrariness. When the speaker expresses arbitrary signs that the recipient is unlikely to know, there is the speaker's consensus expectation that the recipient will express that he or she does not understand, and if this is confirmed, the speaker can quickly make corrections. Mutual expectation has a similar nested structure as mutual knowledge, that is, Person A and Person B both have expectations and also expect the other to have expectations. In the remainder of this sub-section, several concepts that underlie an understanding of intersubjectivity in the context of the present thesis are discussed in order to provide conceptual framing and facilitate an understanding of the individual chapters on cross-signing.

In order to understand the notion of intersubjectivity for the purpose of this thesis, it is useful to briefly consider that different perspectives have been brought to bear on this concept. Intersubjectivity has been studied in various fields, including philosophy, linguistics, sociology, education, and psychology. A representative philosopher who recognised intersubjectivity in communication is Jürgen Habermas. Based on combining perspectives from the philosophy of language and from social science, Habermas (2006) developed the idea of intersubjectivity further through the concept of 'mutual understanding', the purpose of which is inherent in verbal communication. In psychology, intersubjectivity is understood as "a shared understanding among those who participate in the activity" (Husserl,1989; Marx, 1989). In the field of linguistics research, most of the studies that recognise intersubjectivity through interaction of participants involve analysing pragmatics and

dialogue analysis. Other research looks at communication and interaction (Tirassa & Bosco, 2008). Methodologically and conceptually, it is the linguistic perspective that is most relevant to this thesis.

1.4.1. Interaction engine

An interaction theory put forward by Levinson (2019) argues that children have a strong instinct for communication and an instinctive/automatic understanding of human interaction. Using that understanding, children are said to be able to develop intersubjectivity (psychological/social relationships between people) and specific languages. Language does not create/induce the ability to communicate and interact. On the contrary, the interactive instinct becomes the engine for language learning. In other words, language was developed to facilitate social interaction. The most important thing for human beings is social interaction. Human communication primarily involves social interaction that takes place within conversation. The constructs of conversational behavior that occur in conversation are remarkably constant, such as taking turns, repairing communication, and initiating and replying in adjacency pairs. Levinson (2019) highlights many studies that show that the dialogue structure is very similar in all languages. Humans spend 30-70% of their day interacting socially. This is much more than other primates (baboons, gorillas). People speak more than 15,000 words for about 2 hours every day in small segments (about 2 seconds long), transitioning with others through speaking-to-talk Levinson (2019). We try to help

others interpret our intentions/goals well, and we try to play a role in common/ shared interactive situations. The interaction engine is particularly relevant to discussions in Chapter 5 of the thesis.

1.4.2. Grounding and common ground

To develop mutual knowledge, it is important to have common ground through grounding (Smith, 1982; Clark & Brennan, 1991). Grounding involves the aim of the communication, and the medium. For example, in a game based on colours during this study, the participants understood that the aim was to talk about colours so that when someone mentioned 'door', they could surmise that the intended referent was the colour of that door. The participants used the medium of face-to-face signed interaction, rather than another one such as writing emails. And by using a face-to-face sign language interaction medium rather than other methods such as writing e-mail, the participants mutually understood how the conversation should work and achieved grounding. Therefore, it is important to establish what a cross-signer does not know about the recipient. To this extent, coordination problems can be solved by agreement during the interaction, which leads to a common/mutual understanding of the issue, referred to as 'coordination equilibrium'. Agreement is a good way for interlocutors to create concordant mutual expectations. This is because agreement makes strong expectations of several orders (e.g., 4 orders: I expect that you expect that I expect that you expect).

To achieve intersubjectivity, there must be a common ground for established communication. The common ground is 'common knowledge' according to Lewis (1969) and Schiffer (1972). Clark (1996) notes that it is based on older, analogous concepts, including mutual knowledge or belief. McCarthy's (1989) 'joint knowledge', in fact, proposes that the common ground of two people is the sum total of their mutual/common/collaborative knowledge, beliefs, and assumptions. With common ground, if the speaker knows, so does the listener; if the listener knows, the speaker knows too. A common background must be established each time we interact. The common background is based on mutual trust, cooperative perceptual experiences, and continuous cooperative behavior. At the first meeting of the cross-signers, a common ground between the signer and the recipient requires grounding, that is, building a foundation in the process of making sure each person understands what the other is talking about. A new foundation can be built on an initial foundation, and common ground continues with several layers of understanding. The notions of grounding and common ground are a continuous thread in this thesis but are particularly important for understanding the data discussed in Chapters 2 and 3.

Interlocuters identify and expand common ground through communication. In other words, communication is built on a common ground and this common ground is an incremental event (see Pickering & Garrod, 2007 on incremental common ground). If the listener does not understand the speaker's expression in the process of sharing the expression, he or she proceeds to let the listener know through

communication (correction). When communication is successful, commonalities are discovered and differences are identified. However, when communication is unsuccessful, common ground must continue to be sought so that success can be achieved. A common ground that increases incrementally between the speaker and the listener occurs through the mutual sharing of knowledge during the communication. In this way, each individual can share the experiences of others and, in the end, expand the conversational repertoire that each individual holds.

1.4.3. Convention

There are many different facets to the notion of 'convention', including the choice of what language to use, and the rules, method and medium of language use. When two people interact for the first time, they may or may not be able to rely on a shared language. If they both know the same signed or spoken language, they can draw on its conventions. This could include a lingua franca, for example in the case of a NGT (Nederlandse Gebarentaal - Sign Language of the Netherlands) user and a Korean Sign Language user who both also know International Sign. However, in the absence of a shared language, the two individuals will have to depend on general communicative conventions such as perspective-taking and 'try-marking' (offering a phrase tentatively, see Chapter 2) to determine what the other person may know or be likely to understand. These processes can help them to mutually agree on the adoption or invention of a sign for a particular concept. Where there is no mutually understood convention within the interlocutors' previous experience, e.g., no sign

available in their existing inventory, they may invent a new form or sign within their

interaction. Therefore, the two types of convention are an agreement to use a sign

from an existing inventory, and the invention of a new form, including an agreement

on what the form means and that it will be used in the interaction going forward.

These processes of conventionalisation are particularly relevant in the discussions

of data in Chapter 3 and Chapter 4.

Conventions are very much context-dependent, as pointed out by Lewis (1969).

The meaning of a word or sign differs depending on the community in which it is

used, and the 'public lexicon' of that community. In order to find out in what sense

a certain word can be used, we must look at and confirm the background of which

community we both belong to and what experiences we both have. An example of

this might be knowing that a deaf interlocutor is a member of the World Federation

of the Deaf (WFD) and is therefore very likely to know International Sign, or that

they are a deaf student at the Max Planck Institute in the Netherlands and are

likely to know NGT. Communities such as the WFD often have their own unique

vocabularies and conventions, and general knowledge of these can be especially

helpful in situations where two interlocutors do not have a shared language. For

example, a convention in many sign languages is the iconic connection between

'breast' and 'woman'. The sign for 'woman' in International Sign refers to a breast,

and this association is found in several Asian sign languages. However, this may be

difficult to communicate if the interlocutors do not share this common ground, e.g.,

if one of them is from a community where this is not a typical linguistic convention

or the sign is deemed culturally offensive. In order to see if we can use a particular form or sign, it is essential to identify the cultures and communities to which the interlocutors belong. This is essential in cross-signing because it helps a person to understand their partner's likely linguistic repertoire and decide to what extent they can use iconic words or expressions and/or rely on English or International Sign. As they go through the process of checking these things, they create a space to build mutual conventions.

1.4.4. Repair in interaction

Research has found that repair is a salient feature of all human communication that is overwhelmingly similar cross-linguistically, and functions in a uniform way across different languages (e.g., Schegloff et al., 1977; Dingemanse and Enfield, 2015; Levinson, 2019) and modalities (Manrique, 2016). Despite the world's languages being varied in terms of grammar, morphology, phonology, etc., they are all remarkably similar in their use of the repair and turn-taking systems. Manrique (2016) enables the inclusion of sign languages in this assertion, as she notes that the functions of sign language repair and spoken language repair are very similar. Even though the grammatical systems of sign languages have affordances that are often distinct from those of spoken languages, basic interactive practices like repair are similar cross-linguistically. This is because everyone, regardless of modality, must deal with comparable social and physical pressures of interaction (Floyd et al., 2016). Repair, therefore, is a crucial part of all communication and collaborative

action. Cross-signing involves a great deal of collaborative action, i.e., cooperation and sharing of communicative decisions, such as how much time to spend tackling a repair sequence. Collaborative action can help interlocutors identify, draw attention to, and resolve communicative issues using repair sequences. Repair functions alongside turn-taking in a system of mutual support and reinforcement. For instance, many repair tools stem from strategies related to turn-taking (e.g., saying 'excuse me' or 'sorry' to signal that one wishes to interrupt the turn-taking pattern). Moreover, turn-taking errors or dysfluencies, such as two people inadvertently starting to sign or speak at the same time, are often resolved with a short repair sequence (e.g., 'sorry, you go ahead'). The structures of repair sequences also fit into the framework and rhythm of turn-taking; in other words, repair attempts must follow the turn-taking system, and interlocutors must respect this framework. Their participation in repair sequences is organised accordingly.

On a basic level, repair can be divided into self repair (SR), in which the repair is initiated by the speaker, and other-initiation repair (OIR), in which the repair sequence is instigated by the other person, or addressee (Schegloff et al., 1977). The development of a new shared language in the context of cross-signing requires a very efficient repair system. The nature of cross-signing, in the sense that the participants have not established any prior linguistic conventions or mutual understanding, also makes SR difficult to deploy; nearly every sign and utterance is a potential trouble source, so it is nearly impossible for a cross-signer to determine when a SR will be effective. Also, cross-signers seem to adopt a

welcoming disposition or attitude toward interruptions and OIR initiations. They appear to expect these to arise at any moment, and therefore they are not as face-threatening or problematic as they may be in communication amongst shared-language users. Chapter 2 and Chapter 3 offer a detailed analysis of repair sequences in cross-signing.

OIR occurs with considerable frequency in cross-signing, perhaps because this type of communication is, as stated above, highly collaborative and requires constant negotiation and monitoring for understanding, given that there is no existing shared language known to both interlocutors. OIR involves suspending the conversation to refer to some previous trouble and finding a solution so that the conversation can continue. This means OIR involves a side sequence devoted expressly to identifying the trouble and determining a solution. Both people cooperate in this side sequence, in a process that involves their full concentration and contributions from each person. Investigating OIR, therefore, enables more of an insight into how both cross-signers take responsibility for the communication, how their interactions progress, and how they construct a shared repertoire.

Manrique (2016) discusses the use of open, restricted and implicit OIR by Argentinian signers to build intersubjectivity, which she defines as creating and maintaining a mutual or shared understanding. Starting from a place where there is no language in common, very little intersubjectivity exists at the outset of cross-signing, though the signers do have mutual knowledge of the immediate visible

surroundings, e.g., the lab environment and the objects within it. Therefore, intersubjectivity must be carefully fostered and nurtured throughout the interaction. It would seem that most trouble in cross-signing relate to understanding, but issues with articulation and visual perception probably also exist in the data. However, because no shared language is in evidence, it is very difficult for a researcher to confidently ascertain which problems derive from misunderstanding and which are connected to perception or articulation. Once intersubjectivity is built, it becomes easier to determine the nature of trouble sources.

1.5. Participants and data

1.5.1. The data sets

The data for this study come from two sources. The first set is taken from a corpus created during a Sign Language Typology (SLT) project, directed by Zeshan, which ran from 2003-2006 at the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands. The corpus produced as a result of the SLT project consists of 10 hours and 28 minutes of video recordings of periodic meetings between participants. In those interactions, participants were asked to freely converse with each other, without any particular instructions as to the content of the conversations. At the point of the recording, they had been made aware of the general aim, that is, to document how signers would interact when meeting for the first time in the absence of a shared language. They also knew which country their

interlocutor was from and that they were going to be working together on a project investigating the linguistic typology of sign languages. Beyond this context, they did not know anything about each other. At the time of the video recording activities for this study, these data were opportunistically gathered as a by-product of the SLT research project involving an international group of sign language users. The four participants chosen from the Typology group are all males, from South Korea, Uzbekistan, Netherlands, and Hong Kong and are referred to in the examples as A, B, C and D, respectively. The participants subsequently gave their consent for the use of the recordings for the current research purposes and the current study overall has ethical approval through Radboud University's Ethical Committee (Project code EC2012-1304-098).

The second set is one sub-group of participants from another corpus project, Multilingual Behaviours in Sign Language Users (Multisign), also led by Zeshan, which took place from 2011-2016. For the corpus data, dyads of deaf signers who did not share a common language were filmed communicating. These individuals came from China, Hong Kong, India, Indonesia, Jordan, the UK, Japan, South Korea, Nepal, the Netherlands, Turkey and Uzbekistan. The sub-group from the Multisign project chosen to take part in this current study includes two male participants from Jordan and Indonesia, one female participant from Nepal, and one male participant from India, and are referred to in the examples as E, F, G and H, respectively.

The Multisign signers had not met previously and had minimal knowledge of English

and no shared sign language. All four informants were paid for their participation, which took place as part of a trip in India that also included attending a three-week leadership and capacity-building training course for deaf people. The Jordanian, Indonesian and Nepali signers were provided with in-country assistants[4] to help them become familiar with the setting in India (which was unnecessary for the Indian signer). They were filmed during their first meeting in India, after one week, and after three weeks. This thesis focuses mostly on the interactions on the first encounters, with the exception of Chapter 4, which offers a comparison of the colour descriptions used in at the first and final recording sessions

It was important to film the Multisign participants on the first meeting because this was before they had a chance to see or adapt to each other's signing, providing maximal opportunities for communicative trouble. They were filmed on the same day, unlike the Typology group, whose pairs were each filmed at different times. Between the filming sessions, the Multisign group attended the deaf leadership programme, and socialised with each other and with other deaf people in their environment (see Bradford et al., 2019, for a detailed characterisation of the Multisign group and its setting in India). The Typology group, in contrast, were in a work setting between the filming sessions, assisting with a research project at the Max Planck Institute for Psycholinguistics, and interacted with each other in that context.

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[4] The in-country assistants were all from the same country as the participant, had international experience and knew at least some International Sign (see Bradford et al., 2019). The Jordanian and Indonesian in-country assistants had been involved in a previous round of data collection for the MULTISIGN project in the UK in 2012, and the Nepali in-country assistant had studied in India on a BA programme in applied sign language studies.

1.5.2. Linguistic profiles of participants

The Typology group participants are all males in their mid-twenties to early thirties who attended Deaf schools offering sign bilingual education, that is, a special education school where sign language is the medium of instruction alongside teaching reading and writing in the local language of literacy. Two of the participants are 'native' sign language users as they have Deaf parents. The other two come from hearing families; they use a national sign language as their main and preferred language although they acquired it later in life through the school setting. A minority of Deaf people also have considerable skills in speech and lipreading, but this was not the case for any of the participants in this study.

As a group, the Typology signers had more international exposure prior to data collection than the Multisign group, and some had even arguably engaged in cross-signing before, on a limited basis. However, their experience in international contexts varied. Signer A, from South Korea, had been to an international conference, the Deaf Way II conference in the US, which provided him with about 20 days of immersion in ASL and IS.[5] Signer D, from Hong Kong, had frequently been to Taiwan and thus acquired some Taiwan Sign Language and cross-cultural

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[5] On occasion during the data collection, Signer A from the Typology group looked up definitions in an online dictionary via a hand-held device. This signer would watch a fingerspelling of an English word and then look up the equivalent word and meaning in their own written language, as discussed in Section 3.3.3. The context of the Typology group was rather informal and flexible, and this signer was comfortable enough to call a temporary halt to the conversation to consult a dictionary. This did not occur in the Multisign group.

communication skills. Signer B, from Uzbekistan, had lived in Germany for 14 years and learned German Sign Language (DGS), and was the only one of the four who was fluent in two sign languages. Signer C, from the Netherlands, had attended the same conference as Signer A, in addition to a World Federation of the Deaf (WFD) conference that was held in Canada. Signers B, C and D each met with Signer A, resulting in the three dyads from this group, which are analysed in Chapter 2.

In contrast, the Multisign participants had very little experience of international or cross-cultural communication, apart from Signer H, who had some experience of meeting Deaf sign language users from other countries during a BA course. They had no shared language and Signers E, F and G had never been to India previously. They also advised the researcher that they had minimal knowledge of English; during the coding it became apparent that some of them knew individual fingerspelled English words, but this was sporadic. Their familiarity with English appeared to be basic, e.g., enough to fingerspell some words but not to fingerspell sentences. Therefore, the profile of these participants differs from the Typology group in terms of their international experience. This is a factor to consider, and while a focused comparison of the two groups is outside the scope of this study, it may be illuminating to bear in mind this distinction between the groups and the effects it might have. Table 1.2 summarises the participants' background details, including language proficiencies:

Table 1.2. Socio-linguistic backgrounds of the participants

Project	Participants	Language Background
Typology	**Signer A :** **Family background :** Deaf parents and siblings **International experience :** Attended Deaf Way II conference	**Native :** Korean Sign Language (South) **Intermediate :** written Korean **Minimal :** written English, International Sign
	Signer B : **Family background :** Deaf parents and siblings **International experience :** Moved from Uzbekistan to Germany	**Native :** Russian Sign Language **Fluent :** German Sign Language, (written) German, (written) Russian **Intermediate :** (written) English, International Sign
	Signer C : **Family background :** Hearing parents **International experience :** Attended Deaf Way II and WFD conferences	**Fluent :** Sign Language of the Netherlands, (written) Dutch **Minimal :** (written) English, International Sign
	Signer D : **Family background :** Hearing parents **International experience :** Has often travelled to Taiwan	**Fluent :** Hong Kong Sign Language **Intermediate :** Taiwan Sign Language, (written) Chinese
Multisign	**Signer E :** **Family background :** Hearing parents **International experience :** no experience	**Fluent :** Jordanian Sign Language **Intermediate :** (written) Arabic **Minimal :** (written) English
	Signer F : **Family background :** Hearing parents **International experience :** no experience	**Fluent :** Indonesian Sign Language (BISINDO) **Intermediate :** (written) Bahasa Indonesia **Minimal :** (written) English
	Signer G : **Family background :** Deaf parents and siblings **International experience :** no experience	**Fluent :** Nepali Sign Language **Minimal :** (written) Nepali, (written) English
	Signer H : **Family background :** Hearing parents **International experience :** Some experience of meeting deaf people from other countries.	**Fluent :** Indian Sign Language **Intermediate :** (written) English **Minimal :** (written) Hindi

While the groups' differing experiential and linguistic profiles offer a contrast, it is worth pointing out that these two corpora were used in part because such data are exceedingly rare, and these are the only two corpora of cross-signing known to the researcher. The chief concern in compiling the data sets was to ensure that all participants were fluent signers. The myriad factors that can influence cross-signers, such as piecemeal lexical knowledge from a variety of languages that they may have encountered at some point in their lifetime, are impossible to control for in a scientific study with such a rare data set. Therefore, while this research has made reasonable efforts to attend to language background factors and their potential impacts on the findings, it has not been feasible to control for the multiplicity of such variables.

1.5.3. The data activities
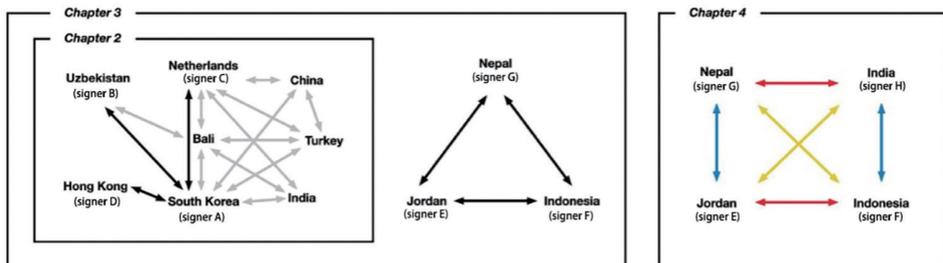
Figure 1.1. Participant configurations of cross-signing participants (Typology project dyads at left, and Multisign project dyads at right)

Figure 1.1 shows the interaction pairs in which signers participated in the two data sets, and arrows signifying the nationalities of the dyads used for this study appear in bold. The interactions depicted in the inside of the left-hand box are considered

in depth initially in Chapter 2, and then this data set is also discussed in Chapter 3, alongside discussion of the interaction presented in the triangle to the right of the left-hand box; subsequently, the interactions depicted in the right-hand box are explored in depth in Chapter 4.

Table 1.3. Summary of data duration

Dyad	Signers	Recording length	data
1	Signer A – Signer C	37 minutes	Typology
2	Signer A – Signer B	10 minutes	
3	Signer A – Signer D	33 minutes	
4	Signer G – Signer F	40 minutes	Multisign
5	Signer F – Signer E	29 minutes	
6	Signer E – Signer G	39 minutes	

The studies in Chapter 2 and Chapter 3 examine only the initial encounters between the participants, as these most aptly display the incipient features of cross-signing, prior to lexical convergence and accommodation.[6] Therefore, the analyses were carried out on 1 hour and 20 minutes of video data from the Typology project, which when combined with the 1 hour and 48 minutes from Multisign, amount to 3 hours and 8 minutes of video data.

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[6] For a study that investigates how cross-signing develops over time, based on several subsequent data collection sessions, see Bradford et al. (2019).

These data were transcribed using ELAN video annotation software (Sloetjes, 2013). Section 3.2.1 explains the transcription scheme that was used in these analyses. In addition to annotating the data, three of the participants were interviewed on webcam by the first author about some aspects of their interactions, in particular, the provenance of some of the signs they had used (See Section 3.3.1 for details). Several considerations were involved in choosing the pairs of signers. First of all, there is an equal number of dyads from Typology and Multisign (three pairs each). Because signers from both groups had been chosen according to different selection criteria, it was important to foresee potential comparison between the two groups. Having roughly equal amounts of data from each group is therefore beneficial. All dyads last between 30 and 40 minutes, with the exception of the conversation between Signer A and Signer B. This video is exceptional in that the conversation lasted only 10 minutes, as Table 1.3 above illustrates. For the Multisign group, the three pairs constitute the entire set of conversational data from the project sub-group that was based in India. A fourth signer was only involved in elicitation experiments but did not participate in the free conversations (see Bradford et al., 2019).

Within the Typology group, three dyads were chosen that all involved the same signer, Signer A, who is also the author of this study. As one of the participants, this affords particular insight and a unique perspective into the data. As argued in Zeshan (2015), the complexities of cross-signing can be understood better if we include an element of introspection from the perspective of those present in the

conversation. This motivated the choice of the sub-set of three dyadic conversations investigated here, as the Korean participant is present in all of them. The other three participants are selected here for analysis on the basis of diversity of their personal and linguistic backgrounds. This distribution means that each individual's amount of data is different in terms of how many minutes they were involved in a conversation, because some people are involved in conversations more than once. For example, Signer C is present in a total of 37 minutes of conversation with one other participant; Signer F is in a total of 69 minutes with two other participants; and Signer A appears in 80 minutes of conversation with three others. However, this variation in the amount of data is not too problematic because this study does not fully analyse patterns in the use of repair strategies at the level of individuals and is limited in this respect in that there are only minimal discussions of individual differences in the chapter that focuses on the Multisign project (Chaper 4).

In order to facilitate the initial encounters between the participants, specific research activity games were organised during the dyad interactions. For the Multisign signers new to India, the in-country assistants did not explain the games to the participants but were available to answer questions and clarify and translate any information that the participants were unsure about. (The participants required very little of this support.) The games were explained by the researcher to one pair of signers at a time just prior to the commencement of the filming, using a practice picture to demonstrate. During the sessions, the assistants were not present in the room. Afterwards, the in-country assistants were each filmed with their respective

participant going through each colour from 24 colour chips (see Figure 4.3 in Chapter 4 for further details), asking them how they signed each colour, including any alternative variants and signs from other sign languages that they used. The assistants also asked which language each variant/sign was from, to help facilitate easier data analysis later on (see further details in section 4.2.2). As stated in the previous section, the participants' only commonality in terms of language background is a very minimal use of English, and hence they sometimes relied on fingerspelled English words, using the one-handed rather than the two-handed alphabet. They are each at intermediary level in their national spoken language but did not tend to fingerspell words from these languages. Prior to the first game session, the participants had had one week during which they were free to converse with each other spontaneously. This is slightly different from the situation discussed in chapters 2 and 3, where participants had not met at all before data collection started. As this study focuses on experimental data from a specific limited domain rather than on free conversation, having a week of contact before data collection was not considered a methodological problem.

As noted in Table 1.4 below, the experiments took place on three occasions. The natural conversations, on the other hand, were recorded four times: upon their first meeting, one week later, two weeks later, and three weeks later. The experiments were not carried out on the same days as the natural conversation to minimise participants' fatigue. During the intervening time, the participants were also free to interact informally all day with each other and with the wider university community.

The university had a relatively large Deaf population due to running a course in sign language linguistics for Deaf students. This course was attended by deaf people from all over India, and from other parts of the world, too. Since the university is a rehabilitation-related institution, there were also a few Deaf people who studied other majors. At night, the participants were in university accommodation that was gender-segregated. This meant that the Nepali signer was separated from the other three in the evening, though in practice all of the signers spent more time interacting with local people and university students than with each other during the one-month study period. Before commencing the activities for the study, the non-Indian participants started learning Indian Sign Language and continued to learn it from the Indian participants throughout the experiment.

Table 1.4. Recording schedule, indicating the data analysed in chapter 4

	First meeting	After 1 week	After 2 weeks	After 3 weeks
Natural conversations	YES	YES	YES	YES
Experiments	NO	**YES**	YES	**YES**

In each session, each of the 4 participants played a game with each of the other participants, resulting in 3 games per session (see Table 1.5). Three sessions were recorded, each a week apart. The data for the main analysis came from week 1 and week 3.

Table 1.5. Summary of data activity sets

Session	Game	Dyad A	Dyad B	Recording length
Week 1	1	Jordan-India	Nepal-Indonesia	137min
	2	Jordan-Indonesia	Nepal-India	
	3	Indonesia-India	Jordan-Nepal	
Week 2	4	Jordan-Indonesia	Nepal-India	107min
	5	Jordan-Nepal	Indonesia-India	
	6	Jordan-India	Nepal-Indonesia	
Week 3	7	Indonesia-India	Jordan-Nepal	81min
	8	Jordan-Indonesia	Nepal-India	
	9	Jordan-India	Nepal-Indonesia	

1.6. Structure of the thesis

Most human communication is between people who speak or sign the same languages. Nevertheless, communication is to some extent possible where there is no language in common, as every tourist knows. How this works is of some theoretical interest (Levinson, 2006). A nice arena to explore this capacity is *cross-signing, i.e.* when deaf signers of different languages meet for the first time and are able to use the iconic affordances of sign to begin communication. This chapter has introduced some essential concepts and discussions related to cross-signing in order to situate it in a current context and to explore it in relation to other phenomena, such as International Sign. An introduction to intersubjectivity has also been provided, along with an initial description of the linguistic profiles of the participants and the data activities related to this study. It is relevant to note here that chapters 2, 3 and 4 have been earlier published (Chapter 2 as Byun, et al., 2018; Chapter 3 as Byun, et al., 2019 and Chapter 4 as Byun, et al., 2022).

The next chapter, Chapter 2, provides a detailed examination of first encounters between cross-signers, and the stages that they go through in order to repair initial errors in communication. Here, the main focus is on other-initiated repair (OIR), that is, where one signer makes clear that he or she does not understand, thus initiating repair of the prior conversational turn. OIR sequences are typically of a three-turn structure (Dingemanse, Roberts, et al., 2015), including the problem source turn (T-1), the initiation of repair (T0), and the turn offering a problem solution (T+1). These sequences seem to have a universal principle (ibid.). In most cases where such OIR occur, the signer of the troublesome turn (T-1) foresees potential difficulty and marks the utterance with "try markers" (Moerman, 1988; Sacks & Schegloff, 1979) which leads to a pause to invite recognition. The signers use repetition, gestural holds, prosodic lengthening, and eyegaze at the addressee as such try-markers. Moreover, when T-1 is try-marked this allows for faster response times of T+1 with respect to T0. This finding suggests that signers in these 'first encounter' situations actively anticipate potential trouble and, through try-marking, mobilise and facilitate OIRs. The suggestion is that heightened meta-linguistic awareness can be utilised to deal with these problems at the limits of our communicational ability.

Chapter 3 focuses specifically on repairs in cross-signing, including identification of trouble sources, repair strategies and communicative success. Sign language users may face communicative challenges that arise from the absence of a shared conventional language and are thus specifically associated with cross-signing. To resolve this communicative problem, signers capitalise on repair: a

sequential infrastructure that is accessible to all, partially independent of language

(Dingemanse, Roberts, et al., 2015). Repair sequences are central to understanding

the cooperative process of language creation in cross-sign settings, hence, this

chapter also focuses on Other-Initiated Repair (OIR) sequences that target the

use of novel signs: a three-turn structure including the problem source turn (T-

1), the initiation of repair (T0) and the turn offering a problem solution (T+1). At T0,

addressees frequently responded by repeating the sign that is the problem source,

thus initiating restrictive repair. In the absence of linguistic convention, signers use

a wide range of semiotic resources to resolve reference at T+1: including logical

inference, iconic depiction, and paraphrase. The individuals who participated in

this study vary naturally on potentially relevant dimensions, such as linguistic and

international experience as well as age of sign language acquisition. The analyses

are targeted to identify evidence of variation in metalinguistic abilities based on the

variety of tools that are available at T+1 as well as the number of embedded repair

sequences that are required to resolve reference. One general consideration arising

from these data sets involves the role of metalinguistic skills. Preliminary findings

show variation in both the success rate in resolving reference and the diversity of

metalinguistic structures that are used. It remains to be investigated how this may

correlate with individual backgrounds such as age of sign acquisition, being fluent

in multiple sign languages, and having international deaf social networks.

Following from this, Chapter 4 explores the ways in which interactive sequences

modulate the selection of expressive forms in cross-signing. The specific focus here

is on the evolution of the shared repertoire amongst signers over several weeks as they co-construct meaning across linguistic and cultural boundaries. We look at two possible factors influencing the selection of expressive forms (cf. Tamariz et al., 2014): content-bias (where the more iconically-motivated, and/or easily-articulated form is selected), and coordination-bias (where participants attempt to match each other's usage). The data set consists of a 325-minute corpus of first encounters between dyads of signers of Nepali Sign Language, Indian Sign Language, Jordanian Sign Language and Indonesian Sign Language. Recordings took place at the first meeting, after one week, and after three weeks, with the initial and final meeting reported here. The participants vary naturally with regard to their linguistic and international experience as well as their age of sign language acquisition. In addition to spontaneous conversations, structured dialogues were collected using a Director-Matcher task. In the set-up, the Director and the Matcher have minimally-distinct coloured images, alongside a set of colour chips from which they need to select based on the Director's descriptions. We coded and examined the various colour expressions exploited by the participants. The semantic field of colour was chosen for this investigation into the evolution of shared communication because the visual domain of colour retains sufficient levels of abstraction while affording signers iconic potential. Participants initially used a range of strategies, including pointing, articulating signs for common objects with that colour (e.g., referring to a common iconic vein on the wrist of the non-dominant hand and indicating the flow of blood out of the vein with the dominant hand to mean 'red'), and their own native variants. However, three weeks later these individuals all started using the same

forms, e.g., the Indian signer's variant for 'green' and the Nepali signer's improvised 'tree-trunk' variant for 'brown'. The iconic motivation of the latter and the ease of articulation of the former suggest that the content-bias is in play. The coordination-bias also seems influential in the group's eventual selection of one variant (cf. Tamariz et al. 2014), though above all, it is interaction itself that drives the selection of forms more strongly than either of these biases. This chapter also explores additional factors that can influence selection of a colour sign within the data. It also considers participants' metalinguistic skills (Zeshan, 2015) and fluency in multiple sign languages (Chapter 2).

In order to explore the rapid building of communication, Chapter 5 explores the phenomenon of intersubjectivity in the context of cross-signing, and how it is built rapidly due to the unique linguistic strategies available to cross-signers. Cross-signing creates fertile ground to examine cognitive aspects of language use, such as communicative trouble and repairs, because the interlocutors have no shared linguistic structure or conventional code to rely upon and can only draw on features such as visually-motivated forms or gestures and pragmatic principles of conversation. A cognitive issue in cross-signing contexts is the establishment of intersubjectivity. When humans can understand each other due to having a 'shared sense' of a situation, then they can successfully communicate and coordinate with each other. This shared sense is called 'intersubjectivity'; it is in fact the foundation for human cognition, and results from both interaction and representation (Alterman, 2007). Prior work by Zeshan and colleagues has suggested that cross-signers

build intersubjectivity and increase their communicative efficacy very rapidly (Zeshan, 2015). Therefore, this chapter will consider the key question: What enables cross-signers to rapidly build their intersubjectivity? The answer to this question will encompass both representation, i.e., formal features such as signed expressions motivated by visual iconicity (Emmorey, 2014); and interaction, i.e., communicative features such as the turn-taking system (Levinson, 2016). The effect of intersubjectivity on language construction will also be considered. Considering intersubjectivity and other notions from conversation analysis, or CA (e.g., Schegloff, 1992), the context of cross-signing addresses a gap in the literature, because most studies of cross-cultural signed communication (e.g., studies on International Sign) have focused on lexical and grammatical features, and/or have investigated production and interpretation issues rather than comprehension and interaction.

In Chapter 6, the concluding chapter, the discussion focuses on three specific areas from which conclusions are drawn: firstly, a return to the issue of language emergence summarises the findings in relation to the effectiveness of context in the development of intersubjectivity; next the relationship between cross-signing and International Sign is explored again, providing concluding remarks from a modern perspective; finally, I revisit my positionality in the research as a Deaf sign language user who also took part in the first data collection activity. Conclusions, then, are drawn across many aspects of building intersubjectivity and of the importance of understanding the role that such factors have to play in cross-signing settings.

2. First Encounters: Repair Sequences in Cross-signing[7]

2.1. Introduction

2.1.1. Contact situations between sign language users: Cross-signing

The study of conversation between partners who have no shared language may at first seem an exercise in futility. However, Deaf[8] sign language users from different countries who do not share a common language, signed or written, are readily able to engage in such conversations, for instance during international events, or when traveling. Such signed interactions, where communication emerges ad hoc between individuals without a shared language, have been designated 'cross-signing' (Bradford, Sagara & Zeshan, 2013; Zeshan, 2015). Cross-signing is distinct from International Sign, which can be considered a semi-conventionalised pidgin and has developed over a substantial time period as the main form of communication at international gatherings of Deaf people such as the congresses and events hosted by transnational organisations including the World Federation of the Deaf or the European Union of the Deaf (Allsop, Woll & Brauti, 1995; Supalla & Webb, 1995).

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[7] A version of this chapter has been published as Byun, K.-S., De Vos, C., Bradford, A., Zeshan, U., & Levinson, S. C. (2018). First encounters: Repair sequences in cross-signing. Topics in Cognitive Science 10 (2), 314-334. doi:10.1111/tops.12303.

[8] The capital letter is commonly used to signify group identification as a member of the signing community, in this case spanning cultures.

Cross-signing arises from the particular sociolinguistic situation of Deaf sign language users. Deaf people as a minority population use the visual-gestural mode of communication, while hearing people constitute the linguistic majority that relies on the auditory-vocal mode. There are relatively few hearing people who are keen on learning a sign language to communicate with Deaf people. As a result, there is a strong sense of kinship and shared identity among Deaf people internationally, commonly expressed as "Deaf like me" (Spradley & Spradley, 1985). For this reason, Deaf people who travel abroad tend to have a strong preference for interacting with other Deaf people. This study analyses one of the central means used to create mutual understanding on the spot in initial encounters between Deaf people of different countries. Naturally, in conversation between two participants who have no shared language, communicative success cannot be presumed, and communication trouble is frequent. All human communication involves metalinguistic awareness (as shown e.g., by the choice of reference forms or linguistic register), but in these circumstances communication is by necessity metalinguistically rich, as participants must strive to build meaning in a creative, local and collaborative manner to achieve mutual understanding. This involves a progressive series of steps towards increasing mutual understanding (Zeshan, 2015). An important aspect of this stepwise process is the function of repair mechanisms to address communication trouble, as well as the use of try-markers, which signal by their form the current signer's insecurity as to whether their addressee will be familiar with a particular form or referent (as in 'the vegan restaurant?', where rising intonation signals uncertainty about recognition). As could

be expected, repair sequences are common in these cross-signing interactions. Hence, the present study investigates how communicative trouble is anticipated, recognised and repaired by conversational partners. The study investigates such repair sequences during first encounters, capitalising on insights from Conversation Analysis (CA), where repair sequences have been intensively investigated, albeit in situations involving a shared language (Sacks et al., 1974; Schegloff et al., 1977; see also Dingemanse et al., 2015). While work on the conversational infrastructure of signed languages has been sparse to date, initial reports suggest that despite potential differences between the auditory and visual language modalities, very similar turn-taking principles apply to signed languages as have previously been reported of spoken languages. This is, for instance, evidenced by the mechanisms that are in place to enable smooth turn transitions (Baker, 1977; Mesch, 2010), resolve overlap (McCleary & Leite, 2013; Girard-Groeber, 2015), and optimise turn timing in signed conversations (de Vos et al., 2015). Hence, CA methods are particularly well-suited to the study of cross-signing, as these interactions and the communicative strategies that feature in them are not easily understood outside the particularities of the sequential context in which they emerge.

2.1.2. Repairs in spoken and signed conversations

Within CA, repair denotes the operations that participants use to address some trouble in communication (Schegloff et al., 1977). This includes "misarticulations, malapropisms, use of a 'wrong' word, unavailability of a word when needed, failure

to hear or to be heard, trouble on the part of the recipient in understanding, [and] incorrect understandings by recipients" (Schegloff, 1987: 210). Repair is initiated by the speaker or the addressee; either way, repair is normally accomplished by the speaker of the trouble source (Schegloff et al., 1977). The majority of repair actions (at least in spoken languages) are 'self-initiated repair' (SR), i.e., begun by the speaker of the trouble-source. Once initiated, there will usually be a repair solution, and the self-initiator is most likely to solve the problem. Less commonly, repair may be initiated by one participant, the recipient of the trouble-source, and completed by the other, the originator of the trouble, and the resulting sequence is known as 'Other-initiated repair' (OIR) (Schegloff et al., 1977). The OIR sequence has three basic steps: the trouble source (T-1), the repair initiator (T0), and the repair solution (T+1). Three basic types of repair initiators have been attested across a range of languages: open class, e.g., "sorry?", "huh?" or "what?" (where the exact nature or location of the trouble is unspecified); restricted requests, e.g., category-specific questions ("who?"), or repeating the trouble-source turn portion that was not understood (where the locus of the trouble is identified), and restricted offers, which offer a candidate understanding, e.g., "do you mean ...?" (Dingemanse, Roberts, et al., 2015).

In signed conversations, recipients provide visual feedback to the producer by means of nods and facial expressions (Fenlon, Schembri & Sutton-Spence, 2013). In signed languages, non-manual signals (albeit of a specific kind) are also used as open-class forms of repair initiation. Depending on the language background

of the recipient, such signals may include a raised or furrowed brow, a wrinkling of the nose, or blinking (Johnson, 1991; Dively, 1998). In this context of non-manual backchanneling, a blank expression combined with holding or freezing of the hands can be taken to signal a trouble in seeing or understanding (Manrique & Enfield, 2015). Note that back-channel elicitation of repair is potentially "off-record" – it may signal likely problems in understanding but not overtly request repair. Manual forms of open OIR in signed languages include gestures such as the palm-up gesture (Dively, 1998). In the context of tactile signing, such as between DeafBlind persons, tactile cues such as, tactile hand waving, light pressure or tactile signing of 'what?' or 'What did you say?' are used as open forms of OIR to indicate a problem in understanding (Mesch, 2001). Even in conversations using spoken languages, repair initiations involving gestures occur. These may be manual, such as cupping a hand to the ear (Mortensen, 2012) or non-manual, such as a head tilt and raised eyebrows (Seo & Koshik, 2010). Mortensen (2012) calls these embodied repair initiations "visual initiations of repair". They are open forms as they do not necessarily specify the problematic part of the utterance (except perhaps through timing of the action) but merely signal a problem in hearing or understanding.

In spoken languages, repetition can count as open-class if the whole utterance is repeated or restricted if just part of the original utterance is repeated. In parallel with speakers, sign language users can also initiate restricted repair sequences by full or partial repetition of the trouble source turn, or by offering a candidate understanding, or, more rarely, using question words (e.g., Johnson, 1991; Dively,

1998). This chapter is focused on restricted repair sequences, which are the most frequently used type of OIR in the cross-signing data. In this context, metalinguistic awareness is also of interest, which includes phonological, morphosyntactic and pragmatic levels (Tunmer & Bowey, 1984; Silverstein, 1981), and evidence of all three of these is found in the cross-signing data. But here it is useful to focus specifically on the lexical level as a locus of metalinguistic awareness because of the importance of resolving the meaning of individual lexical signs that are not shared by sign-interlocutors. In ordinary conversation, unknown or unconventional words may be a relatively minor source of trouble, but in cross-signing this is a central issue.

2.2. Methodology and data

The methodology employed in this study comprises observations of pairs of signers as they engage in cross-signing activites. The dyads of participants were arranged into two data sets, which are described in Chapter 1, in section 1.5.1. This section (2.2) focuses on the Typology project dyads only, and details of the Typlogy participants' backgrounds are also provided in Chapter 1, in section 1.5.2 and in the first four rows of Table 1.2, found in the same section. The participant configurations by country are shown in section 1.5.3, in Figure 1.1 Section 1.5.3 also provides details of the duration of each paired interaction, in Table 1.3, totalling in 1 hour and 20 minutes of video data from the Typology project.

2.2.1. Data annotation

The video-annotation software ELAN was used to code for the following parameters: (1) try-markers (e.g., holds, mouthing, repetition, slowing); (2) types of OIR (restricted, open); (3) OIR sequences through T-1, T0 and T+1; (4) repair initiations at T0 (e.g., repetition, added mouthing, hand waving); (5) language resources for making the repair (e.g., repetition, fingerspelling, substitution, explanations, examples, and iconic-indexicality, see Chapter 3); (6) gesture movement phase (e.g., hands being raised to prepare for signing); and (7) non-manual markers (e.g., eye gaze, mouthing, headshake).

In order to analyse the timing of subsequent turns the Kita et al. (1998) gesture phase coding system has been adopted, which differentiates between four gestural movement phases of the hands. Using the example of the sign BROTHER (Figure 2.1), there is a phase of preparation in which the hand is rising, not yet at the location of the sign itself but already with the initial handshape forming. This is followed by the second phase, the stroke, in which the sign itself is produced. In the third phase, the terminal handshape of the sign may be held at the end. Finally, the hand is lowered in the fourth phase of retraction.
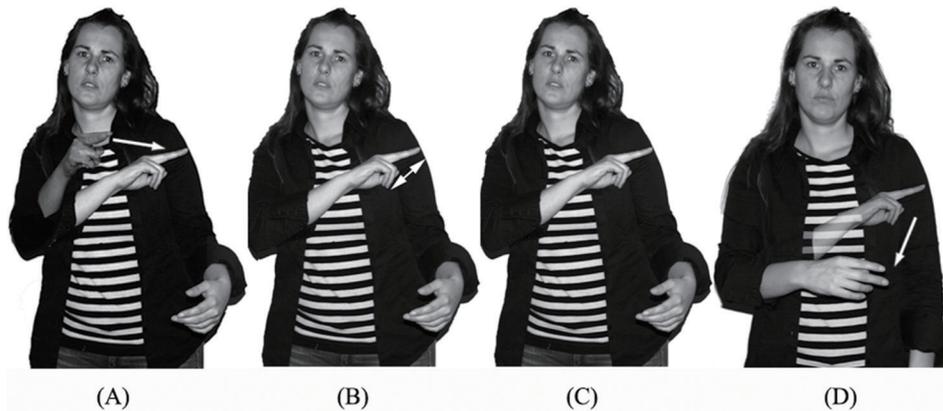
Figure 2.1. Gesture movement phases of the sign SIBLING in Sign Language of the Netherlands (A: Preparation, B: Stroke, C: Hold, and D: Retraction) (Adapted from de Vos et al., 2015)

In sections 2.3 and 2.4, the characteristics of repair sequences in these cross-signing interactions are discussed in detail, including the various resources that are used to initiate repair, the anticipation of repair as evidenced by try-marking, as well as the timeframe within which repair is resolved in cases where try-marking is either present or absent on the trouble source turn.

2.3. Try markers in cross-signing

2.3.1. Try markers in spoken and signed languages

In their analysis of spontaneous conversation of English, Sacks & Schegloff (2007: 26 [1979]) first described try-markers as the use of rising intonation, followed by a brief pause to indicate that the "...form being used will on this occasion, for this recipient,

possibly be inadequate for securing recognition". In cases where the recipient

has been able to identify the referent, try-marking has been observed to lead to

acknowledgements, such as an "uhuh" or a nod during the following pause. In more

problematic cases, when the recipient does not insert such a response, the speaker

will attempt to offer further descriptors. Moerman (1988: 39) argues that in spoken

Thai, rising intonation rarely features in try-marked turns, but short pauses are more

common. Additionally, Moerman (1988: 191) suggests that stretching the final

continuant or adding the particle /ni/ in sentence-final position may project possible

further talk by the current speaker, thus prompting a back-channeling signal from the

interlocutor. In Kata Kolok, a rural signing variety in the north of Bali, squinted eyes

may be combined with pointing signs to check the interlocutor's familiarity with the

indicated location, effectively functioning as try-marking of the locative references

(De Vos, 2012: 374). Like spoken try-marked turns, such expressions often evoke a

single nod in return. Thus, it seems that there are language-specific strategies that

function as try-makers on an interactional level yet there are also common semiotic

features attested such as questioning prosody as well as a brief pause of the try-

marked constituent in question (Clark, 1996). Due to the nature of cross-signing,

numerous lexical signs will be unfamiliar to the interlocutor, and turns are thus

frequently try-marked. In the following section, the various formal strategies that have

been identified as try-markers in the cross-signing data set are described.

2.3.2. Try markers in the cross-signing data: Form and patterns of occurrence

A try-marker explicitly invites a grounding sequence (i.e., the overt intentional establishment of common ground in an interaction, cf. Clark, 1996), which may be either an affirmative response token, or a request for clarification (OIR). Although try-markers are not obligatory on T-1 for a repair initiation to occur, as it is always possible for the addressee to initiate repair, the frequency of try-markers at T-1 in OIR sequences is striking. Out of a total of 51 OIR sequences coded in the data, 39 sequences (76%) appear with a try-marker in T-1, while 12 sequences (24%) appear without a try-marker. In cross-signing, try-markers have discrete forms, and the formal properties of try-markers that occur at T-1 are summarised in Table 2.1. The data reveal that eye contact occurs in 100% of all try-markers at T-1, clearly an obligatory form. As a close second, the use of a hold, i.e., holding the sign in final position for an extended duration, as a try-marker at T-1 occurs so frequently (at 97%) that it is practically obligatory. Other formal properties of try-markers with frequent occurrence are added mouthing and repetition. In 6 cases (15%), T-1 included an explicit question as to whether the interlocutor is familiar with a particular sign.

Table 2.1. Frequencies of formal features of try-markers at T-1 of OIR sequences

Formal characteristics of T-1	Eye contact	Hold	Mouthing	Repetition	Explicit question
Try-marking at T-1 **39 (100%)**	39 (100%)	36 (97%)	19 (49%)	17 (44%)	6 (15%)
No try-marking at T-1 **12 (100%)**	6 (50%)	3 (25%)	2 (17%)	–	–

These data demonstrate that try-markers in cross-signing typically have several co-occurring formal features, with the canonical form consisting of eye contact and hold, and additional frequent, but optional, features in the form of repetition and mouthing. As shown in the bottom row of Table 2.1, some of the same formal features also occasionally occur in non-try-marked turns, but do not have the function of try-marking in these cases.

Example 2.1 shows the use of a try-marker in the conversation between the signers from Korea and Hong Kong. In this example, signer A uses two try-marked utterances in sequence, both of which are marked by eye contact and hold thus inviting a grounding response by the recipient with the aim of identifying whether the message was understood correctly. Thus try-markers provide the recipient with an opportunity to signal understanding or request clarification and are an explicit strategy for the current signer to ascertain if the recipient has understood one's message. As marked in the ELAN transcript, signer D provides the expected feedback such as a head nod, which is taken as a form of off-record repair.

Example 2.1. Try-marker with eye-contact, hold, and repetition

Signer A produces the Korean sign PEOPLE for the first time, making eye contact and holding the sign in final position. Signer D does not respond, keeping a blank expression, i.e. off record repair.	A then repeats the sign more slowly, sustaining eye contact and questioning expression, again holding the sign in final position.	At A's repetition, D copies the sign and holds it in final position along with A.	As signer A begins to fingerspell 'people' and articulates P-E-O, signer D offers his understanding using a kanji-based sign for 'person' and then the sign for 'many'. Signer A stops spelling and affirms that signer D has understood the meaning.

Try-makers are evidence of metalinguistic awareness on the part of the signer using them. During cross-signing, signers continuously entertain hypotheses about what the interlocutor may be able to understand, and keep track of signs whose meaning has been 'agreed' between participants just as speaking interlocutors implicitly come to agree on reference forms (Schober & Clark, 1989) (Zeshan, 2015 describes this process of meaning negotiation in detail). Try-marking occurs when signers are aware that the signs they are using may constitute a trouble source for their interlocutor. Furthermore, the analyses of the timing of OIR sequences indicate that try-marking of T-1 can expedite the process of communicative repair as such. The implications of the data for the issue of metalinguistic awareness are explored further in section 2.4.

2.4. Repair in cross-signing

2.4.1. Other-initiated repair in cross-signing data: Formal characteristics

Misunderstandings can originate at different levels of communication, including at the level of metacommunicative actions (Clark, 1996; Dingemanse et al., 2014; Robinson & Kevoe-Feldman, 2010). In cross-signing, since there is no shared code, the trouble sources are likely in the first instance to involve the level of meaning of individual signs. In line with this, in the cross-signing data it was found that there is a preference for restricted repair initiators, as the recipient would interrupt to enquire about the meaning of specific signs. In the current data set of 51 OIR sequences, only 3 instances concerned open-class repair initiations. Open-class repair initiators in the cross-signing data included signing "what?", or "I don't understand". A second type of open repair initiator is the use of off-record repair (see examples 1 and 3), that is, a non-occurrence of the expected backchanneling such as nodding and facial expressions given by the recipient that indicates attention and understanding (Manrique & Enfield, 2015). Non-manual signals such as a frown can also effectively function as open repair initiators. Finally, the data contain a third type of repair initiator, a small wave or gesture towards the speaker with a questioning expression, which also falls in the open-class category.

Restricted repair initiators in the data frequently involve repetition. That is to say, the recipient copies a sign accompanied by a simultaneous questioning expression

e.g., raised eyebrows and/or a head tilt. This may be accompanied by pointing to the sign with the other hand. These phenomena would seem to correspond to someone repeating a trouble source word in spoken languages with rising intonation. Table 2.2 below shows the frequencies of repair initiators and their sub-types within all 51 OIR sequences. The first row shows the frequency by form of the repair-initiator. The following rows show a breakdown of frequencies according to whether or not there has been a preceding try-marker at T-1. The columns break down the repair-initiators by abstract character (e.g., repetition) or concrete form (e.g., body lean). Note that here 'off-record initiators' often consist of withholding of expected affirmative back-channels.

In the data, repetition of the trouble source was the most frequent repair strategy, while candidate understandings were in fact less frequent (cf. Schegloff et al., 1977). In some cases, these repair-initiating repetitions were slower in production and formally smaller than the original trouble source, but no clear pattern has been identified as to whether this had any consequences for how that repair initiation was dealt with by the participants (cf. Curl, 2005). As with the form of try-markers discussed in section 2.3.2, some of the repair-initiating forms co-occur. For instance, the attention-getting gesture (hand wave, tap or pausing gesture) could co-occur with a forward-leaning body posture, followed by repeating the sign in question. Interestingly, body leans are commonly found in repair sequences of Argentine Sign Language (cf. Floyd et al., 2016). Off-record repair, by definition, always occurs on its own, and is not combined with any of the other forms (Manrique & Enfield, 2015). Conversely, in this data, signers produce repetitive nodding with

a puzzled facial expression, indicating they are not confident they understand fully. This is particularly interesting, as nodding is normally associated with acknowledgements, but by combining it with a puzzled look cross-signers are able to convey that the grounding sequence initiated by the try-marker has not come to completion. In this data set, such tentative acknowledgements are therefore often taken as repair initiations on behalf of their interlocutor. Aside from head nods, T0s also included other head movements such as forward head tilts, chin raises and side-to-side headshakes. Notably, restricted offers, also known as candidate understandings, do not occur on their own in the data set and are only attested in addition to repetition of the trouble source (cf. Dingemanse et al., 2014).

Table 2.2. Types and frequencies of repair initiation at T0

	Repetition	Candidate understanding	Attention-getter	Head movement	Facial expression	Body lean	Off-record repair	Tentative
All T0s	34 (67%)	6 (12%)	11 (22%)	35 (69%)	18 (35%)	17 (33%)	11 (22%)	8 (16%)
Try-marking of T-1	25 (64%)	6 (15%)	3 (8%)	25 (64%)	15 (8%)	8 (21%)	10 (26%)	8 (21%)
No try-marking of T-1	9 (75%)	-	8 (67%)	10 (83%)	3 (25%)	9 (75%)	1 (8%)	–

The data show that regardless of the presence or absence of a try-marker, the most frequent form of repair initiation at T0 is repetition, with an overall occurrence rate of 67% (75% in sequences without try-marker and 64% in sequences with try-marker). Repetition is associated with restricted repair because repeating a sign is equivalent to asking for clarification of the meaning of this particular sign only.

The other repair initiators found in the data show distinct patterns according to their occurrence in OIR sequences with and without try-markers. The attention-getting hand wave gesture occurs much more often in contexts where there has been no preceding try-marker. In other words, if no try-marker is used at T-1, the recipient must take responsibility for requesting clarification, and the attention-getting hand wave gesture is a common way of doing that. Leaning forward towards the interlocutor's signing space is another way to signal an interruption for clarification, and therefore it occurs more frequently in the absence of try-markers, although forward body lean is also present in a minority of OIR sequences with try-markers (21%). Conversely, off-record repair is most likely to be taken to be a repair initiator only if preceded by a try-marker (there is only one exception of absence of back-channeling without preceding try-marker). This pattern arises from the fact that try-markers make relevant an acknowledgment of understanding, and in the absence of such a signal, subsequent moves are taken as a repair initiation. In the data, a try-marker at T-1 is often followed by a blank expression instead of the back-channeling normally expected if the recipient understands; this happens in 26% of OIR interactions with try-markers. Alternatively, the try-marker may be responded to with an inclined body orientation and repeated head nods indicating that more information is desired, as the recipient is still processing the message. These nods are called 'tentative acknowledgements' here, and they occur only if there has been a try-marker at T-1.

Examples 2.2 and 2.3 show OIR sequences without a try-marker and with a try-marker respectively. In Example 2.2, the repair initiators are attention-getting gesture, forward head/body lean, and repetition. In Example 2.3, there is a sustained absence of (affirmative) back-channeling from signer A (the off-record initiating mentioned above), while signer B uses several try-markers and communicative strategies to try and convey the intended meaning.

Example 2.2. Other-Initiation of Repair without try-marker at T-1

| T-1(no try-marker): Signer A produces the sign HAPPY without a try-marker. | T0 : Signer D interrupts with a tap and pausing gesture and repeats the sign HAPPY to ask for meaning. |

Example 2.3. Other-initiation of repair with try-marker at T-1

| T-1 (try-marked) : Signer B signs BORN with a brief hold eye contact, but signer A withholds backchannelling (off-record repair) | T-1 (try-marked) : Signer B Signs OLD with a brief hold, with eye contact and a blank expression from signer A. | T-1 (try-marked) : SignerB signs MAP with classifiers. Signer A maintains his blank expression with a finger on his chin throughout the utterance. |

2.4.2. Types and timing of OIR sequences

In cross-signing, restricted OIR sequences can be further classified based on the timing of the respective turns: T-1, T0 and T+1. De Vos et al. (2015) discuss the timing of turn-taking in spontaneous signed conversations, using the gesture phases shown in Figure 2.1 above (preparation, stroke, hold, and retraction). They report that in question-answer sequences of Sign Language of the Netherlands, signers optimise stroke-to-stroke turn boundaries, and overlapping holds, preparation, and retraction phases are not treated as intrusive to the on-going discourse. In the normal case, the beginning of a turn-initial stroke starts approximately 200 ms after the turn-final stroke of the preceding turn has ended, just like spoken turns typically occur with a 200-300 ms gap. Cross-signers, in the normal case of repair initiation, also minimise the offset between the end of the final stroke of T0 and the beginning of the first stroke of T+1. Additionally, the analysis reveals that try-marking on T-1 facilitates the occurrence of fast-track repair sequences in which T0 and T+1 effectively coincide. This is when T+1's turn-initial stroke coincides with turn-final stroke of T0. Conversely, repair solutions may be delayed at T+1, when the preparation phase of T+1 is initiated after the final stroke of T0 has ended, but the hands are still held up the air. When T0 is not initiated until after the retraction of T0, those cases have been considered as a gap in the communication.

Figure 2.2. represents all 4 timing categories graphically.
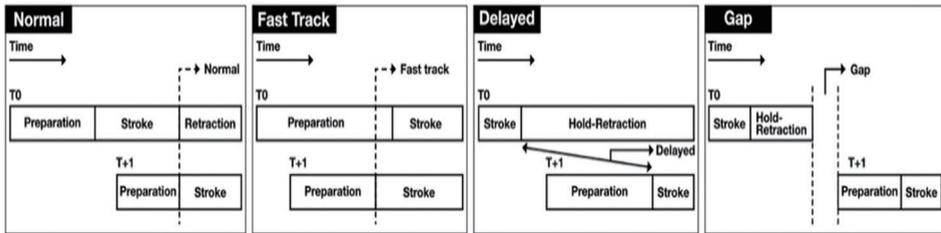
Figure 2.2. Timing of T+1 in relation to T0

Table 2.3 below summarises the types and timings of 42 OIR sequences. The remaining nine OIR sequences have only non-manual behaviors in some of the relevant turns, without any manual signs. Therefore, the timing categorisation could not apply because it relies on the timing of gesture phases which are defined as being manual behaviors. Although non-manual behaviors also occur at specific times, they are outside the scope of the data in Table 2.3:

Table 2.3. The timing of Repair in T+1 in relation to Initiation in T0, according to the categories in Figure 2.2

	Fast-track	Normal	Delay	Gap	Total
Timing of T+1	15 (35.7%)	7 (16.7%)	12 (28.6%)	8 (19.0%)	42 (100%)
Try marking of T-1	15 (44.7%)	7 (20.6%)	6 (17.6%)	6 (17.6%)	34 (83.9%)
No try-marking of T-1	-	-	6 (75%)	2 (25%)	8 (19.1%)

Fast-track repair sequences

In the data, it was often found that after T-1, rather than waiting until the stroke phase of T0 is complete, the signer responds by offering a solution (T+1) very quickly, at the initial preparation phase of the recipient's repair initiation. In effect, the repair initiator and its solution are produced simultaneously. The term fast-track repair sequence is used here for this latter type of interactional sequence. This data reveal that such fast-track repair sequences, where T+1 and T0 coincide, only occur in the presence of try-markers. Hence, it seems that try-markers directly facilitate fast resolution of trouble in communication, when a signer anticipates trouble and marks out signs as foreseeably potentially troublesome.

Example 2.4 illustrates a fast-track repair sequence which occurred in the context of one of the signers bringing up the issue of sign language interpretation. Signer C starts off by using his native sign[9] INTERPRETING^{NGT} which he try-marks by making eye contact with his interlocutor and holding the sign. Signer A begins to respond by repeating the sign with a forward head tilt, thus initiating repair. In the absence of an acknowledgement such as a nod, Signer C can project this forthcoming repair initiator and immediately provides the ASL sign INTERPRETER^{ASL}. In Example 2.4, the overlap pattern between the preparation, stroke and hold phases (P, S and H) of signs is visible in the time-aligned ELAN annotations, together with screen shots of the signs for INTERPRETER. The dashed line indicates the start of the stroke of T+1, which aligns with the preparation phase of T0.

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[9] In this chapter the use of lexical signs from conventional sign languages is indicated by abbreviations in superscripted small caps directly following the sign. NGT stands for *Nederlandse Gebarentaal* / Sign Language of the Netherlands, ASL for American Sign Language, and HKSL for Hong Kong Sign Language.

Example 2.4. Fast-track repair sequence

T-1 (try-marked): Signer C articulates the NGT sign INTERPRETER and holds it, with eye contact.	T0: Signer A brings hands into the preparation phase of a repetition of the sign.	T+1: Before signer A has finished producing the repetition of the sign (whilst still in the preparation phase), signer C switches to the ASL sign INTERPRETER.
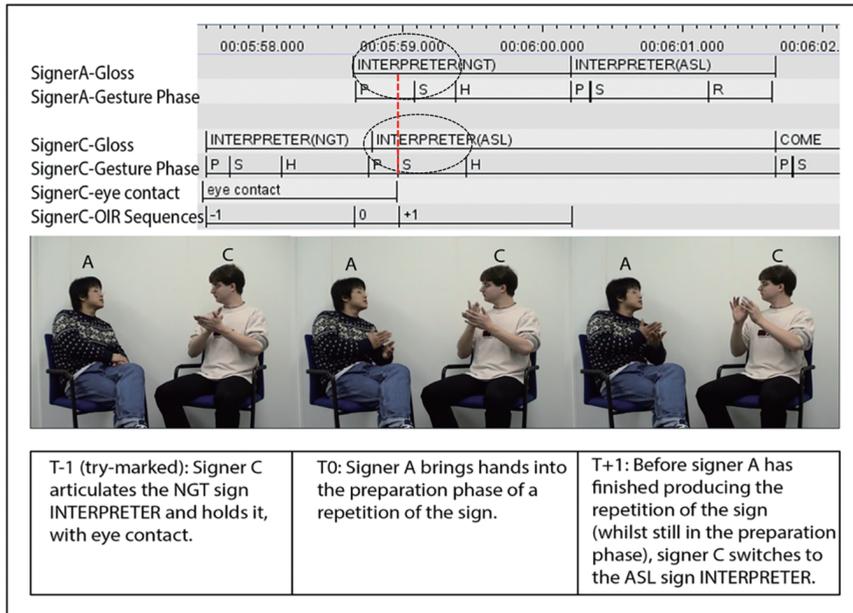
Repair sequences with delayed response

In addition to fast-track sequences, there is also evidence of occasional delays in the timing of repair sequences in the data. Such sequences with delayed response are associated with the absence of try-markers, although delayed responses and gaps do occur under both circumstances. The high percentage of delayed responses where there is no try-marker makes sense from an interactional point of view. As the signer of the trouble source does not expect nor anticipates the repair initiation, it takes more time to come up with a repair strategy. Note that in spoken interaction, repair-initiators tend to be systematically delayed in just these circumstances (Kendrick, 2015).

One example of delay concerns a difficulty in the expression of the concept of happiness (Example 2.5). In this excerpt, signer A uses his native sign HAPPY[HKSL] when talking about meeting other young signers in Hong Kong. In the absence of try-marking, Signer C initiates repair with an attention-getting gesture followed by a repetition and subsequent hold of the sign HAPPY[HKSL] while he leans forward. Signer A then breaks eye contact in considering the repair initiation, delaying the response, before offering EMOTION GOOD as a trouble solution.

Example 2.5. Delayed repair sequence

| T0 : Signer D repeats the sign HAPPY with a questioning expression as T0. | T+1 : Signer A then breaks eye contact in considering the repair, delaying the response. Finally, signer A offers EMOTION GOOD as a trouble solution. |

Gaps in repair sequences

Breaking eye contact with the interlocutor is typical of a gap after T0. In such cases, neither participant is actively producing signs, nor is receptive to signs. The effect of breaking eye contact is to allow the current signer extra time for metalinguistic processing, as they consider further options how to resolve the communication difficulty. In a sense, this is the opposite of try-marking. While try-marking signals to the interlocutor "you are welcome to interrupt here for clarification", breaking eye contact signals "don't interrupt me now, I am thinking". Example 2.6 illustrates such a lapse in the conversation where the repair solution comes markedly late after the repair initiation.

Example 2.6. Repair sequence with gap
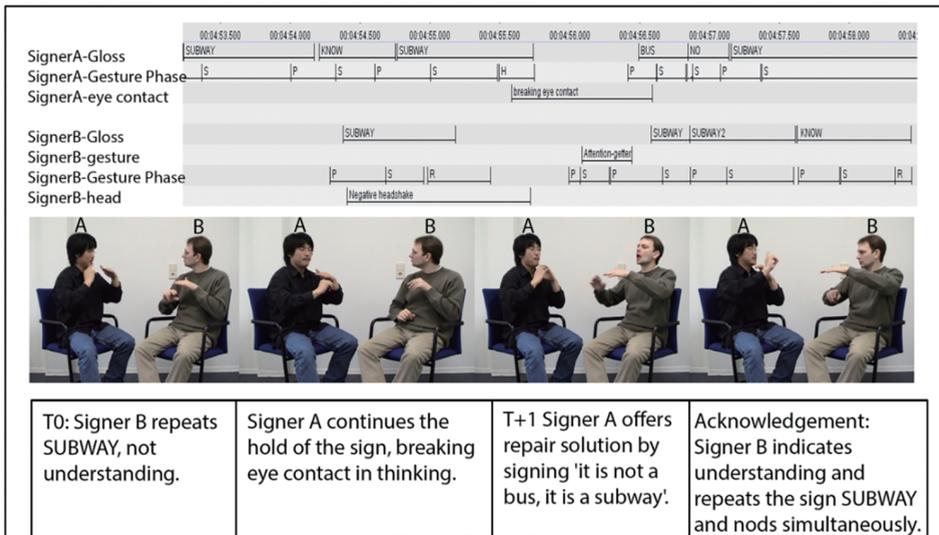
All types of repair sequences have in common the goal of achieving intersubjectivity, that is, establishing the knowledge and mutual agreement that both interlocutors share the newly introduced conventions (in most cases, a sign whose agreed meaning was in doubt), both as producers and receivers in the communication (Tomasello, 2003). The present data differ from available studies on spoken languages in that intersubjectivity is minimal at the beginning, as there is no shared language. At the same time, deaf signers in these interactions are able to improve the level of intersubjectivity with considerable success, and it seems that this is enabled by some particular affordances of the signed modality. For example, the spatial iconicity of sign languages enables the interpretability of some signs, while signed output allows for a higher level of simultaneity compared to speech, and simultaneity of both interlocutors' output is exploited in the fast-track repair sequences.

2.5. Conclusions

This study so far has analysed first encounters between Deaf sign language users who do not have shared competence in any sign language. Unlike speakers of unrelated languages, signers are able to communicate successfully about a range of topics, including academic and personal life. Miscommunication, and the chance thereof, are nevertheless a continuous challenge to the flow of the ongoing conversation given the lack of conventional signs. The analyses focus on how signers signal and anticipate such trouble in ongoing conversation.

The data investigated here show several interesting patterns that differ from what has been found in previous research. First of all, cross-signing interactions have a very high percentage of restricted repair through repetition of the trouble source, presumably due to the fact that there is no shared language available in the interaction. Therefore, grounding is essential to the interaction, and there is a particular challenge with respect to understanding lexical signs used by the interlocutor (Clark, 1996; Zeshan, 2015). Moreover, grounding sequences which are sequential in spoken languages (Clark & Brennan, 1991) can partly overlap in signed conversation, as is evident in the fast-track repair sequences discussed here.

This chapter has also investigated the use of try-markers within the context of signed repair sequences. The canonical form of try-markers, with eye contact and hold of the sign in its final position, is equivalent to the typical try-marking intonation patterns in spoken languages. Data provide evidence that try-markers create a welcoming environment for repair and can expedite the process of repair, facilitating fast-track repair sequences. Such sequences, characterised by a timing overlap between T0 and T+1, only occur in the presence of try-markers. These findings on the relationship between T0 and T+1 qualify the general observation that repair initiations in spoken languages tend to occur after a brief gap of silence after T-1, more than twice the duration of silence preceding responses to polar questions (Kendrick, 2015).

The issue of metalinguistic awareness has also been of interest to this research,

and the occurrence of try-markers is overt evidence for metalinguistic reasoning: signers use try-markers when signers anticipate understanding trouble. This implies that signers are monitoring their own output with respect to how likely their signs are to be understood by the interlocutor. In the process, they use metalinguistic reasoning to decide which signs are likely trouble sources, resulting in the use of try-marking for those signs. Another aspect of metalinguistic skills is the range of repair strategies employed by signers after a trouble source has been flagged up. Initial observation suggests that signers differ as to the range of strategies they have at their disposal in order to overcome communication difficulties. For instance, strategies of clarification include using a sign from another sign language, fingerspelling, mouthing, drawing or writing in the air, and circumlocution with highly iconic signs or gestures. In effect, cross-signing prompts multimodal behavior, as signers exploit linguistic and interactional creativity (Zeshan, 2015).

It is tempting to see cross-signing as a window into the development of other types of signed communication, such as the development of 'home sign', i.e., the ad hoc gestural communication of deaf individuals growing up in an environment without any other deaf people or sign language users present (Goldin-Meadow & Mylander, 1998). When home signers are brought into contact for the first time, usually as children in a newly established school for the deaf, their signed communication becomes successively enriched and conventionalised (Kegl et al., 1999). However, it is important not to jump to conclusions because deaf home signing children may well differ from cross-signers in terms of cognitive resources

and metalinguistic strategies, as the cross-signers in this study are already fully fluent in a sign language. Thus, the signed modality alone is not enough to presume that the same processes, e.g., for creating intersubjectivity, are at work, and this is a matter of empirical research. On the other hand, International Sign (IS), being used by adult signers as an international lingua franca (McKee & Napier, 2002; Rosenstock, 2008), is likely to have parallels with cross-signing in its development because the sociolinguistic context is very similar, and cross-signing is claimed to be "a window into the past of the development of IS" in (Zeshan, 2015: 254). Within cross-signing, the extent and patterns of individual differences between signers as to the resources and strategies used for repair need to be subject to future research. Moreover, it is also acknowledged here that OIR sequences can have more complex patterns, e.g., repeated repair attempts. These have not been fully studied in the current research and need further exploration in future.

3. Repair in cross-signing: Trouble sources, repair strategies and communicative success[10]

3.1. Introduction

The scholarly recognition that signs and gestures comprise actual, genuine languages, following Stokoe's unprecedented research in 1960, made a large impact on the field of linguistics. This and other sign language linguists' research in the next decades introduced the concept of a 'visual-gestural language' for the first time and demonstrated that sign languages have their own phonology, morphology and syntax. However, there is still very little research into the use and scale of these languages. The World Federation of the Deaf (WFD) states that out of the 7 billion people who live across the globe, about 70 million are deaf (including those who may identify as 'hard of hearing'), which is based on the tendency for 0.1% of the population to be deaf (Hill, 2015). Thus, only a small proportion of a given population is deaf. Additionally, though sign languages are the languages of deaf communities, not all deaf people use them, making the population of deaf signers smaller still.

Because so few hearing people use sign language, deaf signers become accustomed to exploiting their own and other people's gestural skills. For example,

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[10] A version of this chapter has been published as Byun, K.-S., De Vos, C., Zeshan, U., & Levinson, S. C. (2019). *Repair in cross-signing: Trouble sources, repair strategies and communicative success.* De Gruyter Mouton & Nijmegen: Ishara Press

a deaf patron in a restaurant who is unsure about what to order may point at the menu with an expression of uncertainty, and the hearing, non-signing waiter may then point to a particular item in the menu and give the thumbs-up gesture. In the same way, signers bring these gestural resources to bear on their communication with signers from other countries. Though two signers may use mutually unintelligible sign languages and may come from different cultures, each is likely to have well-developed gestural abilities from years of communicating in a non-signing hearing world, and can utilise these skills to a high degree when interacting with the other in the visual-gestural modality (Bradford, Sagara & Zeshan, 2013; Crasborn & Hiddinga, 2015; Zeshan, 2015; see also Chapter 2). Despite considerable structural and lexical differences among sign languages, it seems that deaf signers who come into contact persist through difficulties and challenges to achieve communication. This has led researchers to remark on the surprising camaraderie that deaf people seem to enjoy at international events and when travelling to other countries, as they are already equipped with an understanding of each other due to worldwide similarities in deaf cultures (Spradley & Spradley, 1985). As explained in section 1.1, this gives rise to international networks of deaf signers in a similar way to what Zheng et al. (2010) describe in their paper on the concept of social networking based on locations and trajectories of users identified through a Global Positioning System (GPS). In other words, deaf signers connect based on the countries and cities they have travelled to and the sign languages they have learned along their trajectory. When connecting through overseas travel and remote communication, they use ad hoc visual-gestural improvisations to interact, which are called 'cross-signing' in this

study (see also Bradford, Sagara & Zeshan, 2013; Zeshan, 2015; Chapter 2).

Cross-cultural communication skills can play a major role in the ability to carry out repair (i.e., the process in which a trouble occurs within the interaction and attempts are made to resolve it). These skills equip cross-signers with an array of tools they can exploit, sometimes in impressive, numerous consecutive repair attempts, to get their meaning across. This chapter examines these tools and strategies more closely to get an insight into the nature of cross-signers' metalinguistic abilities in the area of repair and their effect on the interaction. Being one of the very first investigations into the phenomenon of cross-signing, this also permits the clear identification of practical conversational tools that could prove useful for deaf individuals who network with overseas peers and/or in the international deaf community or aspire to do so. This could be of benefit to the deaf world as a whole, strengthening its engagement, mutual understanding and unity. This exploration of repair in cross-signing may also be of value not only to people who would like to engage in cross-signing themselves, and people who use International Sign and/or travel internationally, but also to sign language teachers who need to communicate with first-time learners who do not sign at all, and teachers who want to instruct their learners on how to interact with signers who use other sign languages. It also is of value to linguists as an innovative and unusual piece of research into how signers interact when they do not share a language, and how they construct their communication almost from scratch. This is particularly relevant to scholars studying the pragmatics and evolution of language. In addition, the chapter reveals

some of the abilities that humans can rely on for communicative trouble-solving in the absence of language.

This chapter explains the process of conversational repair in the context of cross-signing, with a particular focus on the tools and strategies that cross-signers use to signal trouble and carry out repairs, and to what extent these are successful (cf. Dingemanse et al., 2015). This helps to illuminate what forms and structures cross-signers rely on to keep the conversation going, how they attempt to make themselves understood and sustain their own understanding, and how they build a shared toolkit for communication. After section 3.1 introduces some of the key concepts, section 3.2 revisits the method and data collection, including information about the participants and how the data were annotated. Section 3.3 explores the general mechanics of conversational repair as well as the specific repair tools used by the cross-signers and their relative rates of communicative success.[11]

3.1.1. Cross-signing

Because they lack shared conventions, cross-signers are much more reliant on shared knowledge of the immediate setting (cf. Levinson, 2006). They tend to establish grounding (in the sense of Clark & Brennan, 1991) through tools

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[11] It is important to point out that 'success' is used as a relative term here, because it is not possible to confirm absolutely in each and every instance whether or not a cross-signer has understood an utterance.

and strategies related to turn-taking, repair, and other interactive features of the conversation, such as pointing and joint attention. According to Clark & Brennan (1991: 148) grounding is achieved in a situation where "we and our addressees mutually believe that they have understood what we meant well enough for current purposes" (the grounding criterion). Another related concept is intersubjectivity, in particular, the intersubjectivity of linguistic conventions, i.e., the mutual knowledge that everyone in the interaction can use and understand the conventions (Tomasello, 2003). This intersubjectivity is notably absent when two cross-signers meet for the first time.

In face-to-face communication, frequent backchannelling helps to sustain the interaction and establish common ground. Backchannels are behaviours that an addressee uses to signal continued interest and understanding, co-occurring with another interlocutor's turn (cf. Dixon & Foster, 1998; White, 1989). The multimodality of backchanneling, for example via vocalisations such as "uh-huh" in English or via nodding, has been recognised in spoken languages, and research has extended to cross-linguistic and language contact settings (e.g., Cutrone, 2005; Heinz, 2003). Interestingly, the present study supports the notion that backchannelling patterns in signed conversations differ from those found in the spoken language research (see also Manrique & Enfield, 2015 on Argentinean Sign Language). To indicate trouble in a spoken language conversation, an overtly negative backchannel (e.g., a frown) would tend to be used, whereas in sign language interactions, trouble can be indicated by the lack of a positive backchannel (i.e., a neutral face; see section 3.3.2).

Where individual signs are the source of communication trouble in cross-signing, this often involves difficulty in agreeing on a shared code, i.e., shared forms that both interlocutors understand, and know that each other understand. Zeshan (2015) discusses the intersubjective multilingual-multimodal space gradually constructed by cross-signers during their conversations. Use of a shared code is obviously problematic in cross-signing scenarios, as the interlocutors initially have no common sign language and no previous experience communicating with each other, making the non-understanding of forms quite frequent. In cross-signing conversations, sometimes the addressee is familiar with the form or sign being used, but still does not understand the intended meaning and/or context, and/or does not have enough background information to ascertain what is being communicated.

3.1.2. Conversational repair

In this chapter, the notion of repair and its associated communicative interactions and strategies constitute the main framework, as well as the coding system described in section 2 on methodology. One of the most important areas to focus on when considering cross-signing as a phenomenon is conversational repair. Repair is a process in which trouble occurs and is pointed out, and attempts are made to resolve it; this sequence has been described within the realm of conversational analysis, or CA (Schegloff et al., 1977). In other words, repair refers to the set of practices whereby a co-interactant interrupts the ongoing course of action to attend to possible trouble in speaking, hearing or understanding the talk. Such trouble

includes "misarticulations, malapropisms, use of a 'wrong' word, unavailability of a word when needed, failure to hear or to be heard, trouble on the part of the recipient in understanding, and incorrect understandings by recipients" (Schegloff, 1987). Repair is then used to ensure "that the interaction does not freeze in its place when trouble arises, that intersubjectivity is maintained or restored and that the turn and sequence and activity can progress to possible completion" (Schegloff et al., 1977).

Interlocutors will generally make attempts to overcome the trouble instead of ignoring it or giving up. They may make repeated attempts at repair of a single trouble source before coming to a resolution. A person may for example try a number of different words or signs until one is successfully understood by their interlocutor. Very rarely is repair a one-off occurrence in a conversation; it is a phenomenon that happens continually, and is naturally expected in many contexts. Other-initiated repair (OIR) has been found to occur once every 1.4 minutes on average in any language (Dingemanse, Roberts, et al., 2015). Humans use repair universally, to negotiate communication in every interaction. This is shown by Dingemanse et al. (2015), who found that repair sequences across 12 languages were remarkably similar. They theorised that this was due to three factors: self-referentiality (talking about the communication itself, e.g., 'Did you mean Stephen?'); social intelligence and theory of mind (knowing that others see the world in a different way); and collaborative action (cooperating and sharing decisions about communication, e.g., how much time to spend on a repair sequence). Repair contributes to the co-creation of shared understanding. It may be a joint effort,

where for example one person finishes another person's truncated sentence.

Drawing on aspects of CA, this chapter examines repair sequences in cross-signing situations. This is an innovative undertaking, as previously most research into repair has focused on interlocutors using the same language (Sacks et al., 1974; Schegloff et al., 1977; see also Dingemanse et al., 2015). According to Schegloff et al. (1977), there are technically two kinds of repair, one originating from the person producing the message (self-initiated repair, SIR), and one originating from the recipient of the message (other-initiated repair, OIR), resulting in a sequence of turns. These are discussed separately in the literature. In a repair sequence, there are distinct parts: T0 refers to the turn which indicates repair (e.g., 'sorry, what?'). T-1 is used to designate the turn of the actual trouble source, i.e., the utterance that caused a problem (Dingemanse, Roberts, et al., 2015) or misunderstanding (Pietikäinen, 2016). T+1 is the turn where a solution is offered in response. The forms of turns at T+1 and T-1 will be examined further as these are the forms that create the trouble (T-1) and constitute solutions (T+1).

The main focus in this chapter is on the strategies that signers employ at T+1, as illustrated in Figure 3.1 In this figure, T-1 involves Signer D producing a form for 'man' from Hong Kong Sign Language (HKSL), articulated at the side of the head. At T0, Signer A signals trouble by repeating the form. At T+1, Signer D offers the Korean Sign Language (KSL) raised-thumb form for 'man' as a solution.
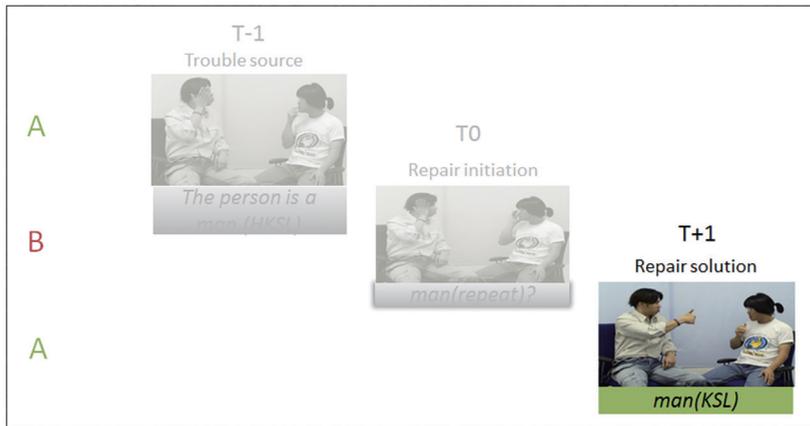
Figure 3.1. Repair solution (T+1) 1

Another key issue is the actual means or strategies of repair; resolving trouble through repair cannot be characterised as simply asking or urging the other person to explain more. It involves distinct and identifiable strategies. The data analysed in this chapter have been coded with a focus on these various strategies used in repair sequences. Repair is very important in cross-signing for several reasons. Firstly, repair facilitates trouble identification and joint attention, giving signers a ready framework in which to point out trouble and thus enabling them to share the same focus on a specific item. Secondly, repair sequences allow signers to build interaction with a common goal (resolving the trouble), within the structure of turn-taking. Thirdly, repair gives signers the chance to engage in trouble solving, as they consider and decide on strategies to try and then retain or abandon. Lastly, cross-signers learn through repair, and acquire communicative tools for their personal toolkit or repertoire.

In cross-signing, repair appears to be more welcome and expected compared to repair in interactions between users of the same language; however, repair initiations in cross-signing occur less frequently than once every 1.4 minutes, which was the average rate for multiple languages found by Dingemanse et al. (2015). Rather, repair initiations in the cross-signing data occur about every 2.1 minutes. This is probably because cross-signing proceeds at a slower pace than same-language interactions, and because only the first repair initiation of a sequence was included in this data. A notable feature of cross-signing is the lengthy repair sequences, which often involve side-sequences and repairs-within-repairs, so if all of the initiations in a sequence were included, the rate may be closer to Dingemanse et al.' (2015) rate of once every 1.4 minutes. As the data suggest, repair is a dialogue strategy that cross-signers seem to use readily and openly to facilitate negotiation. Their repair attempts, including other-initiated repair, seem to occur mostly without the frustration and face-threats that sometimes accompany repair in same-language conversations, which contribute to a preference for self-initiated repair amongst same-language users (Schegloff et al., 1977).

3.1.3. Research question

The main focus for the part of the study reported here covers sequences in other-initiated repair (OIR) in cross-signing, and can be formulated as follows:

In cross-signing OIR, what do the T+1 turns look like, and how does communicative success vary across the different T+1 strategies?

This question sets the stage for the main topic of the chapter, that is, the deployment and success of repair strategies. Which repair strategies do signers deploy to resolve communication trouble? When there is a communication breakdown, signers theoretically have many ways of trying to resolve the trouble. For instance, they could resort to writing, fingerspelling, giving examples, or using alternative signs from other sign languages. Within the small sample of signers in this study, the aim was to track which of the possible resources the signers used in real conversations. Once the repair strategies have been identified, it is interesting to consider how successful the repair attempts are when these strategies are deployed.

3.2. Methodology

This section describes the coding processes of the two main data sets introduced in Chapter 1, in section 1.5 The sociolinguistic backgrounds of the participants who took part in the data collection activites are presented in Table 1.2 in section 1.5.2, and this chapter now focuses on all of the participants, except for the last participant in the table, Signer H, as he already had some previous experience with IS and cross-cultural communication. The configurations of the dyads are presented in Figure 1.1 in section 1.5.3, and as this chapter focuses on both data sets (the Typology project data and the Multisign project data), the data duration summary of the six signers

presented in Table 1.3 in section 1.5.3 is also of relevance. In the following section,

the annotation process is described, including how categories of repair strategies

were developed, and how values were assigned to the data inductively.

3.2.1. Data coding

Data were coded using the ELAN multimedia annotation software (Sloetjes, 2013),

which allows time-aligned codes to be linked to a video on parallel tiers. The tiers

can be defined flexibly according to the research questions being pursued. In

this case, annotations were made on separate tiers for each of the signers in the

interaction. In addition, tiers were labelled according to the phase of the repair

interaction (T-1, T0, or T+1). The content of the tiers includes capital letter glosses

representing the manual signs, as is the usual convention in sign language

linguistics, and labels for the type of repair strategy used (e.g., substitution). Figure

3.2 shows a screenshot of the data annotation in ELAN.

Figure 3.2. Data annotation in ELAN

Following the identification of the parts of the repair sequence, the different types of strategies and tools exploited at T+1 were categorised. This was done using an inductive data-driven approach, watching and annotating the clips and then considering how the various strategies could be meaningfully classified. The resulting types are defined in this section, and examples are given in section 3.3.3. In total, 88 repair sequences were coded. The coding schema of repair strategies that emerged from the inductive process is summarised in Table 3.1. Repair strategies are distinguished from each other on the basis of features, with the following values:

+ : feature always applies   **(+)** : feature usually applies

– : feature does not apply   **(–)** : feature usually does not apply

0 : feature is not relevant

Each repair strategy differs from all others in at least one of the features, so that all strategies are uniquely identifiable.

Table 3.1. Repair strategies

	single sign	spoken language reference	trouble source included	established signs
Repetition	+	–	+	+
Substitution	+	–	–	+
Literacy	+	+	–	0
Explanation	–	–	–	(+)
Example	–	–	+	(+)
Productive signs	(-)	–	–	–

If a single sign is the basis of the repair strategy, this may involve repetition of the same sign that was the trouble source at T-1, or substitution with a different sign, often but not always a close equivalent from a different sign language. Alternatively, signers may resort to a repair strategy that is based on using literacy, i.e., written representations of words from a spoken language. In most cases, this involves fingerspelling, which is the use of a manual alphabet to sign a sequence of letters spelling out the target word. Other uses of literacy include writing/tracing on a surface or in the air.

Alternatively, signers may use various multi-sign strategies. In the case of explanations, the trouble source is described using a circumlocution. For example, an explanation for 'happy' may use signs with meanings such as 'smile', 'feel good', and 'celebrate', but not a sign for 'happy' itself. If the trouble source itself is used in the repair, this is categorised as an example. Examples often work by inserting the trouble source sign into a sentence, thereby clarifying its context and allowing the addressee to infer the sign's meaning. For instance, 'age' was clarified by saying "my age is 27; what is yours?".

In addition to the above sign language-based strategies that rely on established signs, another option is to use productive signs. The distinction between established and productive signs is complex and consists of a set of criteria (Johnston & Schembri, 1999: 136). In short, productive signs are characterised by their formational components (handshapes, movements, locations, etc) being meaningful. Therefore, the meaning of productive signs is componential and relatively transparent, due to non-arbitrary relationships between the sign's form and its meaning. Established signs, on the other hand, have a higher degree of conventionalisation and there may often be arbitrary relationships between the sign's form and meaning. Productive signs include those described in the literature as having a high degree of visual iconicity, namely classifiers (Schembri, 2003), size and shape specifiers, and indexical signs such as pointing. For the purposes of this thesis, this category also includes gesture and mime, which is sometimes deployed by signers to resolve a trouble source. The productive strategy usually involves

multiple signs, but can sometimes consist of a single sign. Since explanations and examples are also multi-sign combinations, the entire utterance may contain productive signs (hence the feature (+) instead of +). But the use of productive signs is not the main characteristic in these strategies. The established-productive distinction is irrelevant for the 'literacy' strategy as it does not consist of signs as such (hence the feature 0).

In addition to these categorisations, a strategy was coded as 'mixed' if a single turn at T+1 contained more than one of the above strategies. It is necessary to distinguish these cases because the coding labels the communicative turn (T+1) as a whole and not its individual components, so that each T+1 is associated with only one coding category. In the data, fingerspelling was sometimes preceded or followed immediately by another strategy, for instance fingerspelling followed by a substitute sign to convey the meaning 'difficult'. Thus the 'mixed' category is a sequential combination of more than one of the above strategies within the same turn.

3.3. Repair strategies in cross-signing

This section sets out the results from this research with respect to the research questions. Firstly, the discussion considers the nature of the trouble source that gives rise to OIR in the sequences investigated here (section 3.3.1). This is because the repair undertaken at T+1 should not be seen in isolation but with respect to the entire repair sequence. Therefore, a closer look at the trouble source at T-1 serves

to situate the deployment of repair strategies in the appropriate context with respect to the specific phenomenon of cross-signing. Section 3.3.2 takes a closer look at the form of the turn where one of the interlocutors signals the communication trouble (T0). Section 3.3.3 presents the deployment and frequency of the various repair strategies, and section 3.3.4 summarises the results in terms of the differential success of the signers' repair strategies.

3.3.1. Trouble sources

There are three basic types of trouble that may occur in conversations: trouble in receiving the message, trouble in producing the message, and trouble in understanding the message (Schegloff et al., 1977; Schegloff, 1987). A person may miss or be unable to hear (or in this case, see) a message, for example due to environmental noise (or visual obstruction); the sender might produce the message using incorrectly articulated words or signs, which can also cause trouble. Alternatively, the addressee may fail to comprehend precisely what the message means, or may come to a very different understanding than what the speaker or signer intended. In the data, the reasons for communication trouble are often complex and difficult to verify with certainty, but they appear to mostly fall into the category of trouble in understanding the message. Receiving the message was not an important factor in these data, as the setting was optimized for video filming of the conversations, so there were no visual obstructions.

This section takes a closer look at the sub-set of trouble sources where a communication difficulty originated in the turn preceding an OIR, i.e., the indication of a problem by the interlocutor. As noted above, this study's interest is in the original trouble source of repair sequences involving OIR because the current chapter is part of a larger programme of research focusing on OIR. The data include all trouble sources in OIR sequences, regardless of whether a shared understanding was ultimately achieved, and regardless of whether the indication of a trouble at T0 was followed by a single repair attempt, or whether multiple attempts at repair were necessary.[12] All instances of T-1 for which the T+1 repair strategy is analysed in this chapter were coded as to the type of trouble source at T-1.

Table 3.2 shows the trouble source types for the 88 coded instances of T-1, which triggered repair initiations at T0. It shows that OIR was most likely to be employed for trouble related to the use of individual signs. However, it is sometimes difficult to distinguish repair initiations that are due to trouble in recognising a sign or form, from those that arise from problems in understanding the content of the message. For example, if the trouble source is a fingerspelled English word, it may be unclear whether the other signer does not know that particular English word or concept, or whether they know it but just had difficulty following the spelling.

Many of the 88 occurrences of T-1 are individual signs that are unfamiliar to the

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[12] In any case, each successive repair attempt builds on the entire interaction, so one cannot be sure which part of the entire interaction is responsible for an ultimate successful conclusion.

other participant, most commonly due to being from a sign language that they do not know. Usually this was due to the interlocutors using signs from their own languages, but it also occurred when some signers used ASL. For example, the sign CENTER was used by a participant who knew ASL, but was not recognised by the other signers. In contrast, a repair initiation that targeted the entire utterance and left the exact nature of the trouble source unspecified occurred only once. This instance is marked by a so-called 'open repair initiator' (Dingemanse, Roberts, et al., 2015), that is, a form that signals a general lack of comprehension. This distribution suggests that either it was rare for signers to experience trouble with an utterance overall, or that they preferably chose to target an individual form when initiating a repair.

Table 3.2. Trouble sources in all instances of OIR (T-1)

Individual Sign	Fingerspelled word	Entire utterance
79	8	1

For some of the individual signs causing a trouble at T-1, and used to restore communication at T+1, it was possible to verify which signs were from which languages. To help with this identification of signs, the first author was able to undertake some interviews remotely via online communication with three of the participants. Signer C and Signer D from the Typology group were interviewed, as well as Signer G from the Multisign group. In addition, the first author was able to use his own judgment with respect to KSL signs, as KSL is his first language. It was

not possible logistically to interview all of the participants, but it was feasible to ask these three whether a trouble source sign used by a particular signer was in fact part of this signer's lexicon in his or her own sign language. In several cases, the sign at T-1 within the first repair sequence is already a substitution, i.e., another sign language being used instead of the signer's native sign language. One example was the use of the ASL sign for 'people', based on the P-handshape, by Signer A when addressing Signer D. Signer A resolved the trouble by offering two further signs for 'people'. Thus cross-signers sometimes seem to suspect that signs from their native sign lexicon could become trouble sources even in the absence of any negative feedback, and therefore possibly avoid them; alternatively, it may be the case that they know a sign that they deem to be more suitable for the particular interaction. In Chapter 2 this point is pursued in detail with respect to the try-marking of signs at T-1.

In the overwhelming number of cases, it is an individual sign, i.e., the surface form, that is pinpointed as the trouble source (89.7%). This is in line with Chapter 2, which found that individual signs are the source of trouble in over 90% of cases in their data. For example, in the interaction between Signer C and Signer A, a NGT sign for 'why' produced by Signer C was not understood. Signer C then articulated the ASL form for 'why', which was understood. In another interaction, Signer F produced a sign meaning 'cannot', from his language, Indonesian Sign Language, when conversing with Signer G, who then indicated that she did not know this sign. In all of these cases, the signer of the trouble source was using a form that had not been

agreed on, and/or that the addressee did not know. Zeshan (2015) has documented the same phenomenon and proposed a systematic process by way of which signs are added to an agreed shared lexicon by the participants in the interaction.

Much more rarely, in 9.1% of cases, a fingerspelled word occurs as trouble source. In some instances, both signers knew the one-handed (ASL or IS) alphabet, but did not know about the variations for some letters that exist for some sign languages. For example, for the letter 'U', most versions of the one-handed alphabet have a palm-forward orientation, but Dutch signers use the opposite orientation (see Figure 3.3). They also position the thumb and forefinger differently for the letter 'F' compared to most other users of this alphabet, allowing them to overlap. Some of the participants were confused by these variations, especially when used in initialised signs such as 'culture' with C-handshape and 'family' with F-handshape in ASL.

Figure 3.3. Different orientations for the fingerspelled letter 'U' in ASL/IS and NGT

Finally, there is one case in the data where an open repair initiator is used, that is, an utterance that signals a general lack of understanding (similar to English *what?*, *huh?*) rather than focussing on a particular sign.

In addition to the lack of a shared code as such, problems with understanding the message also included a number of other types. Firstly, there were examples triggered by not understanding English, e.g., the fingerspelled word A-R-E-A; the signer knew what all the letters were, but they did not know English and thus did not understand the meaning. Next, there were examples where a signer was unfamiliar with the conventions or grammatical rules of another sign language. For example, in LIU the order of two-digit numerals is produced in a reversed fashion relative to Indonesian Sign Language, such that in a sentence meaning 'I am 24 years old', the sign for '24' appears as the sequence FOUR TWENTY.[13] This caused

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[13] Following the usual conventions in sign language linguistics, a gloss using capital letters refers to a sign, while lowercase letters enclosed in single quotes refer to a sign's meaning.

considerable communicative difficulty between Signer E and Signer F, and they had to resort to tracing written digits in the air (see Zeshan, 2015: 222 for a similar example). Trouble also arose with concepts that the addressee had not seen or experienced before, e.g., because they were uncommon in the addressee's culture. For example, Signer E used a sign for 'police' referring iconically to the policeman's helmet and holstered gun; this was not understood by Signer G, in whose mountainous home environment such police officers are not seen.

Finally, some signs that are relatively abstract, arbitrary or opaque were a source of problems in understanding. One illustration of this is the LIU sign for '(years of) age', which involves pointing to the teeth. This was misconstrued by Signer F as a reference to 'teeth', which prompted him to sign about the topic of dentists. It may be that in such cases, iconic parts of overall opaque or abstract signs act like 'false friends' and lead the addressee down the wrong path. Another example occurred when Signer G wanted to communicate the concept of 'exam', and signed an explanation that represented the actions of 'write on the paper and finish and turn it in'. Despite its iconic motivation, this explanation was not understood by Signer F, the addressee, who did not grasp Signer G's overall aim in this part of the conversation.

Cases of visual obstruction did not occur in the data, but there were several sources of trouble related to understanding the form of a sign. In one example, Signer C produced the ASL-derived form meaning 'family', which makes use of the F-handshape. As the F-handshape is articulated slightly differently in NGT, this

caused a problem for Signer A, even though he was familiar with the ASL sign. The articulation was such that he could not grasp the sign the first time. Similarly, phonological variations in the articulation of common iconically motivated signs sometimes created trouble. For example, the sign for 'milk' that refers to milking a cow may be produced slightly differently, e.g., with more of a palm-outward versus palm-inward orientation, and with the thumb more or less extended. In such a case, both signers know the sign and its iconic motivation, but the phonological difference triggers communicative difficulty. For example, the left-hand picture in Figure 3.4 shows a sign for MILK at T-1 that uses a T-handshape and appears to be quite enlarged, with maximal use of the signing space. The other signer then repeats it at T0, using the same handshape but smaller movements, taking up less of the signing space.

Figure 3.4. MILK at T-1 and repetition at T0

As mentioned above, often examples from the data are not easily categorisable into one of the three basic types of communicative trouble, and reflect a combination of issues. For example, when conversing with Signer A, Signer B produced a form meaning 'Uzbek', referring to a person from Uzbekistan. Not only was this not part of an agreed code between the two signers, but Signer A was not aware of this country or the concept of 'an Uzbek person' at all. Therefore, this was a problem with the shared code and access to the concept.

In another instance, Signer D articulated a sign for 'man' produced at the side of the head, with which Signer A was unfamiliar, and which he took to mean 'woman'. Again, this was caused not only by the form not being within the signers' shared code, but also by a misunderstanding based on wrongly assuming what the iconic motivation was. Such misconstrual of iconic motivations of signs occurs regularly in the data. When Signer C articulated a sign for 'hearing' (in which an F-handshape moves back and forth near the ear), Signer A guessed that the sign might be iconic but was not sure what it meant, imagining that it may mean something like 'too loud'. Similarly, in the discussion between Signer G and Signer F, the former used a sign for 'woman' that refers to a pierced nose. Signer F then imagined that Signer G was talking about piercings in general. He did not realise that a pierced nose had any iconic association with the concept of 'woman', because he was not familiar with the significance of this in the cultural context of Nepal.

The complexity of factors involved in miscommunication caused confusion and

difficulty for the researchers when carrying out the analysis. One of these was related to ascertaining the specific reason behind an observed repair initiation and seeming lack of understanding by the addressee. For example, in the interaction between Signer E and Signer F, the former fingerspelled O-L-D 'old' using the one-handed alphabet, which the latter did not understand. It was unclear whether this was due to Signer F's lack of familiarity with the one-handed alphabet, or a failure to see and/or accurately identify all of the letters in the word, or a lack of English proficiency. In terms of the three basic categories mentioned at the beginning of this section, 'shared code' problems and 'understanding-related' problems are especially tricky to tease apart in cross-signing. Therefore, in this section, a qualitative description of examples is offered in order to convey the complexities involved in identifying reasons of miscommunication, and the quantitative analysis of trouble sources is limited to the results in Table 3.2. The next section focuses on identifying the form of the T0 turn.

3.3.2. Form of the T0 turn

The T0 turn in cross-signing can take several different forms, including repetition, offering another equivalent sign as a means of checking (so-called 'restricted offer'), a blank facial expression (i.e., lack of backchannelling), or an explicit statement indicating that the signer does not understand. The range of T0 forms found in cross-signing is similar to the taxonomy described by Manrique (2016) for Argentinean Sign Language (Lengua de Señas Argentina, or LSA). Manrique

suggests that the T0 turns produced by LSA signers can be placed into three groups: open, restricted, and 'implicit' initiators. She finds that the restricted repair initiators comprise more than half of all OIR in LSA and include requests, offers, and questions, both manual and non-manual. The most common format for open repair in LSA is non manual marking, especially by means of lowering the eyebrows Manrique (2016). These findings are similar to what is seen in the cross-signing data, although the sequence of repair progresses differently for cross-signers in comparison with same-language signers. The quantitative results for the occurrence of these types of T0 (repetition, restricted offer, a blank facial expression, and a statement of non-understanding) in the data have been calculated, and are presented in this section along with qualitative examples.

Repetition has many functions and processes in OIR, including identifying a source of trouble, presenting what needs to be repaired, and inviting clarification, specification or confirmation (Dingemanse & Enfield, 2015). Dingemanse et al. (2015) find that in interactions between users of the same language, repetitions at T0 may be of the full trouble source, or only part of it, and that overall, repetitions comprise 48.3% of T0 turns. In comparison, in the cross-signing data, out of 88 instances of OIR, 65 (73.9%) took the form of repetition. Most of these occurrences (45 out of 65, i.e., 69.2%) were repetitions of the full trouble source, whilst the rest (20 out of 65, i.e., 30.7%) were repetitions of only part of the trouble source. One example of a partial repetition is when Signer B articulated the sign UZBEK 'Uzbekistan', which is performed at the side of the head and has a mouthing (silent

lip pattern derived from the articulation of a spoken word) reflecting the articulation of 'Uzbek' (see example 3.1). At T0, Signer A repeated the mouthing, but not the manual component of the sign.

Example 3.1. Partial repetition of 'Uzbekistan' at T0, using only the mouthing

Signer B :   U   Z   B   E   K   (T-1)

                'Uzbek'

Signer A :   'Uzbek'   (T0)

Another example occurred when Signer A articulated two adjacent signs for 'study' at T-1 (see example 3.2). The first sign, with the hand located at the mouth, is from Korean Sign Language. The second, performed immediately after the first, was the American Sign Language form with the hands in front of the signer. A later interview revealed that Signer D did not know either of these signs. However, at T0, Signer D only repeated the second sign, not the first, possibly because it was easier to remember and repeat the second sign in the sequence.

Example 3.2. 'Study' - only the second sign was repeated at T0

Signer A : HOW   STUDY(KSL)   STUDY(ASL)   HOW   Pointing(you)   (T-1)

Signer D :

STUDY(ASL)   (T0)

There was another occasion where Signer A used this strategy of articulating two adjacent signs with the same meaning, the ASL and KSL forms for 'university' (the former based on the fingerspelled letter U, and the latter a half circle around the head; see example 3.3). Here, Signer D also repeats the second sign in the pair at T0, which is the KSL sign; therefore, it appears that the latter sign is being selected for repetition, rather than the sign from a particular language. This is only a supposition as the nature of this phenomenon is not yet clear, but the tendency to select the second sign in an adjacent same-meaning pair for repetition at T0 may be an interesting area for further investigation.

Example 3.3. 'university' - only the second sign was repeated at T0

Signer A : MUST UNIVERSITY(ASL) UNIVERSITY(KSL) MUST KNOW Pointing(he)   (T-1)
Signer D :

UNIVERSITY(KSL)   (T0)

Some trouble source repetition at T0 was accompanied by other signs or strategies as well. There were 20 such cases in the data. These include repetition being used alongside non-manual features (e.g., eyebrow movements, body leans), mouthings, and restricted offers. Restricted offers are utterances at T0 with which the signer attempts to guess the meaning of the trouble source sign; they are used to offer a candidate understanding, like saying "do you mean X?", for the other interlocutor to react to (Dingemanse & Enfield, 2015). Restricted offers appeared after repetition

in three instances. For example, Signer G articulated the concept of 'August' by presenting 8 digits and then making a sign for 'calendar' that refers to flipping the page of a wall calendar (see Figure 3.5). Signer F repeated the '8' and 'calendar' signs, and then made a sign for 'computer' (possibly having mistaken the 'calendar' sign for 'laptop'). This 'computer' sign (see Figure 3.6) therefore constituted a restricted offer, and the sign is accompanied by a questioning facial expression.

Figure 3.5. Sign for 'August' referring to a wall calendar

Figure 3.6. Sign for 'computer' used as a restricted offer

In another example, Signer F articulated the fingerspelled letter 'D' from ASL, and Signer G repeated this at T0 and then traced a written 'F' on her palm, because she erroneously thought the letter being signed was 'F' (see Figure 3.7). Similarly, Signer C fingerspelled I-F 'if' with the index finger and thumb of the F handshape overlapping, and Signer A repeated this handshape at T0 and then traced a written 'F' on his palm.

Figure 3.7. Repetition (from T-1) and then offer at T0

Another type of T0 is the blank face, with a lack of feedback or backchannelling. This can signal trouble to the interlocutor (cf. Manrique, 2016 on the occurrence of this phenomenon in Argentinean Sign Language). This kind of indication of trouble is termed 'implicit' by Manrique (2016). 'Implicit' or 'off record' repair initiators comprise a category that is rare in the research on spoken languages, which concentrates mostly on various types of explicit repair initiators (Manrique, 2016). This occurs 15 times in the cross-signing data, comprising 17.2% of the T0 turns. Most of these are instances of the blank face appearing by itself, but occasionally it can be accompanied by other features. For example, in two cases the T-1 turn is try-marked, and the hold persists even with the blank face being apparent at T0, so the signer of the T0 turn adds another indicator of trouble such as a head tilt

or frown. In such an interaction, the person who articulates the try-marker initially has a chance to register the blank face and make the necessary adjustments or further attempts, and the signal of communication trouble is then reinforced with the additional facial expression at T0, e.g., the frown. The non-manual signals at T0 imply that the participants can minimise the addition of signs or forms to the interaction, which may potentially cause additional trouble or confusion and necessitate further repair attempts. It could also be argued that this T0 option is less face-threatening than other indications of trouble, as these non-manual indicators are more subtle and less overtly challenging. Overt utterances signifying a lack of understanding are comparatively less frequent and are seen only 4 times in the data (4.6%). 'I don't understand' occurs three times, and 'I don't know' appears once. The opposite scenario also occurs in the data, that is, an overt indication that the addressee understands and wants the signer to continue. The term 'continuer' refers to this function, which may be carried out by backchannelling (usually nodding). This maintains the interlocutors' shared connection. In one instance, this is done explicitly with a manual sign meaning 'I understand'.

Interestingly, there is an example in the data where the intended function of the turn at T0 itself is misunderstood. In this interaction, Signer E indicated a trouble source (involving signs about age), and Signer F then signalled a confirmation, believing that Signer E had understood when in fact he was trying to mark an instance of trouble. Therefore, the T0 was misunderstood and had to be repeated and clarified in order for the repair sequence to progress. This is the only occurrence

of this sort of misunderstanding at T0 in the cross-signing data. Pietikäinen (2016) postulates that this kind of misunderstanding may be due to 'common ground fallacy', wherein people assume too much common knowledge, and do not make their communication clear enough and fail to engage in sufficient monitoring. Perhaps the reason why it occurs only once is that cross-signers approach the communication with a great deal of vigilance (frequently using try-markers and delayed responses, as described in Chapter 2) and little if any assumption that they share common ground. Cross-signers seem to be more ready for communication trouble, backtracking and repair sequences, whereas same-language users may tend to communicate with the default expectancy that they will be understood, so that the need for checking understanding is less salient, whereas it is heightened in cross-signing.

3.3.3. Deployment of repair strategies in cross-signing interactions

This section examines some quantitative data associated with the strategies used for other-initiated repair attempts in cross-signers' interactions. These data include signers' deployment of particular strategies and differences between attempts within the same sequence, i.e., the first, second, third and so on. However, the first attempt is the main focus here, and each of the first-attempt strategies are explored and illustrated, including repetition, literacy, substitution, explanation, examples and productive signs. Signers' reasons for selecting these strategies are also considered. This section provides a necessary background to the subsequent

section 3.3.4, which presents data on which repair strategies were the most and least effective. The data reveal, in total, 88 occurrences of other-initiated repair attempts, including repairs that were immediately successful after the first repair attempt, repairs that were successful but needed more than one repair attempt, and repair attempts that were ultimately unsuccessful. Table 3.3 shows the distribution of 82 ultimately successful repair sequences produced by participants in the Typology group and the Multisign group. Instances of repair sequences with only one attempt, i.e., one-off repair initiations, comprise 53 of these 82 occurrences, or 64.6%. Sequences with second, third, fourth, and fifth attempts together account for 29 of the total, or 35.4%. More than five attempts did not occur in the data. These percentages are close to what has been reported in spoken-language research by Dingemanse et al. (2015). Using much larger corpora than the one in this study, with higher numbers of repair attempts, they find that a repair initiation selected from the corpus at random has a 58% chance of being a one-off, and a 42% chance of being part of a longer sequence.

Table 3.3. Distribution of sequences of other-initiations repair by number of attempts in +1

	1 attempt	2 attempts	3 attempts	4 attempts	5 attempts	Abandoned	Total sequences
Repetition	22 (26.8%)	6 (7.3%)	3 (3.6)	1 (1.2%)	1 (1.2%)	1 (1.2%)	34 (38.6%)
Substitution	31 (37.8%)	10 (12.1%)	5 (6.0%)	2 (2.4%)	1 (1.2%)	5 (6.0%)	54 (61.3%)
Literacy	53 (64.6%)	16 (16.5%)	8 (9.7%)	3 (3.6%)	2 (2.4%)	6 (7.3%)	88 (100%)

In a small minority of six instances, repair efforts were ultimately abandoned without resolution. This usually seemed to be because the person who initiated the repair failed to make clear whether the repair was successful or not. However, the specific reasons behind such abandonment and ambiguity were not investigated in this study. But in 82 of the 88 cases in Table 3.3, the repeated attempts resulted in successful repair. This was on the first meeting, at which point none of these individuals had communicated with each other previously. Table 3.4 shows the distribution of individual repair attempts in T+1 since a repair sequence can include more than one individual repair attempt. Signer C, Signer E and Signer G produced trouble sources, followed by repair attempts, more often than the other participants. Moreover, three of the aforementioned instances of ultimate abandonment arose from a T-1 turn by Signer G. However, individual differences of this kind are disregarded here, and the main aim of Table 3.4 is to provide an overview of overall repair frequency, and the frequency of repeated repairs.

Table 3.4. Distribution of first and repeated repair attempts in T+1

	Signer A	Signer B	Signer C	Signer D	Signer E	Signer F	Signer G	total
1st attempt	9	2	19	3	19	12	18	82
2nd attempt	1	1	8	1	10	2	6	29
3rd attempt	1	–	4	–	4	1	3	13
4th attempt	–	–	2	–	2	1	–	5
5th attempt	–	–	1	–	1	–	–	2

Example 3.4 shows a case of repeated repair attempts. The signer first produces the sign NEPAL (1st attempt), and as this is not understood, she uses fingerspelling (2nd attempt), and then explaining (3rd attempt). The explanation clarifies that she is talking about 'the country north of India'. A visual-spatial SASS (size and shape specifier) construction happens to be embedded in the explanation but the entire sequence is categorised as an instance of 'explaining'. Unfortunately, dedicated analyses of the occurrence of specific morphosyntactic phenomena such as SASS within repair sequences is outside the scope of this chapter but would be a fascinating area for future research.

Example 3.4. Multiple repair attempts (Success at 3rd attempt)

To provide a broader overview of the results, Figure 3.8 shows the range of communicative repair strategies that were identified in this study and the number of times they were employed in a first repair attempt. As the figure indicates, substitution and fingerspelling/writing-based (literacy-based) strategies were drawn upon most frequently overall, though the results reveal that these did not bring about successful repair at the same rate.
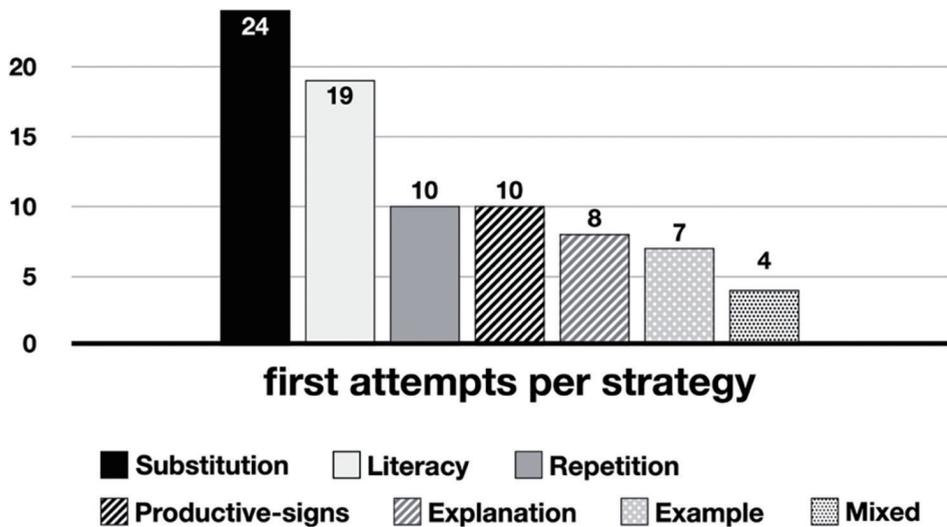
Figure 3.8. Number of first attempts in T+1 per strategy

A great deal of variation is found with respect to how frequently each of the strategies occurs with the individual participants. This is summarised in Figure 3.9 Two of the participants (Signers B and D) have a very small number of occurrences. The remaining five participants have between nine and 21 occurrences, and each individual has a somewhat different profile. For example, Signer C only uses a total of four strategies, while Signer E uses a wide variety of strategies.

The largest amount of data with respect to the length of video recordings is associated with Signer A, but this participant does not have the highest number of repair occurrences. His profile also has a conspicuous absence of the Literacy (fingerspelling and writing) category.
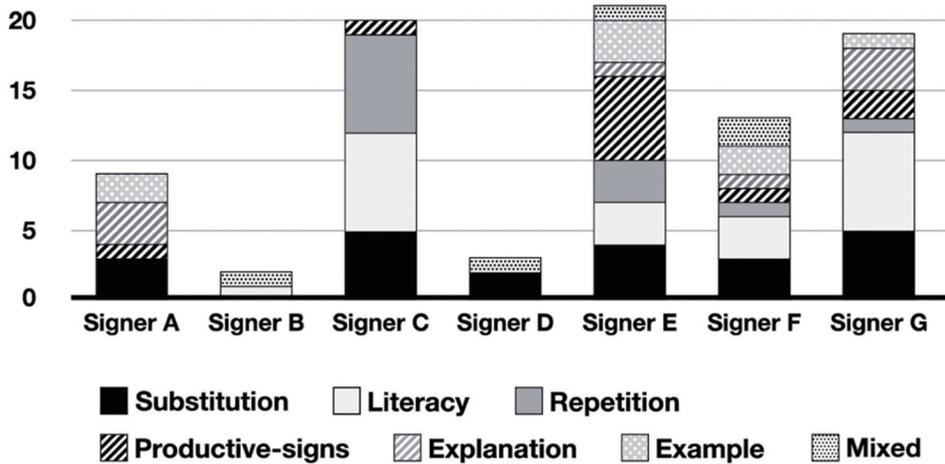
Figure 3.9. Individual variation in the use of repair strategies in T+1

Such large variation is expected because there are so many factors whose interplay determines the profile and behavior of each individual. Some participants are more active communicators, that is, they talk much more than their interlocutors. People may also be more or less inclined – for reasons of personality or culture, for example – to interrupt their interlocutor at T0. Additionally, the topic of the interaction also plays a role. For example, if place names are important for the conversation, fingerspelling may be a natural choice for repair. The conclusion from these considerations is that the repair strategies should primarily be characterised in terms of the range of strategies, and by demonstrating the range of options

that signers can draw on for repair. Frequency counts are less revealing because individual differences are large in relation to the total number of occurrences.

In the remaining discussion, the focus is on instances of first repair attempts only in T+1, because this allows us to compare like with like, and avoid any contamination from instances where a form's success was due to its use in a previous repair attempt within that sequence.[14] The plentiful first attempts in the data enable this approach to provide a useful picture of participants' strategies and assumptions at initial contact.

Repetition

Repetition refers to the repeating of a trouble source, as in the first repair attempt in Example 3.4 above. In another instance the NGT sign for 'summer' was not understood by the interlocutor, and it was repeated for the benefit of the addressee, slowly and with slightly more emphasis. There are 12 cases of repetition in the data. Example 3.5 shows a data segment with repetition as the repair strategy, with Signer E articulating the trouble source NAME at T-1, Signer F signaling the trouble at T0, and Signer E responding with repetition of the same sign at T+1. One reason for deploying repetition might be that the signer wants to check which sign it was that the addressee did not understand, or give the addressee another chance to see the

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[14] This of course still leaves open the possibility of influence from previous repair sequences, but it is not possible to control for this factor within the setting of this research.

sign and verify if s/he still does not understand it. Further reasons could be that the signer is using repetition to stall for time as s/he has not yet selected an alternative strategy, or indeed that s/he has difficulty coming up with another strategy. Repetition may be part of the process of replication, in which one person tries to determine the results of her/his beliefs about the world by assuming that other people are also trying to determine the results of their own beliefs (Lewis, 1969). Employing repetition allows a signer to check their beliefs and those of their interlocutor.

Example 3.5. Repetition

This is an example showing the use of repetition as a strategy at T+1. The Jordanian signer (E) makes a statement referring to a person, using that person's name sign which is composed of a movement from the chin to the forehead.	The Indonesian signer (F) then articulates the name sign to signal that he does not understand what it means.	The Jordanian signer then repeats the sign to try to solve the communicative trouble.

Sometimes a form is repeated within T-1; that is, the repetition occurs before the interlocutor has signalled a problem with understanding at T0. These cases are not included in the count for repetition as a repair strategy at T+1, but are assigned to the T-1 turn. Moreover, if the repetition produced by the sender overlaps with the prompt for repair from the interlocutor at T0, the decision to assign the sender's repetition to T-1 is based on the co-occurrence of try-marking (cf. Chapter 2).

Of the occurrences of repetition in the data, half are repetitions of fingerspelled words, and the other half are repetitions of signs from the signer's language or other sign languages. In very few cases did the addressee use one of the overt signals of communication trouble at T0, including a facial expression indicating uncertainty (such a facial expression was the trigger for repetition in only one case). Instead, in most cases, the T0 trigger for repetition was the absence of backchanneling. This pattern suggests that not giving a positive backchannel counts as a T0 trigger in cross-signing, which is different from what is found in the spoken language research. In spoken languages, the lack of a positive backchannel is normally not enough to constitute a T0 trigger, and an overtly negative backchannel is needed. Repetition is also different from the other strategies in that it is accompanied by mouthing in 83% of cases when used at T+1. All other strategies are overwhelmingly produced without mouthing, and several strategies, including explanation, example, and mixed strategies are never accompanied by a mouthing at T+1. 'Mouthing' refers to a signer's partial or full, but unvoiced, production of a spoken-language word with the mouth, and it usually happens simultaneously with the manual production of a lexical sign (Boyes Braem & Sutton-Spence, 2001). The frequency of mouthing in the two repair strategies where it does occur is as follows:

Repetition with mouthing	10/12	83%
Literacy with mouthing	5/21	24%

In a study on regional language variation, Stamp et al. (2016) found that in

addition to repetition, English mouthing, fingerspelling, and signing a different variant for the same concept were each used as a means of resolving instances of miscommunication. Similarly, cross-signers frequently seem to use mouthing, usually English mouthing, in conjunction with repetition. Repetition in first repair attempts occurs with mouthing 83% of the time, i.e., out of 12 total instances of repetition, 10 appear with mouthing and only 2 appear without mouthing. The preference for repetition with mouthing over repetition without mouthing may lend further weight to the notion that cross-signers are replicating forms to check the results of their beliefs about the world, in the terms of Lewis (1969). New issues in communication are dealt with through convention by considering how similar problems have been dealt with previously; that is, our experience of the previous issue aids in finding a solution to the current issue. Furthermore, this gives more weight to the notion of replicating the repertoire of different languages in different modalities to confirm the consequences of belief in the world. Cross-signers are less likely to use mouthing with literacy strategies. Out of 21 first-attempt instances of fingerspelling or writing-based strategies, only five were produced with mouthing, which is a rate of only 24%, much lower than the 83% rate at which repetition occurs with mouthing. The occurrence of mouthing with other strategies is very rare, although it is likely where other strategies are combined with repetition or utilised in a sequence alongside repetition.

Literacy

The Literacy category includes all strategies that exploit written languages, including both fingerspelling and writing. This section concentrates on the 19 cases where fingerspelling/writing was used as a first-attempt repair strategy and appeared as a 'new' tool in the sequence; that is, T+1 involved fingerspelling or writing but T-1 did not. Fingerspelling is the most common way in which literacy is deployed in the data. For instance, if the addressee does not understand a sign for 'home', the signer may fingerspell H-O-M-E for clarification. In the data, the target language of fingerspelling is always English, so the deaf participants seem to be aware that this is the language of international communication. Successful deployment of fingerspelling thus relies on both knowledge of the manual alphabet itself and lexical knowledge of English. The cross-signers also used writing, especially to communicate about numbers (cf. Zeshan, 2015).

For example, when talking about his age, the Jordanian signer signed '27' using the cross-linguistically atypical method of articulating '7' before '20' ('seven-and-twenty'), which caused a trouble for his interlocutor; he then traced the numbers on his hand to clarify his meaning.

It is noteworthy that four of the sign languages represented, KSL, NSL, LIU and HKSL, use fingerspelling systems that are different to ASL/IS, and yet the signers from these places do not use these native systems in their fingerspelling within the

data. They resort instead to the one-handed English-derived alphabet seen in ASL/ IS. This makes the one-handed alphabet a commonality amongst all the signers, giving them a shared resource to draw on when trouble arises. The frequency of these strategies at T+1 suggests that literacy in the form of fingerspelling and/or writing was seen by the participants as a favourable way to attempt repair, although it was in fact less effective than some of the other strategies in actually bringing about successful repair (see section 3.3.4). Unfortunately, because only the first interactions were coded and no longitudinal data were analysed, it is not possible to say whether this lack of success led participants to decrease their use of literacy-based strategies over time. Observation of the sequence of initial conversations suggests that at least some participants used this strategy less in their later pairings compared to their earlier ones.

Possibly, this favourable view toward literacy-based strategies is due to the status of English as a worldwide lingua franca, especially in technology and remote communication, and/or perhaps it reflects the great importance typically placed on writing and fingerspelling skills throughout deaf education. Fingerspelling was particularly useful when a signer was able to look up definitions in an online dictionary, as they could use the spelling to find the word and meaning in their own written language. To this end, Signer A used a hand-held device to look up the Korean translations of 'identity' and 'area' that were fingerspelled to him.

Fingerspelling is sometimes the main available way in which to introduce a concept,

e.g., a country such as Nepal (see Example 3.6), a language such as Arabic, or a

person such as Kang-Suk. Also, the first meeting usually involves many introductory

items such as names, and fingerspelling is a typical way to provide these in many

sign languages. Johnston (1989 & 1998, in Johnston & Schembri, 2007: 322) states

that in Auslan, for example, fingerspelling is commonly employed to convey English

proper nouns and concepts that have no lexicalised Auslan sign. Thus, abstract

concepts like 'culture' and 'theory' may frequently need to be fingerspelled in

cross-signing, as there is no immediate visually iconic means of portraying them,

especially in the first meeting when the shared code might be minimal.

Example 3.6. Literacy strategy for clarifying a proper noun

Signer F - T0	Repetition(NEPAL)		NOT-UNDERSTA
Signer G - T-1 / Signer G - T+1	NEPAL		fs:'NEPAL'

In this example of the fingerspelling/ literacy strategy, signer G is talking about Nepal, using a lexical sign NEPAL.	Signer F articulates the sign with a puzzled expression, which triggers no reaction from his interlocutor, signer G, so he then states explicitly that he does not understand.	This prompts G to fingerspell N-E-P-A-L.

The fingerspelling in the data often featured noticeable holds, even at first attempt.

Groeber & Pochon-Berger (2014) find that speakers maintain holds during the

next speaker's turn, which shows that they are not only using holds to signal the

end of their turn, but also to remain in 'speaker position' so that they can easily

resume the role of speaker. They note that this behaviour appears to be common in repair situations, where the management of mutual understanding is complex and affects the interaction's progress. Holds can also help the interlocutors manage intersubjectivity as they advance the conversation, because holds are an 'embodied resource' that reveal a person's current expectations and understanding of mutual behaviour (Groeber & Pochon-Berger, 2014). The holds in the cross-signing data involved each letter being sustained long enough for the signer to seek confirmation from his or her conversational partner (although the precise length of these holds was not quantitatively analysed in this study). This could be due to signers' awareness of each other's non-fluent English, to which they made explicit reference in the data. More importantly though, it contributes to the process of grounding, giving the interlocutors time to devote their joint attention and comprehension to each individual letter. In contrast to fingerspelling, tracing (usually in the air or on the palm of the hand) tended to be used mainly in guessing the meaning at T0. In Example 3.7, Signer C has fingerspelled a letter, and Signer A has not fully grasped the meaning but makes a guess by tracing the letter. Interestingly, Signer C then confirms that the guess was correct by also using the tracing strategy, matching the usage of Signer A.

Example 3.7. T+1 signer accommodating strategy of T0 signer

Here, signer C articulates the fingerspelled letter F from NGT. Signer A states that he does not understand, and mimics the form tentatively.	Guessing at the meaning, signer A traces the written letter T in the air.	Signer C indicates that the guess was not correct, and traces the written letter F in the air, borrowing signer A's strategy. Therefore, a tool exploited at T0 has here directly influenced the utterance at T+1.

Substitution

Substitution is the use of a word from another language that has an equivalent or similar meaning to the trouble source. For example, when Signer D articulated MAN from HKSL and it was not understood by the addressee, he then tried the KSL sign for 'man'. Substitution was the most frequent strategy, with a total of 24 cases identified in the data, and substitution comprised 79% of the successful repairs at T+1. Two types of substitution can be identified: substitution involving a sign or signs from the same language with a slightly different meaning, and substitution involving a sign with a roughly equivalent meaning from a different sign language (see Example 3.8). The first type includes the examples of COW at T+1 being substituted for MILK at T-1; REST for LAZY; and NO and DANGER for CANNOT. Examples of the second type include signs for 'friend' (HKSL sign substituted with

KSL sign), and 'people' (ASL sign with P-handshape substituted with non-initialised IS sign). This strategy was more common in cases where the sign at T-1 was of an abstract nature and not iconically motivated.

Example 3.8. Substitution

The strategy of substitution is illustrated in this example where the Dutch signer (C) articulates the NGT sign for 'interpreter'.	Signer A repeats this sign with a questioning look, asking what it means.	Signer C then selects and produces a substitute sign for 'interpreter' from another language, ASL.

These two types of substitution are familiar from previous research. Lee (2003) draws on the work of Tarone (1980), using Tarone's term 'approximation' to mean something similar to the strategy of 'substitution' here, i.e., the replacing of a trouble source sign with a roughly equivalent form or synonym. Lee also uses a term from Dörnyei and Scott (1997), namely 'foreignizing', to describe the strategy of substituting a troublesome form with one from another language, e.g., the interlocutor's mother tongue or a third language. It is notable that there are many examples of try-marked substitutions. The occurrence of try-marking fits in well with the consideration that in the context of substitution, signers think about the most promising choice of sign in terms of resolving the communication

trouble. In instances of substitution, it often seemed that signers were attempting to imagine what signs their interlocutor would be most likely to understand, given their particular background and native language. A signer might be familiar with a number of different sign languages. For instance, a person from Korea might know Chinese Sign Language (CSL) and International Sign in addition to KSL. If interacting with Signer D, who is from Hong Kong, the Korean signer might draw on CSL with the assumption that this interlocutor probably knows some Chinese-derived signs. In contrast, when interacting with a European signer, the same Korean signer might guess that a substitution from International Sign would stand a higher likelihood of success.

Explanation

The tool of explaining here refers to explicitly describing the meaning and/or grammatical function of the trouble source so that the addressee can make the necessary connections. This does not include the use of synonyms, as that would fall under the category of substitution. For Example 3.9, a signer might resolve the trouble source HAPPY by signing 'smile, glad, laugh, celebrate'; a sign for 'north' that was not understood was clarified by the signer by describing the axes of a compass and the four cardinal directions.

Example 3.9. The Explanation strategy

| An instance of an interlocutor using explaining as a strategy is shown here, where signer A produces the sign HAPPY in the midst of an utterance. | This causes communicative trouble for the other signer, D, who signals a problem by manually signing 'hold on, stop' and then repeats the sign HAPPY quizzically. | Signer A then chooses to explain the concept, uttering ME GOOD EXCITED. |

Lee (2003) notes that the strategies of explaining and giving examples are grouped together into one category called 'circumlocution' by Tarone (1980), as both involve 'talking around' the trouble source. The present study's separation of explaining and giving examples into two distinct categories is more similar to the taxonomy of Dornyei and Scott (1997, in Lee 2003), in which explaining is 'rephrasing' (i.e., describing or expounding on the trouble source item further), and giving an example is 'expanding' (i.e., putting the trouble source item into a sentence).

Explaining was useful in forging a referential understanding of the trouble source sign by drawing explicitly upon the context in question. Examples include the following:

Example 3.10.

Trouble source :   HAPPY (performed on the chest)

Repair :   'work, achieve, feel ecstatic, grin, cheer out loud, heart is full'

Example 3.11.

Trouble source :   WORRY (in neutral space at head height)

Repair :   'effort, bad result, fail, wonder how (to fix), scratching my head'

Example 3.12.

Trouble source :   NORTH

Repair :   axis of north, south, east and west portrayed in space

Such circumlocutions give the addressee the opportunity to identify the meaning of the trouble source form via the context of the explanation.

Example

Use of an example involves offering a new sentence containing an instantiation of the meaning; for example, when the sign 'age' was not understood by the interlocutor, the signer offered the example 'My age is 27' (Example 3.13).

Example 3.13. Deployment of the example strategy

Signer F - T0		Repetition(MANY^OLD)		
Signer E - T-1	OLD#MANY			
Signer E - T+1			example"I am 26 years old"	

This figure shows how the strategy of offering an example can be exploited. Here, the Jordanian signer (E) is talking about the concept of age, which is indicated in JSL by pointing to the teeth.	Signer F mimics this form to signal that he does not know the meaning.	To attempt resolution, signer E gives an example sentence, still using the 'age' sign referring to the teeth: of 'I am 27 years of age. What is your age?' This successfully restores the communication.

Another way of including the trouble source sign in the repair at T+1 was to mention it alongside a contrasting sign, in a "not A but yes B" kind of construction where B was the trouble source sign. In this way, the addressee could infer the meaning of B on the basis that its meaning was in contrast to, or perhaps the opposite of, the meaning of A, a sign that he could understand more easily. Giving examples was sometimes useful in imparting the context to the addressee. When a sign was pinpointed as a trouble source, the signer sometimes gave a number of different examples of the concept. To check understanding, which would typically become apparent at the end of the clause with the example, signers tended to hold the final sign as a try-marker, seeking feedback from the addressee.

This try-marking seems to set the strategy of giving examples apart from that of explaining, as the latter is less likely to involve holds, a crucial component of try-

marking. Out of seven instances of giving examples, four included try-marking,[15] whereas out of eight instances of explaining, only one involved try-marking (see Table 3.5). This may be because explaining usually involves longer utterances and fewer phrasal or clausal boundaries where try-markers could be added. The one occurrence of explaining that did involve try-marking was comprised of a series of visually iconic descriptions of the concept of 'party/celebration' (as the trouble source was a Nepali Sign Language sign meaning 'party'). The explanation included signs referring to a red gown, wedding ring, headdress, noise, and drums, and the Nepali signer used holds as try-markers in between each item to check whether the Indonesian signer had understood, i.e., whether the attempted repair was successful. It was the 'drums' component that finally facilitated the repair. Like in this unusual instance of Explanation, the Example strategy also usually involves shorter utterances with more opportunities for try-marking. Nevertheless, the two strategies are similar with respect to their function of contextualising the trouble source sign.

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[15] There was only one occurrence of giving examples that did not include try-marking (the remaining two of the seven were undetermined). This case was unusual as it was not a typical OIR. One signer was discussing 'age' using a sign that involves pointing at the teeth. The other signer misunderstood the meaning and carried on the conversation under the assumption that the sign actually meant 'teeth'. The first signer then attempted to repair the misunderstanding by giving an example (signing 'year'). This was a more complex misunderstanding, rather than a typical OIR with both signers' attention drawn to a recognised trouble source.

Table 3.5. Use of try-markers with Example and Explanation strategies at first attempt

	Example	**Explanation**
With try-markers	4	1
Without try-markers	1	5
Undetermined	2	2

Productive Signs

As set out in section 2.2.1, this strategy includes the use of indexicality, classifiers (whole-entity, handling), SASS signs, gesture, and mime. In sign languages, such visually motivated forms tend to be selected more often than arbitrary/opaque forms by language learners, especially children (Rosenstock, 2008). Homesign, the system of communication often devised idiosyncratically by deaf children and their families, is noted for being highly iconic (Coppola & Newport, 2005).

Iconicity can be a strong means of grounding and a successful prompt for referent identification that allows a person to identify the signified item using aspects of the linguistic form itself (Perniss & Vigliocco, 2014). Thus, it is perhaps not surprising that iconic constructions including productive signs were selected by participants as convenient ways to make visually-motivated, easily-understood conceptual links between signs and real-world meanings. Example 3.14 shows how visual iconicity was deployed in the Productive Signs strategy. In this example, the signer is representing the actions of a teacher, using a technique known as 'role shift' or 'role

taking' in sign language linguistics. Quer (2013: 12) defines role shift as 'the signer [taking] on the role of the reported person [...] accompanied by an imitation of the actions by the reported agent, in a mimic-like way'.

Example 3.14. Deployment of the Productive Signs strategy

In this example, a signer draws on the visual-spatial strategy. First, the Indonesian signer (F) produces a sign for 'teacher' from his native sign language.	The Nepali signer (G) mirrors the sign to ask for clarification of the meaning.	Signer F then makes use of role shift to act in the character of a teacher, e.g. signing LECTURE+ and WARN+.

Further examples include the concept of 'careful', which was iconically presented as being nervous; 'teacher' was portrayed by writing on a board and lecturing in front of a class; and the meaning of the fingerspelled A-U-G ('August') was shown by flipping through an imaginary 'calendar' on the wall, indicating that the names of months are at the top, and then turning pages and counting up to 8. In another instance where the signers exploited visual-spatial iconicity in the Productive Signs strategy, the initialised ASL sign for 'university' was clarified as 'diploma rolled up in my hands, study (read book), higher-up'; the details and visually-motivated iconicity in these utterances made them effective as vehicles for repair. This suggests that iconicity is a strategy that signers believe will aid the understanding of their addressee, and one

they are ready to rely upon when conversational trouble arises.

3.3.4. Successful and unsuccessful repair attempts

This section presents data on the success rates of the strategies described above, including how often the individual participants used each strategy, and differences between the choices made by the Multisign group versus the Typology group. Therefore, this section looks at a different measure, the rate of success of the different repair strategies. For this, the study investigated which of the repair strategies is successful or unsuccessful in resolving the communication trouble. Deciding what counts as 'success' is not straightforward, and therefore, several safeguards were put in place to ensure reliability of the results. First of all, it is impossible to decide whether an interlocutor has really understood the intended meaning to be conveyed. To the extent that people can remember what they were thinking during the conversation, it is of course possible to ask them afterwards about their level of understanding. Consequently, the data collection reported in Zeshan (2015) for a different aspect of cross-signing included post-hoc interviews with the participants (see also Webster et al, 2019). These interviews can be very revealing and confirm that sometimes, one or both interlocutors believe that communication trouble has been resolved, while in fact they continue to misunderstand each other.

As post-hoc interviews were not considered here due to the logistics and timing of

the interviews in relation to the data coding, success is defined as a signal from the addressee of T+1 as to whether or not the repair is felt to have been understood. Understanding can be signalled by an explicit metalinguistic comment ('Oh, I understand'), a head nod, or an affirmative sign such as GOOD. Conversely, a negative facial expression such as frowning, a negative headshake, or an explicit signed comment (WHAT, NO, DON'T-UNDERSTAND, or a palm-up gesture) signal unsuccessful repair. Typically, in such cases where repair is not immediately successful, this is followed by another repair attempt. Another measure to increase the reliability of the 'successful/unsuccessful' judgment is to restrict the analysis to instances of first attempts of repair only. As each repair sequence has at least one repair attempt, the number of first attempts is equal to the total number of repair sequences, i.e., 88. However, in six cases, there was no clear positive or negative signal from the addressee after the first repair attempt to indicate whether the repair attempt had been successful or not. Hence these instances were excluded from the analysis, resulting in a final figure of 82 first repair attempts for analysis here.[16]

Restricting the analysis to first repair attempts is appropriate, because only at the first attempt it is possible to be sure that the success or otherwise of the repair is due to the particular repair strategy used at T+1. For any successive repair attempt of the same trouble source, any definite conclusion to this effect would be

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[16] Note that this figure is different from the subset of 82 repair sequences in Table 3.6, in which the analysis has deducted from the total number of 88 sequences those 6 sequences where repair was ultimately abandoned at any point in the repair sequence.

impossible. For example, if the first repair attempt is by way of a circumlocution ('explanation' strategy), and a second repair attempt follows using fingerspelling ('literacy' strategy), ultimate successful understanding after the second repair attempt could be due to the fingerspelling being a successful strategy. However, it could also be the case that the addressee merely needed additional time to decode the explanation given at the first repair attempt and is actually disregarding the fingerspelling altogether. Because each successive repair attempt builds on the entire interaction, one cannot be sure which part of the entire interaction is responsible for an ultimate successful resolution. Table 3.6 summarises the first attempts at repair and the rate of success according to which strategy was employed, showing the absolute numbers of successful and unsuccessful instances as well as those that could not be determined (for example, because of unclear backchannelling).

Table 3.6. First attempt success rate per strategy

	Explanation	Productive signs	Substitution	Example	Mixed	Literacy	Repetition
Immediately successful	8 (100%)	9 (82%)	19 (79%)	4 (57%)	2 (50%)	9 (43%)	2 (17%)
Not immediately successful	0 (−)	1 (9%)	5 (21%)	3 (43%)	2 (50%)	10 (48%)	8 (67%)
Success unclear / undetermined	0 (−)	1 (9%)	0 (−)	0 (−)	0 (−)	2 (10%)	2 (17%)

Explanation, using productive signs, and substitution have the highest rates of success at the first repair attempts, at 100%, 82% and 79% respectively; they seemed to be the most effective at helping addressees to make prompt connections between signs and meanings. Giving examples and using a mix of strategies had considerably lower success rates of 57% and 50% respectively, though the total number of occurrences is also low for these categories. Thus, in terms of successful strategies, it would appear that there are three effective ways to achieve repair at the first attempt, namely substitution, explaining, and using productive signs. However, it is important to note that the difficulty level of the trouble source may restrict the availability of certain strategies and influence the signers' choice of strategies, and this research has not analysed T-1 utterances in terms of difficulty or perceived difficulty. Therefore, these results are suggestive only, and require further investigation to tease out how the nature of the T-1 utterance may influence the signer's selection of a particular repair strategy.

The data provide good evidence that some of the frequently-used strategies were less helpful. Repetition was associated with immediately successful repair in only 17% of its occurrences, with the much larger proportion of 67% being unsuccessful. It is worth considering the possible motivation behind a signer's decision to use this strategy, as it may seem counterintuitive that if the addressee failed to understand the form in question the first time, they would comprehend a second, unaltered production of it. This is explored further in section 3.4. Resorting to spoken-language-derived strategies in the Literacy category was unsuccessful 48% of

the time. Participants still continued to use such strategies, however, perhaps because they are still successful more than half the time, and because this may be a common way of attempting repair generally, particularly for signers from cultures where written literacy is widespread. In cross-signing, literacy strategies often appear to be selected for place names (e.g., 'Nepal'), languages (e.g., 'English'), and some abstract concepts (e.g., the concept of 'name' in 'what's your name'). As noted in section 3.3.2, literacy-based strategies may be more useful for abstract concepts such as 'name' because there is much less likely to be a shared code for such items or any other way of indicating them. Having already looked at the data as one corpus incorporating the Typology and Multisign sets together, the results from the two sets are now considered separately in order to facilitate a brief comparison. The results are summarised in Figure 3.10.
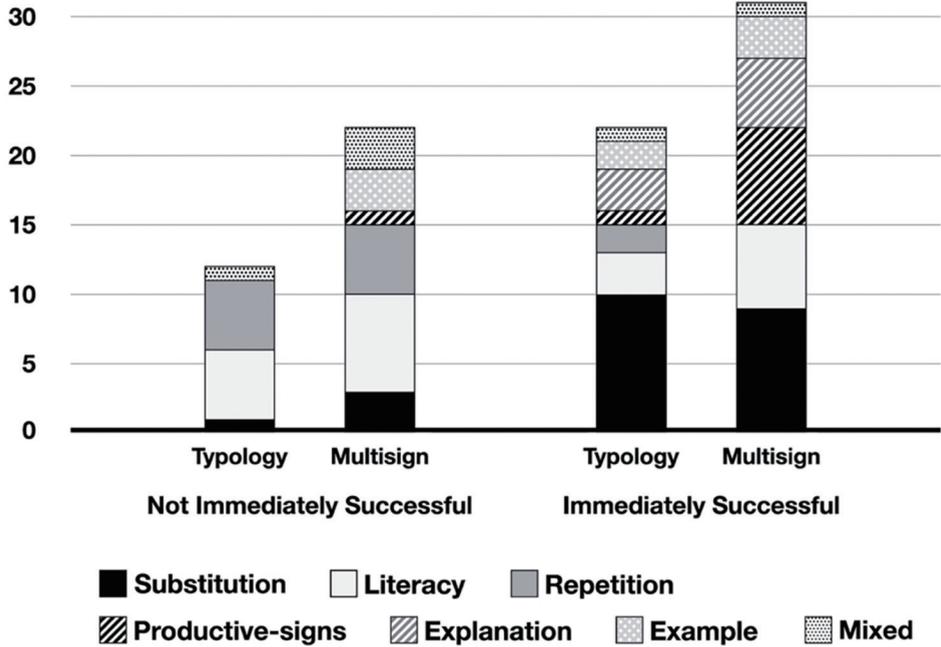
Figure 3.10. Comparison between first attempt success rates per strategy for the Typology group (left) and Multisign group (right)

In both data sets, the two strategies that most often led to successful repair at first attempt were substitution and explaining. Both sets also showed repetition to be an unsuccessful strategy. Overall, the strategy of giving examples was only successful about half of the time, possibly because putting the trouble source sign into a sentence or exemplifying it with other signs still involves using the trouble source sign itself. If this has been a problematic form for the addressee, their confusion may be sustained by additional articulations of the sign. It appears that explaining a form is a more successful strategy. It is worth reflecting on why explaining was so successful as a repair strategy. Explaining was a way to clarify a form and allow the

addressee to consider the context of the meaning more fully. It tended to involve imparting the meaning in a detailed manner, often with longer sequences of signs used for circumlocution, to ensure the addressee grasped the prior context and surrounding field of meaning. This strategy seems to be particularly considerate of the addressee and requires the signer to put forth considerable effort so that the addressee can gain clarity. So perhaps unsurprisingly, this tool has the highest rate of success in the data, in fact reaching 100%. With respect to substitution, a more detailed look at the data reveals that substitution leads to differential success rates of the repair depending on the provenance of the sign chosen. Figure 3.11 shows that, when a signer selects a form from the addressee's language, this is very likely to be successful. In fact, all of the four instances of this at T+1 were successful, as were the seven cases where the signer selected another sign from his or her own language (e.g., KSL CANNOT being substituted with KSL DON'T).
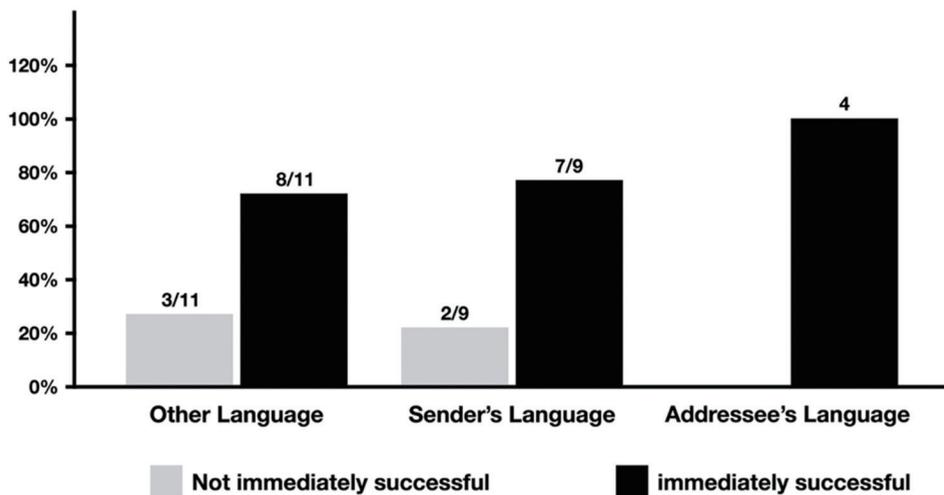
Figure 3.11. Success of substitution in 1st attempt repair strategies according to provenance of signs

The reason why substituting another sign from the signer's own language may tend to be successful is that such a form is perhaps more likely to already be in the two signers' shared repertoire, compared to a sign from a third sign language. The use of other sign languages, i.e., neither the sender's nor the addressee's language (e.g., ASL), resulted in eight instances of successful repair and three instances of unsuccessful repair, which was a much lower rate of success than substituting a form from the addressee's language or a different sign from the signer's own language.

For the Literacy strategy, there is only a slight difference between the two sets of data. There were 3 successful occurrences overall in the Typology set, compared to 5 unsuccessful ones; in the Multisign set, there were 6 successful instances and 7 unsuccessful ones. Another difference between the two data sets is evident when looking at the use of the Productive Signs strategy. This was quite frequent in the Multisign data, with 7 successful cases. While it was also successful in the Typology set, it was infrequent, and it is as yet unclear why there were so few occurrences in this set compared to Multisign. Overall, the similarities between these two sets are more notable than the differences, and the disparity in previous communicative experience between the two groups of signers makes the many parallels all the more remarkable. The main conclusions drawn on the basis of Table 3.6, with explaining, productive signs, and substitution being successful strategies, repetition being an unsuccessful strategy, and literacy-related uses presenting a more mixed picture, still hold when considering the groups separately.

3.4. Conclusions

This chapter has highlighted the considerable skills displayed by sign language users in cross-signing interactions. I have looked in detail at the range of repair strategies and their use in conversations. Despite the challenging situation, cross-signers' combined use of multilingual resources, iconicity, circumlocutions, and literacy often allows them to repair communication trouble within a single turn. A quantitative analysis of some of the data, together with qualitative descriptions of the use of repair strategies, have revealed some of the rationale and underlying motivations when signers try to resolve miscommunication in cross-signing. While several of the strategies clearly aimed at resolving the trouble source directly, the analysis suggests that repetition merely appears to buy time to come up with better strategies, rather than being a preferred repair strategy in its own right. Overall, the results of this chapter are in line with recent research on cross-signing (Zeshan 2015; Chapter 2), particularly with respect to the initial meetings between signers (see Bradford et al., 2019, for a comparative study tracking cross-signers' interactions over a longer time period).

In addition to being of interest in the context of sign language linguistics, research on cross-signing also provides valuable new insights into and considerations with respect to established notions in the area of repair. Firstly, cross-signing leads us to consider the trouble source (at T-1) in much more detail, revealing its complexities. Because a shared code is largely absent at the beginning of cross-

signing interactions, the interplay of factors leading to communication trouble cannot be adequately covered using the three categories of troubles in 'receiving, producing and understanding' the message. Instead, the qualitative examples have shown, for instance, that understanding is itself a multifaceted notion. In cross-signing interactions, failure to understand a sign can be due to the absence of a shared code, the unfamiliarity of a concept (as in the example of 'Uzbekistan'), or misinterpretations of iconicity. The difficulty in understanding a fingerspelled word can be due to the form of the fingerspelled letter, on due to the addressee not knowing the targeted English word.

Likewise, the nature of the utterance that occurs at T+1 is called into question by the use of the Repetition strategy. Due to this strategy being largely unsuccessful, the data have led to the conclusion that the function of Repetition may have more to do with 'buying time' for the sender than with offering a repair option to the addressee. Therefore, it is necessary to consider that either Repetition may not fully fall into the scope of repair, or that utterances at T+1 may serve multiple functions, some of which are not primarily associated with repair in a narrow sense. Whilst this may be the case, it also relevant to note that Repetition often adds mouthing, so it is still an information upgrade and classed as a repair in that sense.

Finally, this research has uncovered some preliminary evidence of how recipient design supports repair efforts. Recipient design is the concept that actors in communication tend to produce their message in a way that is tailored to their

recipient (Sacks et al., 1974; Blokpoel et al., 2012). For example, when formulating their message, people will take into account their addressee's individual background, and what they assume their addressee to know. Some evidence for this is inherent in the data on the Substitution strategy, which showed that signers sometimes show sensitivity to their addressee's background by choosing a substitute sign from the addressee's sign language. The data also show that using recipient design in this way is more successful as a Substitution strategy than choosing a sign from an unrelated sign language as a substitute sign.

The present research is also of interest in terms of the communicative and cognitive skills deployed by signers in the interaction. The data analysed here have provided several clues as to the impressive metalinguistic skills that signers draw upon in this situation. On the other hand, the interplay between signers' individual and social-linguistic backgrounds, and the linguistic basis of cross-signing communication, is a difficult issue that requires further research. Part of the reason why analysing this type of communication is quite difficult is due to the issue of identifying what factors are related to the nature of the sign languages themselves, and what factors are associated with participants' general communication abilities (see Zeshan, 2019, for an analysis of factors in relation to experimental data from cross-signing).

At present, the study does not have multiple dyads of signers from the same countries, with the same linguistic backgrounds, in order to determine where there are similarities due to the languages involved and where communication

is idiosyncratic due to the specifics of the people involved. Having multiple pairs of signers with similar linguistic backgrounds would be very desirable for future research. Overall, the degree of successful repair in such interactions is very remarkable – no such possibilities for sustaining communication would be likely to arise in spoken communication between speakers who did not know each other's languages. The success may be attributed to various sources: the greater use of iconicity and indexicality in sign, the greater need for metalinguistic skills in less standardised languages, and the consequent sensitivity to uncertain intersubjectivity, as shown e.g., in try-marking and substitutions.

4. Interactive sequences modulate the selection of expressive forms in cross-signing: evidence from a colour naming task[17]

4.1. Introduction

This part of the study looks at how linguistic conventions arise in the context of face-to- face, real-time interaction. Cultural traits are transmitted from person to person (Laland, 2004; Kendal et al. 2018). Just like in genetic evolution, there is competition between cultural traits. Some variants may be successfully transmitted, and others may be "flops" (Morin, 2015). For example, in the 1980s, the VHS and Betamax technology formats were competing against each other (Mesoudi et al., 2004). While Betamax was higher quality, VHS eventually became more popular. Various transmission biases are thought to affect the process (see Boyd & Richerson, 1988; Henrich, 2001) such as the inherent effectiveness of the variant (content bias), but also a bias for people to copy prestigious users (coordination bias) or the most frequent variant (frequency bias). These have been tested in various domains such as technology (Basalla, 1988; O'Brien et al., 2014; Buckley & Boudot, 2017), beliefs (Cavalli-Sforza et al., 1982) and storytelling (Stubbersfield et al., 2015).

Linguistic signals (words, signs) are also traits that evolve according to cultural transmission (Croft, 2000). For example, several signs for various regions or countries referring to physical attributes such as 'pointed nose' for 'Europe' and 'oriental eyes' for 'Asian' (a paradigm that included using a fingerspelled letter representing a particular Asian country to pull at the outer corner of the eye are now seen as derogatory and are no longer in use. These have been replaced by more abstract, initialised signs such as 'E' for 'Europe' and 'A' for 'Asia', the letter 'K' for 'Korean', 'C' for 'Chinese', and 'J' for 'Japan'). Transmission biases are not straightforward to test directly in spoken language, since genuine innovation is rare in established languages, and change can take a long time. Researchers have used constrained 'model systems' such as Twitter (Tamburrini et al., 2015) and experimental semiotics: a controlled experiment where participants use a novel communication system that can evolve rapidly (see Caldwell & Millen, 2008; Roberts, 2017; Tamariz, 2017).

While these methods provide experimental control, they often have low ecological validity. Linguistic signals have evolved primarily in a context of interactive, real-time, face-to-face conversation (Croft, 2000; Levinson, 2006;), and conversation is more than just a series of variants being reproduced, as previous chapters have noted. How do interaction and cultural transmission biases relate to each other? Little is currently known about this, though one might expect that they would be related (see Enfield, 2014; Robert & Mills, 2016; Mills & Redeker, 2017). For example, different types of turns execute different pragmatic actions, a phrase used in one context

might carry more weight or mean something very different from it being used in another context (see Chapter 5; see also Austin, 1976; Levinson, 2013; Gisladottir et al., 2015). Turns are also interrelated: types of turn make certain responses relevant and problems in understanding can be fixed in 'repair' sequences (see Chapter 2; Chapter 3; Schegloff et al., 1977; Kendrick, 2015; Dingemanse et al., 2015). Chapter 2 also showed that metalinguistic skills might also come into play, since interlocutors can convey uncertainty about a signal through try-marking. Therefore, it seems reasonable to expect that interactive structures may affect transmission.

To the researcher's knowledge there are no prior experimental studies focused on how the structure of conversation influences transmission in relation to other transmission biases. In order to investigate this, a setting is required that mimics the controlled conditions of experimental semiotics while allowing the flexibility and ecological validity of naturalistic conversation. One potential innovative approach is to study cross-signing, since this is a naturally occurring context in which individuals need to converge on a shared lexicon. There are several studies of signing which have been used to inform theories of cultural evolution. For example, several experimental studies with hearing adults use signing and gesture as a novel communication medium in order to study how communicative conventions emerge (see Motamedi et al., 2017). Some of these studies also consider interactional effects (e.g., Micklos, 2016), though none study transmission biases and interaction at the same time. Another approach is to study real signed languages that emerge spontaneously from scratch. This process has been well documented in the

case of Nicaraguan Sign Language, which emerged over the course of several decades in a deaf school (Senghas & Coppola, 2001), as well as in multiple 'deaf villages' where a local sign language has emerged from the interaction of deaf and hearing community members (Meir et al., 2010, Zeshan & de Vos, 2012). Lesser-known instances of de novo signed communication arise between deaf signers and hearing non-signers (translanguaging, see section 1.2), and among deaf signers who do not know a common written or signed language (cross-signing, see Chapters 2 and 3; Kusters et al., 2017). Translanguaging means mixing modes of language, e.g., writing, signing, gesturing, and speaking. Both translanguaging and cross-signing are of particular interest as they create a real-time pressure to establish a shared communicative repertoire. Translanguaging is different to cross-signing because it involves both spoken and signed languages, but cross-signing involves only signed languages (Otheguy et al., 2015). However, these studies are often not designed to be experimentally controlled, and rarely capture the very first period of the emergence of a signed language.

This study combines the control of experimental semiotics with the ecological validity of cross-signing in order to assess the relative contribution of different biases to the emergence of a shared lexicon. The researcher recreated the context for cross-signing to emerge in a lab by flying deaf individuals from Nepal, Jordan and Indonesia to India to live together for three weeks. Nepali Sign Language, Indian Sign Language, Jordanian Sign Language and Indonesian Sign Language are mutually unintelligible and none of the signers knew any of the other languages.

They all reported having no international experience and not knowing International Sign (IS), but some of the features of their communication suggest that they may have had some experience of IS (it was only feasible to ask them to report whether they had previous experience of IS, and it was outside the scope of the research to investigate this in detail). Recordings were made of spontaneous conversations and structured communication tasks, including a spot-the-differences task based on communicating about colours. The domain of colour was chosen because it was constrained enough to study individual variants, the concepts could be represented directly and easily to the participants (through colour chips), it provided enough scope for ambiguity and different communication strategies including iconicity and it is also used in similar experiments in the cultural evolution literature (e.g., Morin et al., 2018; Berlin & Kay, 1969; Steels & Belpaeme, 2005). In this task, two signers were given a cartoon image each which differed only in the way certain objects were coloured. They could not see their partner's image. Their task was to identify the differences in colour by communicating spontaneously face-to-face. The signed variants used by the participants were coded and examined. The pairs participated in this task on their first meeting, after 1 week and after 3 weeks, resulting in a 320-minute video corpus, of which the initial and final meetings are reported on in this study as a subset of the data. This enabled us to quantify, examine and compare the production of certain forms and utterances robustly to determine what had changed or developed across the three-week period.

Participants initially used a range of strategies, including pointing, articulating

signs for common objects with that colour (e.g., referring to a common iconic sign for 'tree' and pointing to the base to mean 'brown'), and their own native variants. However, after three weeks a consensus had been formed. For example, everyone used the Indian signer's variant for 'green' and the Nepali signer's improvised 'tree-trunk' variant for 'brown'. Sequential analyses indicate that signers continuously assessed the relative ease with which their forms might be understood, and adopted interactional strategies (e.g., try-marking, repair sequences) to manage communicative difficulties that arise. Mixed effects modelling was used to analyse which factors promoted the selection of particular signs. There were significant effects for frequency, content and coordination biases, supporting the findings of previous experimental studies, but the interactional context in which a form was used also mattered.

Before explaining the study in detail in subsequent sections, 4.1.1 summarises what is known of expressions of colour in signed languages, which will be instrumental in describing the strategies cross-signers adopted in this task. Section 4.1.2 details the hypotheses tested in this chapter on the basis of prior literature, including but not restricted to experimental semiotics. The remainder of this chapter is structured as follows: section 4.2 describes the method used in the study, including details about the participants, experimental procedure, transcription process, and statistical analysis. section 4.3 explains the results, and section 4.4 is a discussion of what the results indicate in terms of different biases. Finally, section 4.5 brings the chapter to a conclusion and suggests wider implications for language evolution research.

4.1.1. Colour terms in signed languages

One of the reasons for selecting colour as a domain of interest to study the selection of expressive forms in cross-signing is that this semantic domain lends itself to various iconic motivations for signs, which have been well documented.[18] For this reason, the domain of colour, shows considerable language-internal lexical variation across signed languages (Zeshan & Sagara, 2016). This variation can sometimes be quite extensive; for example, British Sign Language has 22 signs for 'purple' (R. J. Stamp, 2013). The size of the colour sign inventory differs across languages, and may be influenced by the number of users. The patterns of rural signing varieties are relevant to cross-signing research because rural sign languages tend to be more context-dependent, smaller-scale sign languages with fewer lexical signs for colours, and more reliance on index pointing. Because rural signers are in smaller communities, they are under less pressure to devise lexical means of indicating colours (de Vos, 2011). This is similar to the situation of cross-signers, who also exploit pointing to a large extent. However, rural signers tend to know each other whereas cross-signers by definition do not. So, there are many aspects of the shared context that rural signers can draw on, including a shared community history and language and familiarity with each other, while for cross-signers the contextual sharedness is

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[18] See for example Yang 2016 on Chinese Sign Language, Richterová, Macurová, and Nováková 2016 on Czech Sign Language; Hollman 2010, 2016 on Estonian Sign Language; Sverrisdottir & Thorvaldsdottir, 2016 on Icelandic Sign Language; Takkinen, Jantunen & Seilola 2016 on Finnish Sign Language, Sagara 2016 on Japanese Sign Language; Hendriks 2016 on Mexican Sign Language, McKee 2016 on New Zealand Sign Language, etc.

restricted to the immediate setting and the general patterns of human communication.

Larger-scale urban sign languages such as Auslan tend to feature many more colour signs than small-scale rural or village sign languages such Kata Kolok, which allows for more idiosyncratic variaion because it is used by a smaller community (de Vos, 2011). In urban and rural sign languages alike, however, many colour signs are based on the indication of body-parts. In Indonesian sign language varieties, the same indexical body-part pointing signs are used in Solo and Makassar for 'red' (which refers to the lips), 'black' (which refers to the hair), and 'brown' (which refers to the skin on the arm). However, different signs are used for 'pink' in these two regions (see Figure 4.1, taken from Palfreyman, 2016). The sign from Makassar refers to the Indonesian flag, which has both red and white on it. The sign PINK1 (ibid.: 277) from Solo uses the fingerspelled P from ASL. PINK2 (ibid.: 282), also from Solo, is a mono-lexemic variant that uses a mouth pattern from English. The third sign from Solo, PINK3 (ibid.: 286) has a mouth pattern based on the spoken Indonesian phrase term for 'pink', MERAH MUDA ('red, light'). The Makassar variant is older than the three Solo variants. These different variants of PINK show that in some sign languages, visually-motivated iconic variants may coexist with initialised variants (i.e., signs using the fingerspelled first letter of the written word), which are often derived from contact with written languages. Zeshan & Sagara (2016) found that urban sign languages are more likely to have initialised colour signs than sign languages used in rural signing communities.

PINK: Makassar   PINK1: asl/Solo   PINK2: Solo

PINK3: Solo
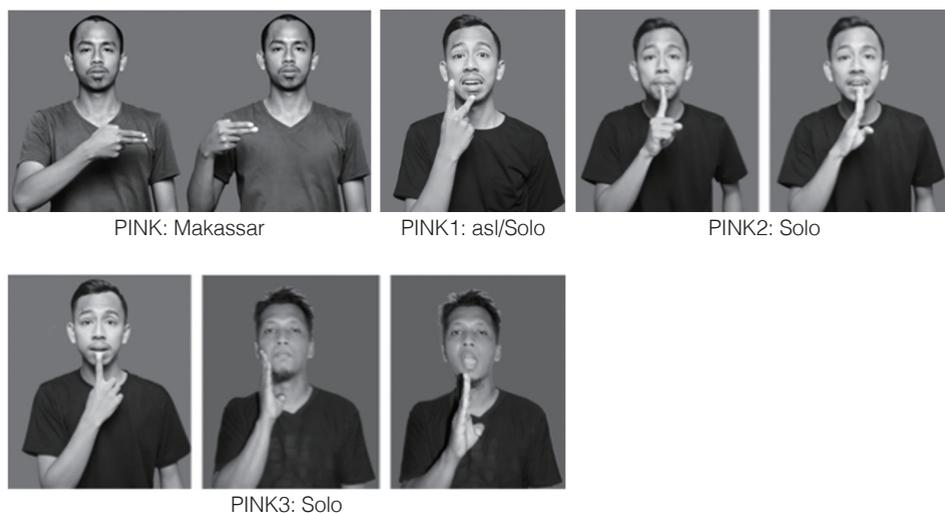
Figure 4.1. Iconically-motivated and initialised colour signs for PINK
in Indonesian Sign Language (from Palfreyman 2016)

Berlin and Kay's (1969) seminal study looked at basic colour terms across many
spoken languages. Basic colour terms are monolexemic, perceptually and socially
salient, not hyponyms (e.g., 'crimson' is a hyponym for 'red') and not contextually
restricted (e.g., 'blonde' can only refer to hair or beer). English has 11 basic colours,
but other languages in their sample had as few as three. Berlin & Kay showed that
spoken languages have basic colour terms according to an implicational hierarchy:
black/white < red < yellow/green < blue < brown < other colours. That is, if they
have a basic colour term for red hues, then they will have one for black and white,
and if they have basic colour terms for yellow and green, then they will have one for
red etc. Berlin & Kay hypothesised that this was also the order in which basic colour
terms evolve in a language (black and white first, then red, etc.).

Notably, very few colour signs adhere to the criteria for 'basic colours' because of their indexical nature, but nevertheless, Berlin & Kay's implicational hierarchy appears to be applicable to sign language typology as well. That is to say, Zeshan & Sagara (2016) show that rural sign languages such as Adamorobe Sign Language (AdaSL) and Kata Kolok (KK) tend to have only the colours on the left side of the hierarchy, whereas larger urban sign languages such as Finnish Sign Language also have the terms on the right (such as brown, for example). Furthemore, Adamorobe Sign Language has just one manual sign with three different Twi mouthings for the three basic colours 'black', 'white' and 'red' (Nyst 2007); Kata Kolok has separate signs for these and for yellow, as well as a single sign for 'grue', a colour term that extends to include both shades of green and shades of blue (de Vos, 2011). To express colours for which they have no lexical sign, both sign languages tend to use pointing to objects in the vicinity. This strategy has also been reported in Al-Sayyid Bedouin Sign Language in Israel and Ban Khor Sign Language in Thailand (de Vos, 2011). As the present study was mainly focused on the evolution of lexical forms, the signers' options for adopting pointing as a strategy were reduced by controlling the lab environment (see section 4.2.2 for details).

Figure 4.2. Signs for 'white', 'black' and 'red' in Adamorobe Sign Language

The signs in Figure 4.2 have the same manual component but differ in their mouthing (from Nyst, 2007: 93). In addition to summarising patterns and constraints in colour term development, Berlin and Kay's (1969) hierarchy is thus useful as a framework for predicting the relative indexical motivation of colour terms (de Vos, 2011; Palfreyman, 2016; Zeshan & Sagara, 2016). One main reason for less iconicity on the right side of the basic colour term hierarchy is that many sign languages tend to use fingerspelling or borrowing to create these signs. Conversely, colour terms on the left side of the hierarchy have been found to be more often motivated by visual iconic in sign languages, relative to terms on the right side of the hierarchy. For example, cross-linguistically, many signs for 'white' refer to the teeth; many signs for 'black' refer to hair; and signs for 'red' tend to refer to the lips. Iconicity in colour terms can also incorporate signs representing objects to indicate the colour as a whole, such as the downwards + hand-opening representational movement of the sun to sign YELLOW, the movement of placing a ring along the ring finger to sign GOLD, and the outwards + hand-opening movement from the body representing

a reflective vest to express a bright yellow colour. Another case in point is signing LEMON to mean 'yellow', which incorporates enacting movement of squeezing a lemon or slicing it in half, the iconicity here used to refer to the peel. The index is not used to refer to the lemon, but to indicate the colour of the lemon, indicating an iconic-indexical correlation. At the same time, the terms on the right side, such as 'pink', are more likely to show sociolectal variation within one and the same sign language compared to terms on the left (Zeshan & Sagara, 2016). The data is investigated to see if the selection of colour terms reflects Berlin & Kay's hierarchy.

4.1.2. Biases in the cultural evolution of expressive forms

Tamariz et al. (2014) were the first to investigate the evolution of expressive forms within an experimental paradigm, and they studied how the participants developed strategies for expressing concepts. The study used the game Pictionary, for which eight participants had to draw concepts for the other player to guess (e.g., 'soap opera' using drawings of two people and a heart, televisions, or soap and a singer). After the first round, they played again with the same concepts, but swapped partners. A person originally from the pair that used 'soap+singer' chose to reproduce this, so more participants saw this strategy. In the second round, the 'soap+singer' strategy started to spread, and eventually, everyone used it. So 'soap+singer' was selected by a series of biased reproductions. Figure 4.3 presents an overview of the initial communication pairs and how they were paired up in subsequent rounds.

	P1	P2	P3	P4	P5	P6	P7	P8
G1								
	A	A	B	B	C	C	D	D
G2								
	A	B	C	D	D	C	A	B
G3								
	A	B	C	D	B	A	C	D
G4								
	A	B	B	A	C	D	C	D
G5								
	A	B	C	D	C	D	B	A
G6								
	A	B	C	D	A	B	D	C
G7								
	A	B	A	B	C	D	D	C

P4 & P3, Generation 1

"TV" variant

P8 & P7, Generation 1

"Soap/Singer" variant

P3 & P8, Generation 3

"Soap/Singer" variant

"Soap/Singer" variant is replicated

Figure 4.3. Experimental design by Tamariz et al. (2014)

Upper panel: Drawings used to convey the concept of 'soap opera'.

There are 8 participants grouped into four pairs – A, B, C, D. However,

the experiment continued so that they played the game several times

with different partners ('generations'). So, in the second generation,

participant 1 is now playing with participant 7, and participant 4 is

playing with participant 5. The bar below each picture is coloured

according to the variant that the participant drew. Lower panel: In

generation 1, participant 3 in group B (pictured left) drew a TV and

participant 7 in group D (pictured right) drew a 'soap/singer' variant for

participant 8. In generation 3, participant 8 replicated the 'soap/singer'

variant for participant 3, transmitting the variant to new participants.

Eventually all participants used this variant.

Using this paradigm, Tamariz et al. (2014) found evidence for both an egocentric bias and a content bias in the selection of forms. Specifically, they found that participants would mostly stick with their own expressive variant (egocentric bias), and that the adoption of a variant would depend upon the intrinsic value of the particular variant (content-bias). For example, variants that are easier to learn or use are more likely to be adopted. People adopt a variant because of the variant's 'intrinsic value', i.e., because there is something easy, efficient, memorable, or special about the variant. The content-biased model operates at the level of the cultural variant, meaning that culture influences how much people spread the variant (ibid.). Notably, the egocentric bias preserves sign variation, giving the

content bias a larger set or inventory of variants from which to select.

In the present chapter, the content-bias was implemented by categorizing expressive forms according to three factors. The first factor is whether they were iconically motivated, i.e., motivated by a likeness between form and meaning that is filtered through a cognitive process determined by the person's perception, mental image or construal of the meaning (Taub, 2000: 47; Wilcox, 2004). For example, in cross-signing one typical strategy for articulating colours, which are abstract and impossible to express iconically without an intermediary concept, is to use an iconically-motivated form intended to represent an object that has that colour, based on the signer's experience and mental imagery. So, the form is iconically motivated by that colour in an indirect way only. For each colour, there are of course a wide range of objects that could be used for this process; for instance, 'yellow' might be indicated by iconically-motivated forms referring to the sun, a lemon, a gold ring, a reflective vest, or reflective lines or strips on the road. The second factor is whether the forms were based on indexicality, i.e., index pointing, which is "an integral component of human communication, and is used at the very earliest stages of cognitive development in infancy" (Morgenstern et al., 2016: 4). For example, a signer may point to their own hair to indicate the colour BLACK or to their lip to express RED. If a signer sees something in the room that is of the colour that they want to articulate, he or she will make use of it as a referent and point to it to indicate the colour. Finally, the third factor is the variants' overall length in seconds as a measure of how easy they were to produce. In addition, the study

investigated whether token frequency might predict the selection of a particular variant over time.

Considering the scarce literature on iconically-motived forms in International Sign, the content bias may not fully explain the selection of expressive forms in cross-signing. That is to say, Whynot (2016) found that the iconic or indexical nature of signs did not generally aid participants' comprehension of International Sign in a lablike setting. This suggests that cross-signers' comprehension may further benefit from conversational cues. In addition to the biases described above, the current chapter therefore hypothesised that the selection of cross-signing variants may also be subject to an interaction bias. This refers to the tendency of a person to select a sign or word that is highlighted within an interactional sequence. Specifically the analysis looked at the influence of whether or not a form was used as part of a repair initiation (as introduced in 2.1.2), was try-marked (see section 2.3), and whether it was explicitly taught within a repair sequence. Interestingly, predictions are complicated with each of these categories. On the one hand, using a variant in an explicit teaching context, or checking or try-marking may draw attention to the variant or reinforce the memory of the variant for the interlocutors. This would predict that the presence of these factors would cause an increase in the frequency of a given variant. However, these contexts are often employed when there is some kind of trouble in communication (e.g., the signers have different native signs for the concept or one interlocutor does not understand the sign). Therefore, if a variant appears in these contexts it could be an indication that it is not a fit variant (e.g., its

meaning or referent is not transparent, or it causes confusion of some kind). In this case, one would predict that the presence of these factors would be an effect of poor suitability and predict a decrease in frequency. Cause and effect are often difficult to tell apart, but at least in this case they make different predictions about the direction of the correlation.

4.2. Method

This section focuses on the Multisign project dyads only, and details of the Multisign participants' backgrounds are presented in Chapter 1, in section 1.5.2 and in the final four rows of Table 1.2, found in the same section. The participant configurations by country are shown in section 1.5.3 as the interactions depicted in the right-hand box of Figure 1.1. Also of relevance to this chapter is the summary of the data activity sets, provided in Table 1.5 in the same section, showing the duration of 137 minutes in week 1 and 81 minutes in week 3, a total of 218 minutes (= 3 hours and 38 minutes) of recording time from the Multisign project. The chapter looks firstly at the experimental procedure and filming setup, as well as the timetable for the games and how they were carried out, and the management of the interviews (4.2.1). The next sub subsection describes the process for transcribing and coding the data (4.2.2), and the final one explains how the statistical analysis was carried out (4.2.3).

4.2.1. Procedure

The experiment took place in a minimally decorated room and the participants and coordinator wore black clothes (see Appendix B). Participants were seated opposite each other at a table. A screen was placed between the participants, to one side, so that they could see each other directly, but there was an area of the table which was not visible to each participant (see Figure 4.6). Participants engaged in a kind of director-matcher task (Pederson et al., 1998) in pairs. The same cartoon picture was given to both participants in the pair. On each picture, five items were coloured. Of these five items, two were coloured the same across both pictures, and three were in different colours (see Figure 4.4; the researcher explained that there were three differences). The participants could not see their partner's picture. The participants were told to communicate so that they discovered which items were coloured differently and what those differences were. The small rectangles shown in the picture were necessary to signal to the participants that they should sign about that colour. For example, the image on the right shows a white apron, which participants might have ignored if the rectangle was not there to indicate that it was a relevant item in the game.

Figure 4.4. Example of the spot-the-differences stimuli presented
to each participant

In order to indicate to the coordinator which colours they thought differed, each

participant was given a picture (such as one of the images in Figure 4.4) and a

set of 24 colour chips (see Figure 4.5). When a participant discovered a similarity

or difference, they placed a colour chip of the colour of the other's stimulus in

the relevant location on their own picture (their partner could not see this). When

they had discovered all the similarities and differences, the coordinator (i.e., the

researcher) recorded the placement of colour chips on the images and then the

participants moved on to a new round with a new set of pictures.[19]

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[19] It is worth pointing out that the researcher's linguistic background and language choices could have influenced
the participants. The researcher, a fluent user of Korean Sign Language, had two years' experience of other sign
languages in cross-cultural contexts (notably International Sign) prior to the Typology group data collection in 2004,
and a further 10 years' experience from then until the 2014 Multisign data collection. Thus, the researcher was
somewhat adept at adjusting his communication to suit signers from other backgrounds, and it is possible that this
could have led to his signing influencing the participants' signing, and vice versa. However, in terms of the colour
game specifically, it is less likely that this influence occurred, because the researcher had not developed any
particular knowledge of colour variants and had not used signs from this domain very often in cross-cultural contexts.
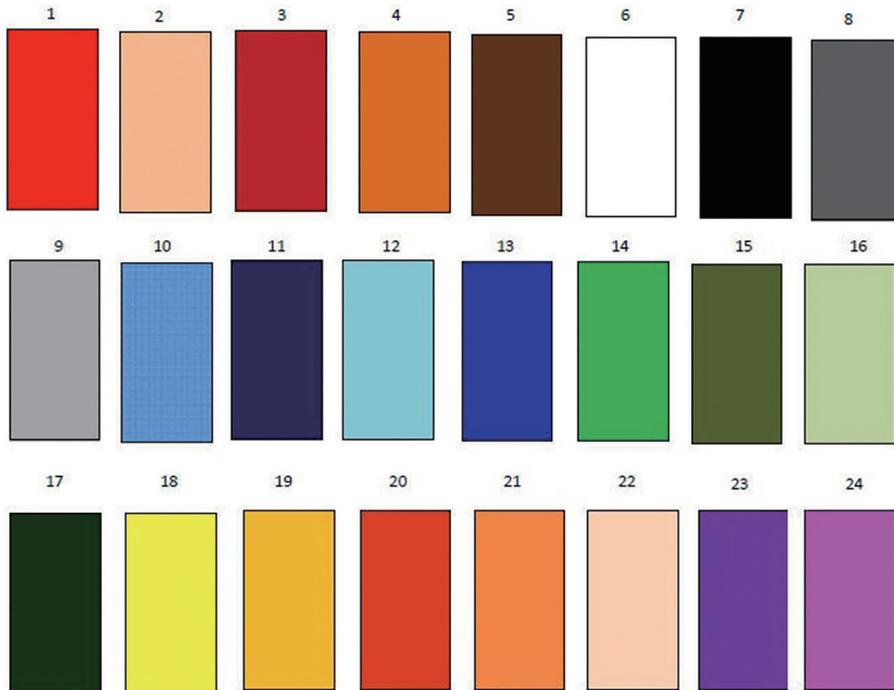
Figure 4.5. Colour chips that participants selected from to check their answers

There was no feedback or discussion after each round, but the researcher took a couple of minutes to capture each participants' ultimate arrangement of colour chips on their completed picture with the camera, and the participants could look at each other's pictures, check their accuracy (see Figure 4.6), and ask questions if they wished. A game consisted of completing three rounds, so that each pair saw three pictures, giving them the opportunity to sign about 24 colours (two identical colours + six differing colours in each pair of pictures). The participants formed new pairs two more times, completing six more rounds, for a total of nine rounds per day. There were three data collection days in total, each involving nine rounds, so the total number of rounds was 27. There were nine pictures available, so each

picture was used more than once during the data collection; the colours were switched round so that participants did not receive the same colour arrangement on the same picture twice (see Appendix C for the details of which pictures and colours were used in each round).
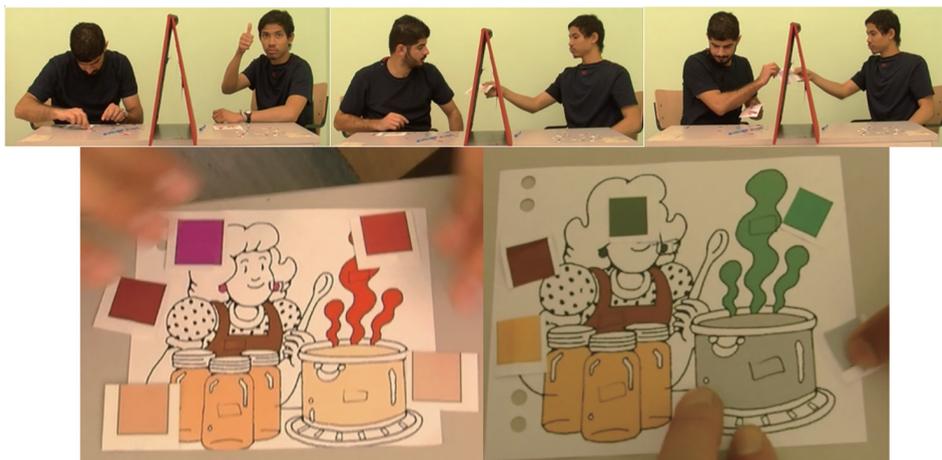
Figure 4.6. Jordanian signer (left) and Indonesian signer (right) doing the director-matcher task

In Figure 4.6 above, the Jordanian signer (left) and Indonesian signer (right) do the director-matcher task using cards and colour chips. The top left-hand picture shows the Indonesian signer signalling that he is finished with that round. The middle and right-hand pictures show the participants swapping cards. The two images underneath show the card that the Jordanian signer was working on (left) and the one that the Indonesian signer was working on (right). Each signer took turns to request the colour sign of the parts on the card containing colour and then placed a coloured chip onto the respective area according to what they understood the colour sign to be. Once the activity was completed, the researcher swapped

the cards so that each person could see if the other had correctly placed the colour chips. The swapping was not to encourage further communication but more for the purposes of the researcher being satisfied that the participants had understood the colour signs that they received. There was no overt control over the participants' behaviour; they negotiated the strategies and roles themselves (no participant was assigned as 'director' or 'matcher' by the coordinator), even when participants used unexpected strategies (see Appendix D for more details on this game). This was done explicitly to promote a greater level of comfort for the participants and to elicit more natural utterances, including spontaneous try-marking and repair attempts. After three weeks of data collection, but before the participants departed from the setting, their respective in-country assistant interviewed their respective signer about what signs they use for various colours in their own sign language, using visual prompts. These conversations were recorded so that they could be cross-checked with the experimental data during the analyses. In each case, the assistant made sure to inform the participant that if their language has more than one sign for that colour, or if they are aware of other signs for that colour from other languages, the researcher would like to be informed of all such variants.

These interviews were vital in securing all of the relevant signs from the signers' languages, as they may have sometimes opted not to use a sign from their own language, e.g., when they felt it would not be understood as well as another strategy. Also, they helped us to distinguish instances when a signer already knew a particular sign (and selected it based on the knowledge they assumed their

interlocutor to have), from instances of true assimilation or communicative evolution, i.e., when a signer began accommodating the usage of the interlocutor. The first author also watched the data clips with the participants and their assistants to explicitly verify the origin and intent of the particular signs they used, e.g., 'Was that sign from your own sign language? Are there other ways of signing that in your language?' Questions were asked of both the participant and the assistant, e.g., the researcher sat with the Nepali participant and Nepali assistant to ask both of them questions about the signs used in the data. The resulting information was placed into a table for ease of reference during the analysis.

4.2.2. Transcription

The resulting corpus totalled 5 hours and 25 minutes. In the data coding, I concentrated on the first and third meetings, for a corpus of 3 hours and 38 minutes, in which only colour terms were coded. The coding was carried out using the video annotation program ELAN (Sloetjes, 2013).

There are three parent tiers: COLOUR, Director and Matcher. The COLOUR tier recorded the actual colour that the signers must expressed to their interlocutor, this being the 'Stimulus' colour. Colours were numbered as shown in Figure 4.5. 'Selected Stimulus' is the number of the colour that the interlocutor then selected based on the description. Note here that the original set-up on one signer being the Director and the other being the Matcher was no longer relevant here, and either signer could take the

initative to describe a particular colour and both would place the coloured chips. The

trial length is calculated by measuring the Stimulus and Selected Stimulus segments

together, i.e., from the beginning of the description of the given colour, to the end

of the final utterance prior to the interlocutors selecting the colour chip. In the data

analysed for this study, the signers were able to select the correct colour in every case,

an observation which speaks to the efficacy of cross-signing even in first encounters.

Each signer had a designated description tier called Sign 1 and Sign 2, for

the signer in in the left-hand side of the video and right-hand side of the video,

respectively. These tiers functioned as parent tiers for multiple child tiers to record

characteristics of the signs being used, in addition to their sequential relevance.

The Sign Origin tier records information about the variant's country of origin and, as

noted in section 4.2.2, about the source of the variant as determined by the interview

data obtained after the experiment. In addition to indexical and iconic information,

information about sign origins can be very helpful in areas of arbitrary knowledge.

For example, if the variant is Jordanian, it is marked 'JSL'. The Iconic Motivation tier

was marked as 'Yes' if any of the sign's features resembled the referent. For the

Indexicality tier, there were three options: 'Yes-body' is for a variant that refers to a

body part; 'Yes' is for an indexical variant that refers to something other than a body

part (e.g., an object in the immediate vicinity); and 'No' indicates that no pointing

or indexicality was used in the variant. For Try-marking, the code 'Yes' indicates

the presence of some sort of try-marker, such as a hold, mouthing, repetition, or

decrease in signing speed (Moerman, 1988; Sacks & Schegloff, 1979; Chapter

2). In the 'T-1 Repair' tier, 'Yes' means that the turn in which the sign appears is followed by a repair initiation (T0), and is thus not yet fully understood. The 'Teach' tier is marked as 'Yes' when the sign occurs in a turn that explicitly instructs their conversational partner on how to use a particular sign. In the T0 tier, the signs that were part of a repair initiation were marked with 'yes'; in most cases this concerned a direct repetition of T-1. In addition, a separate tier was adopted for Candidate Understandings i.e., a subclass of repair initiations that involve the offer of a sign with an equivalent meaning to the one articulated at T-1. By splitting up coding for each of these categories in separate tiers, it was easier to extract information of specific signs using an automated script. Given that there are three categories of tiers for two participants, the participants are identified as 1 and 2. Number 1 is the participant who was sitting on the left in the video and number 2 was sitting on the right. Each participant takes on an autonomous role according to the game. When No. 1 is acting as the Director, s/he is annotated as Director / Sign_1, and No. 2 is annotated as Matcher / Check_2. When No. 2. is the Director, No. 1 is annotated as Matcher / Check_1. Under each category, the segment is time-aligned with the gloss on the Sign 1/2 tier. The data is analysed in a deductive way.

Reliability

Another researcher annotated a random selection of 52 variant tokens (10%) to check for reliability and consistency, focusing only on the relevant annotations to avoid an influence of prior familiarity with the recording sessions and their

transcripts. Agreement was assessed using Cohen's Kappa. The agreement for different measures varied from 'slight' to 'fair' (Try Marking $\kappa = 0.3$ [0.01,0.59]; T0 $\kappa = 0.5$ [0.22,0.77]; T-1 $\kappa = 0.18$ [-0.11,0.47]; Teaching $\kappa = 0.47$ [0.16,0.78]; Candidate understanding $\kappa = 0.27$ [-0.24,0.77]). These values reflect low agreement. When Byun and the coder conferred, they were able to reach a consensus, siding with Byun. It is suggested here that the low values may therefore not reflect unreliable measures, but instead simply indicate that the coding task requires taking the context and interaction history between participants to be taken into account. Coding individual variants in isolation is therefore not a good way to assess reliability, but there are few other options given time constraints and required expertise in cross-signing. Given the fact that consensus was reached after contextualisation and discussion of the items at hand, the study proceeded with the assumption that the coding is justifiable, and demonstrate that the variables above are sensibly related to the other measures.

4.2.3. Statistical analysis

In order to assess the strength of each bias on the variants that were selected, a statistical analysis of the data was conducted. Here, a regression model was used that predicts the final frequency of a variant according to various properties of the item and how it was used in interaction. The results indicate which properties are important for the selection of variants in this experiment, helping us understand the process of cultural evolution. Please recall that the experiment reported

here was designed to challenge signers to differentiate between a range of 24 distinct colours, to make sure the task at hand was not too trivial at the final round. However, of the 24 colours presented in the description of the colour chips in section 4.2.1 above (and see Figure 4.5), similarities in some of the variants rendered it unnecessary to analyse each colour separately, particularly as some of the colour chips represented a shade of one hue. Whilst many of these shades have individual colour terms in English, such as jade, olive and sage for the aforementioned shades of green, respectively, in the data, such subtle differences were communicated by non-manual modification of the sign GREEN, rather than a different lexical variant[20]. Purple was also omitted due to the repeated difficulties experienced by the participants in attempting to express this colour and the amount of retries that were unsuccessful and could have skewed the data. The merging of shades resulted in a reduction from the initial set of 24 colours by combining related shades as follows (the numbers in brackets refer to the colour chip numbers in Figure 4.5): WHITE (6), BLACK (7), RED (1, 3 and 20), GREEN (14, 15, and 16), PINK (4,11), BLUE (10,13), GREY (8, 9). In the remainder of this chapter, the analysis focuses on seven colours, namely WHITE, BLACK, RED, GREEN and PINK using these combined shades, as well as BROWN and YELLOW. In the set of 24 colour chips, BROWN and YELLOW were represented by only a single shade each and hence did not need to be merged.

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[20] cf. de Vos, 2011 for Kata Kolok.

For each unique variant, several variables were extracted from the ELAN transcription using the python library pympi (Lubbers & Torreira, 2014). For the final week, this included the frequency of the variant for the given target colour. For the first week, the variables included: the indexicality of the variant (not indexical, indexical of the body or indexical of something else); whether the variant had been explicitly taught at any point; whether the variant had appeared as a try-marked sign; whether the variant had appeared in a repair trouble source; whether the variant had appeared in any type of repair initiation (T0, candidate understandings and checks were collapsed); the total frequency of the variant across all colour contexts; and the average length of the variant in milliseconds. A mixed effects analysis framework (lme4, Bates et al., 2014) in R (R core team, 2016) was used to predict the frequency of each variant in the final week from variables in the first week, with a random effect for each target colour. A poisson distribution was used to model the frequency data directly. It is possible that an indexical strategy, particularly body-indexical signs, would be more effective for some colours than others, and so a random slope for the indexicality of the variant by target colour was added. The significance of fixed effects was obtained from model comparison tests. See the supporting information (see Appendix E) for full details.

4.3. Results

Descriptive results
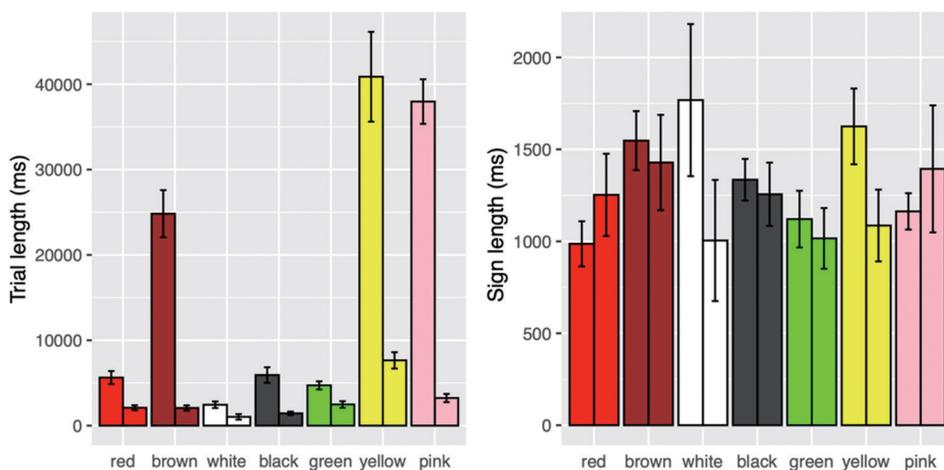
Figure 4.7. Trial length and sign length for different target colours

Left: Average length of trials (start of first turn to the participants noting a colour difference on their sheet) for the first week (left bars) and the final week (right bars). Right: Average length of individual sign variants for the first week (left bars) and the final week (right bars). Error bars (black lines) indicate the standard error.

Figure 4.7 shows the average length of time to communicate a particular colour concept. This is the time from a Director starting to produce a turn to the Matcher noting down the colour difference on their sheet. It is clear that the amount of time reduces from the first week to the second week: participants are improving their

communicative efficiency. Figure 4.8 also shows the average sign length. This is the time taken to produce a single variant. A pressure for production efficiency (a type of content bias) might predict that signs would become shorter. The results show that although the average trial length always decreases, the average signal length does not always decrease. This suggests that interaction is improving more than the signs themselves. This could be due to converging on conventional variants, reducing the number of turns or reducing the number of repair sequences. This may be indicative of a rapid initial evolution in the cross-signers' selection of variants.

Such a rapid evolution was also found by Zeshan (2019), who examined the differences between cross-signers' individual response times in the first round of an elicitation game and a second round several weeks later. This enabled her to identify several factors influencing these response times, including the following 'facilitating factors' that led to faster communication: signers' previous exposure to the other group members; being from a language environment that involves a higher level of dialectal diversity; and using a language with a greater degree of typological similarity to the other signers' languages. The reverse of each of these are identified as 'inhibiting factors'. Two factors that were hypothesised to influence the communication actually turned out to be 'neutral factors' with no effect: using the sign language of the surrounding environment in which the study was taking place ('home advantage'), and knowing the same language of written literacy as other signers.

Statistical analysis of variant selection

The model fit the data reasonably well. When using the model to predict which variants survive to the final week and which do not, it predicts 93 out of 97 correctly. Figure 4.8 shows the model predictions of how these features relate to the probability of a variant surviving. The 'length' chart in the figure shows that the shorter the variant was, the more likely it was to survive. The 'frequency' chart depicts the tendency for the variants with more occurrences to have a higher chance of surviving to the final week.
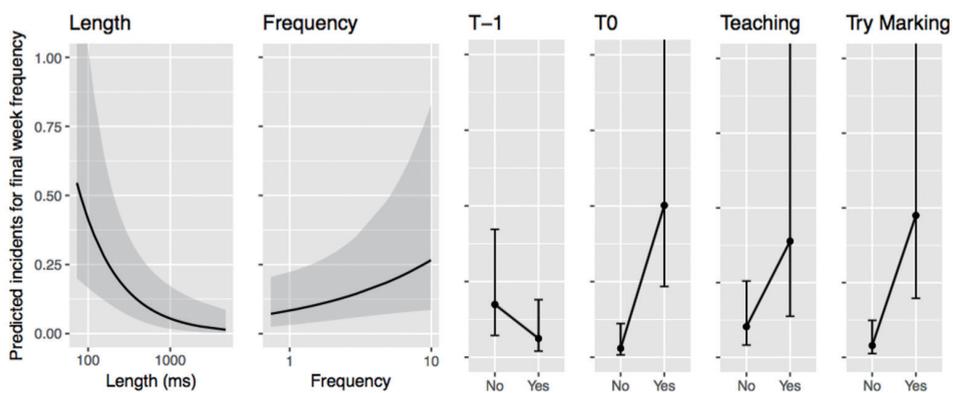
Figure 4.8. Predicted incidents for final week frequency from the model for significant main effects

From left to right: length, frequency, T-1, T0, teaching, and try-marking.

In the final four columns, the predictions are shown according to whether the variant did ("Yes") or did not ("No") appear in the particular context suggested by the heading. For example, variants

used in try-marking situations had a higher final frequency than those

that did not appear in try-marking situations.

Points higher on the vertical axis in Figure 4.8 indicate a higher

likelihood of surviving to the final week. For length and frequency,

the black line represents the model's predictions: the probability of a

variant surviving into the final week is higher for short, frequent variants.

The gray ribbon represents the model's uncertainty. For the last

four plots, black dots represent the model's predictions of the mean

probability for each category of variant. The whiskers represent the

uncertainty of the predictions. For four different interactional contexts,

the prediction of the final week frequency is shown according to

whether the variant is used ("Yes") or not used ("No") in that context.

The four charts on the right-hand side of the figure show that variants used in T-1 turns were less likely to survive, whilst those used in T0 turns, teaching, and try-marking were all more likely to survive. There was also a significant main effect of the first user. All other effects being equal, signs first used by the signers from Jordan and Nepal were more frequent in the final week. Model comparison also showed that the final model was improved by adding indexicality as a random slope by colour (allowing the effect of indexicality to differ between the colours, $\chi^2 = 79.3$, Df = 6, p < 0.001). The effect of indexicality is larger for black and red and smaller for pink and green. Model comparison also revealed three significant statistical

interactions: between T0 and frequency; between teaching and frequency; and between try marking and frequency. The effects of the sequence types were stronger for variants that were more frequent in the first week. This is discussed further in the next section.

The results of the statistical analysis are further explored in Table 4.1. They show the importance of each of the factors in predicting the final frequency. This is assessed by comparing a model with and without the particularfactor, in order to see how much the factor contributes to predicting the final frequency ('model comparison').

Table 4.1. Results of the model comparison tests for different variables

Variable	Beta	Log likelihood difference	X^2	Df	p
Week 1 Frequency	7.2	−29.12	58.24	1	< 0.001*
Length	−1.1	−2.47	4.95	1	0.03*
Indexicality	indexical signs=-1.8, body-indexical = 0.85	−2.11	4.21	2	0.12
Teach	11.0	−6.59	13.17	1	< 0.001*
Try-marking	1.3	−2.71	5.43	1	0.02*
T0	10.0	−10.89	21.78	1	< 0.001*
T-1	−2.3	−2.31	4.62	1	0.03*
Identity of first user		−4.4	8.81	3	0.03*
T0 x Frequency		−10.9	21.79	1	< 0.001*
T-1 x Frequency		−9.06	18.13	1	< 0.001*
Try-marking x Frequency		−11.19	22.37	1	< 0.001*

The columns show the following information. Variable: name of the variable. Beta: the estimate of the variable value in the model. This is the increase in frequency for each unit of increase in the given variable. Often these are hard to interpret directly, but at least give an indication of the direction of the relationship (positive or negative). Log likelihood difference: improvement in how well the model fits the data when including this particular variable. $\chi2$: indication of the relative strength of the improvement. DF: extra degrees of freedom in the model when adding the variable. p: p-value which indicates the probability of seeing this amount of improvement due to chance, taking into account the number of extra degrees of freedom. A low value suggests that the null hypothesis that the variable has no effect and can be rejected. These statistics suggest that there were significant main effects of sign length, frequency in week 1, repair trouble source (T-1), repair initiation (T0), teaching and try-marking, but not for indexicality and iconic motivation. Results of the model comparison tests for different variables. Each row shows results for different variables in the model.

For example, consider the effect of (week 1) frequency: The beta value is positive, suggesting that variants with a higher initial frequency end up with a higher final frequency. The exact value of the beta is difficult to express intuitively because the frequency values have been scaled and the model is predicting values in a non-

linear way. However, what is evident is the relationship in sensible terms in the visualisation in Figure 4.8. The log likelihood difference is large (positive/negative is not important here), suggesting that a model with week 1 frequency is better able to predict the final week frequency of a variant. This is confirmed by the assessments of significance (high χ2 value with few degrees of freedom which yield a small p-value), indicating that week 1 frequency is a significant predictor of final week frequency. It is difficult to compare beta values for different factors because there are continuous and binary variables in the model. However, the χ2 values can be used as a guide for how relatively important each factor is. For example, the effect of week 1 frequency has the highest χ2 value, suggesting that it has a stronger effect than the others.

4.4. Discussion

4.4.1. Content bias

In a cross-signing setting, content bias is expressed when a signer chooses to use a sign from his or her own sign language in the belief that the sign will be understood by the recipient, that is, a potential shared sign. As summarised in Figure 4.9 below, colour signs can be understood in terms of categories based on the content of the sign. When using signs to represent colours, a first distinction is between signs are arbitrary and those that are non-arbitrary or motivated. Arbitrary signs, such as the Indian Sign Language sign GREEN, are not visually motivated.

Non-arbitrary colour signs, that is, signs that are iconically motivated, can be further sub-divided into indexical signs and non-indexical iconic signs. In order to make this distinction, the term 'indexical' is used in a specific way here which is different from its usual meaning in semiotics in the context of spoken language (cf. Parmentier, 1994). 'Indexical' here refers to pointing with the index finger, so all colour signs where the index finger points to or touches a referent associated with the intended colour are called 'indexical'. This includes, for instance, pointing to the teeth to express WHITE or touching the lips for RED. Unlike in the literature on semiotics, 'indexical' in this sense makes reference to the physical form of the sign, that is, the index finger pointing. Non-arbitrary signs of the indexical type may be conventionalised, such as pointing to the head in the sign BLACK (the colour represented by the hair), or ad hoc, such as GREEN when represented by pointing to a green wall. Conventionalised signs are consistently articulated in a specific way, e.g., stroking the scalp twice with the index finger for BLACK in Indian Sign Language, and hence these are listable vocabulary items. By contrast, when a signer points to a green wall that happens to be in the vicinity, the indexical sign falls into the 'ad hoc' type.

The second category of motivated signs is called 'iconic non-indexical'. In this case, the intended colour association is not physically present in a visible object to be pointed to. Instead, signers rely on mental associations between an object and a certain colour.[21] This category contains signs such as 'flower' for PINK and 'lemon' for YELLOW. The internal logic of this content bias is different in that these

associations may or may not be shared across signers initially. For instance, flowers come in many colours, other than pink. However, when a signer believes that pink is a common flower colour and that this association is shared with the addressee, this may result in expressing the concept of smelling a flower as a way of referring to the colour pink. The disucssion returns to these categorisations in the qualitative discussion section below.
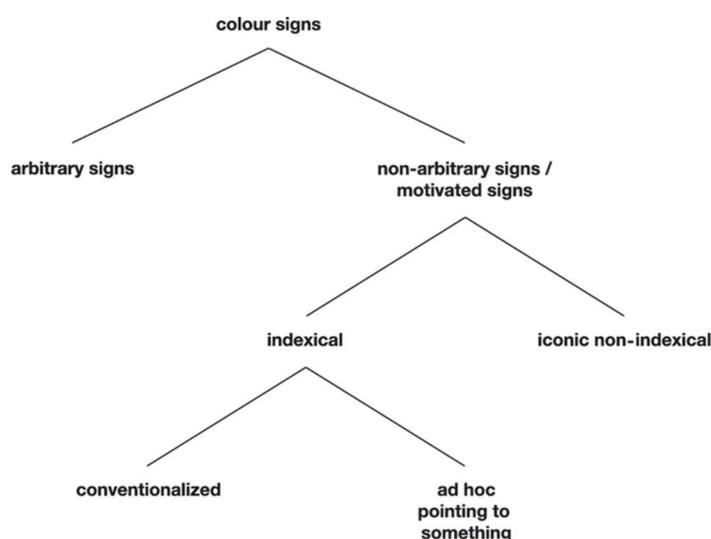
Figure 4.9. Content-biased categories to represent colour words

The factors that measure the content bias are word length, already discussed in the descriptive results section (section 4.3) above, and indexicality, to be discussed in the sub-sections below. The discussion of how indexicality was used to represent

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[21] De Vos (2012: 133) argues that these associations may become conventionalised in signed languages leading to hybrid iconic-indexical-symbolic form-meaning mappings, however since cross-signing is off necessity an improvised communication form, the issue of conventionalization is not directly relevant here.

colour in cross-signing is divided into quantitative statistical results and a qualitative discussion of indexicality, and explained with examples.

Quantitative results

Indexicality

According to the statistics, indexical variants were not significantly preferred over non-indexical variants. Nevertheless, in the next section, a qualitative analysis is presented of how indexicality featured in the data to highlight the theoretical contributions cross-signing makes to this phenomenon.
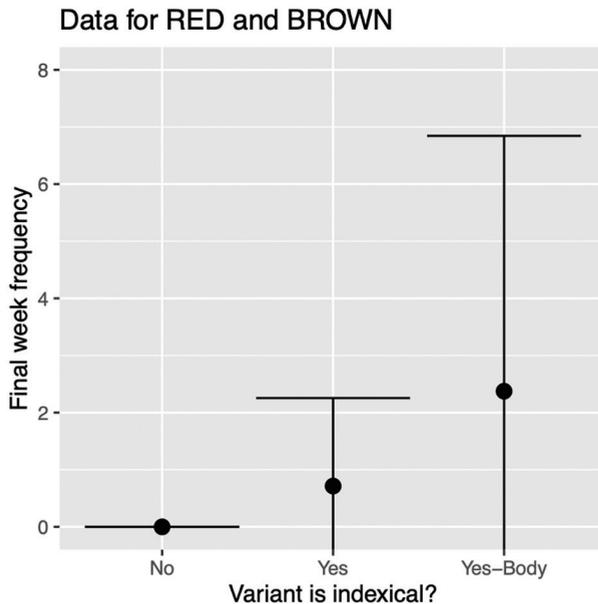
Figure 4.10. Significant random slope for indexicality (p < 0.001)

There was no overall effect of indexicality on the selection of variants. The probability of a sign surviving was roughly equal whether it was not indexical (5.1%), indexical (4%) or indexical of the body (4.1%). However, the effect of indexicality was significantly different for different colours. The effect is strongest for Red and Brown. For example, the mean final week frequency for variants referring to Red and Brown are lowest for non-indexical variants (all have zero frequency in the final week), higher for non-body indexical variants (mean = 0.7 occurrences, sd=1.5), and highest for variants that index the body (mean = 2.4 occurrences, sd = 4.5). This aligns with the observation that an indexical strategy depends on the environment: if there are no pink or green things to point to, then those colour expressions will not be employed. As noted in the qualitative discussion of indexicality in the following section, body-indexicality is important for the signs BLACK and WHITE, but there were relatively few variants for these signs so they were not included in the quantitative calculation and hence are not included in the graph.

Qualitative discussion

Indexicality

Index finger pointing features prominently in both signed and spoken interactions and is one of the earliest communicative forms to develop in infants (Morgenstern et al., 2016). This creates grounding, and leads to symbolic language later (Butterworth, 2003). However, pointing has different semantic-pragmatic functions:

it can identify entities as is often the case in infant-caregiver interactions, but in sign language a pointing sign can also be used for anchoring (Barberà & Zwets, 2013). The function of anchoring is to enable a signer to select a spatial location and link it to a specific referent, localising the referent in the signing space by pointing to that space. The location functions as a base, or anchor, for further mention of the same referent and enables the signer to refer to it by pointing to the location; the noun sign does not have to be articulated again once this anchor is established, hence its occurrence in sign languages only. Conversely, identifying does not create a new base or anchor, rather, it adds spatial information to an already-existing location and enables the signer to add additional information about the referent. Two types of indexicality are identified by Coppola & Senghas (2010): direct deixis (pointing to a real, present location) and indirect deixis (pointing to non-present entities). Deictic expressions can be exophoric (associated with the real world, e.g., 'please sit at that table') or anaphoric (associated with the discourse, e.g., 'that [thing I just described] was difficult). In Nicaraguan Sign Language, pointing has been shown to become more indirect, abstract and arbitrary over time, as the signers use less exophoric pointing and more anaphoric pointing. As the language evolved, the pointing became 'despatialised', i.e., the locative part separated from the real-life physical context (ibid.).

Indexicality takes four forms in the present data: pointing to something on the body; demonstrative pointing to objects in the immediate surroundings, such as a tree visible from the window; pronominal pointing to an entity that is not physically

present, and other uses such as pointing to a sign or handshape. The first function is seen in variants for 'black' (which involves pointing to the hair), 'red' (mouth), 'white' (teeth), 'brown' (skin), and 'pink' (tongue). The interviews revealed that indexical variants to point to the skin to mean 'brown' included the Jordanian signer pointing to the arm, the Indonesian signer pointing to the back of the hand, and the Indian and Nepali signers pointing to the face. The indexical variant for 'black' was familiar to all of the signers except the one from Jordan, though they do not all use an extended index finger; they may involve touching or pinching the hair. The data show that the cross-signers rapidly converge on a sign for 'black' that indicates the hair. At first, the Jordanian signer tries two lexical signs from his language for 'black', which have nothing to do with hair, such as one made by brushing the fingers against the cheek (see Figure 4.11). But these are quickly abandoned in favour of the one referring to the hair, which was familiar to the other signers.

Figure 4.11. Signs from Jordanian Sign Language that mean 'black', and make use of visual indexical motivation referring to the hair or hairline

After the first round of the experiment game, the Jordanian signer no longer articulates either of the variants based on the sign for 'black' in his language, and signs 'black' using the reference to the hair. Whilst the initial analysis and annotation of this study did not identify this reference as being particularly iconic, the use of the pointing to the facial hair by the Jordananian does in fact contain an element of iconicity, as the two Jordanian signers both had black beards substantial enough to be referenced iconically to indicate the clour BLACK. In comparison to other informants, and to the researcher also, this was not initially perceived as iconic because they themselves had only small areas of stubble, mainly around the chin and a stubbled moustache, so that reference to the facial hair for BLACK for the remainder of the participants and the researcher seemed impossible. The iconic option was available for the two Jordanian interlocutors due to their shared perception of how iconic a particular body part (in this case facial hair) is, and their ability to mediate cross-signing subjectively (Occhino et al., 2017).

Figure 4.12. A sign from Jordanian Sign Language meaning 'white' that is non-iconic

The signers in this experiment also all converged on pointing to the teeth to mean 'white', even though the Indonesian and Jordanian signers had used signs referring to 'milk' for 'white', and the Jordanian signer had also attempted a non-iconic sign for 'white' from his language (see Figure 4.12 above). For 'red', the Indian signer also used an indexical point to the forehead where the red Bindi dot typically appears. In the data, body indexicality or indexicality related to the shared setting (such as pointing to a green-coloured wall to mean 'green') were both understood quickly and were conducive to shorter interactions. The cross-signing in the data also led to some anaphoric pointing. For example, the Indonesian signer, in conversation with the Jordanian interlocutor on the left, attempts to indicate the colour SKY-BLUE by referring to the area around the clouds but this is misinterpreted as reference to the cloud itself and the Jordanian signer replies with the colour 'white' (marked by pointing to his teeth). The Indonesian signer makes another attempt with a sign based from the nose but as this is also unsuccessful, he then refers back to the sky analogy by tracing the clous in syntactic space with the non-dominant hand and indicating the area around the clouds with the dominant hand, which is immediately understood as SKY-BLUE. Although this sequence is not included in the analysis for this chapter, it serves here as an effective example of anaphoric pointing in order to build on some previous understanding.

Interestingly, the extant literature on pointing does not allow for the phenomenon of pointing to a handshape or sign, which is seen multiple times in the cross-signing data. This phenomenon falls into both of, or perhaps the gap between, the two

above-mentioned categories of pointing: exophoric and anaphoric. Because it involves a visible item or location in the immediate setting, it is exophoric; however, because it involves a reference to previous discourse, it is also anaphoric; yet, because it has features that contraindicate both categories, it may fall into neither. The term 'esophoric' is coined here, deriving from the Greek stem -eso 'within', to denote this phenomenon. A remaining question is whether this phenomenon is not just specific to the visual-gestural modality, but indeed possibly also unique to contexts in which signing is the primary mode of communication, or whether an equivalent could be found in the multi-modal utterances of speakers as well.

Iconic motivation

Some telling examples of iconically motivated forms in the data set include signing CLOWN (referring to the round red nose, or juggling) and tracing a circle on the cheeks for PINK, or portraying the actions of slicing and squeezing a lemon for YELLOW. The forms used for the iconicity strategy might include classifiers and enacting (e.g., 'tasting' a sour lemon), and it may involve representing the entire signified item or only part of it. (Dingemanse, Blasi et al., 2015) notes that iconicity is a vast concept and it is very difficult to code. For example, 'yellow' might be described on one occasion as LEMON-SHAPE, SLICE-LEMON, TASTE-LEMON, and it is challenging to determine how many individual units or variants to code for this one concept that is being communicated.

Another challenge is that there is a difference between a sign articulated by pointing to something visible in the room (e.g., the signer's skin) and a visually-motivated iconic sign referring to, for example, a flower. This is because the colour of the visible object is clear to see in the immediate setting (a case of indexical iconicity according to Figure 4.9), whereas the colour of the object referred to by the iconic sign is not, and signers may differ in how they interpret what colour is intended as the referent due to the fact that they have to rely on their mental association of the object with a certain colour. For example, flowers can be many different colours, so the sign FLOWER, an instance of non-indexical iconicity as per Figure 4.9), will not necessarily make a signer think of 'pink' on its first use. The data show however, that such conventions can be achieved interactionally over relatively brief periods of time, at least in an experimental setting where there is communicative pressure to differentiate colour expressions.

Making the connection between a sign and colour can be difficult depending on the cultures involved. For instance, one signer might use signs referring to reflective road strips or vests to mean 'yellow', but if the other signer comes from a culture where these are not used, or where they have a different colour or appearance, the meaning will not be understood. Non-indexical iconicity is more common for colours for which body-part indexicality is less feasible. For such colours, there can be many different iconic variants, e.g., for 'yellow' the possibilities include referring to the sun, a lemon, car headlights, a reflective vest, and strips on the road. For 'green', there are also many different variants initially, but most of these refer to trees or

leaves, so they are in the same general category, making it easier to narrow down, select and agree on a common variant. For 'yellow', this is more difficult, because the concepts are all so different, so it took longer for the participants to narrow down the variants and in fact they were still dealing with a large number of variants in the final week (see Figure 4.13).
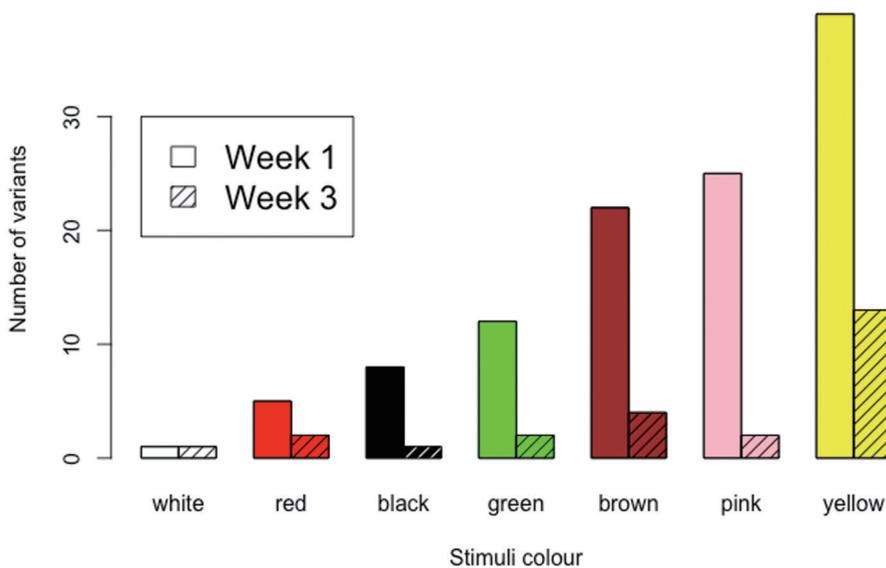
Figure 4.13. Number of variants used in the first week and the final week

Figure 4.13 shows that there were large numbers of variants used in the first week for both 'pink' and 'yellow', but by the last week these had both been reduced considerably, especially the number of variants for 'pink'. There remained a relatively high number of variants for 'yellow' in the final week, compared to the other colours. In the sections that follow, a situated understanding is provided as to why this was the case in this data set. Moreover, these same colours also prompted

multi-sign sequences that combined several strategies. For instance, in the first round, the Indian signer made a sign based on the action of squeezing and tasting a lemon. Then he fingerspelled L-E-M-O-N, and then he signed SUN. He produced a range of variants, but they were not understood by his interlocutor, the Jordanian signer. When signing 'pink', the Indian participant articulated the sequence TONGUE RED DIFFERENT.

Most importantly, many variants could be used to represent the colour 'yellow', e.g., articulating LEMON or GOLD RING. SUN was used to represent red, yellow, orange or gold, because of the sun's variety of colours and the way these are perceived in different cultures. Similarly, there are cultural differences in the colours of vests in uniforms worn by e.g., police officers, which can vary from country to country. These may be e.g., orange, fluorescent green, black or pale yellow. Therefore, one participant might sign VEST POLICE to mean 'yellow', but this may not make sense to another participant who comes from a country whose police officers wear black vests rather than reflective yellow vests. It seems that the wide range of variants for 'yellow' is not a matter of interaction bias but of the diversity of colour expressions and cultural differences causing a problem related to content bias which necessitates a longer interaction.

Berlin & Kay (1969) noticed that there is a hierarchy of colours in the world's languages. Colours tend to develop in stages as follows: (Black, White), Red, (Green, Yellow), Blue, Brown, (Purple, Pink, Orange). In the first week, the number of variants for each colour also predicts this order. This study predicted that the first

basic colour words emerge because they are easy to point to on the body (cf. de Vos 2012). It was found that the number of variants in the first week is correlated with the proportion of indexical variants. For example, 'white' is easy to point to (teeth), and so everyone quickly agrees on that variant, and 'black' is also readily available, as none of the participants come from a culture where there is a lot of non-black hair in the population. 'Pink' is harder to point to, so there is a wider range of strategies and less agreement. The only deviation is for 'yellow'. Therefore, it is suggested that the order of the evolution of colour terms may be influenced by iconic motivations in interactive conversation. The idea is this: colours that can be easily referenced by pointing to objects in the world will initially serve as motivated signs, as they are easier to 'ground' and will have fewer competing variants. Basically, it helps if the variant has a high level of iconicity. However, where there are many iconic variants, such as the different notions of 'yellow', the more they enter into competition, so it becomes more difficult to choose a variant. Over time, the motivated signs will become more conventional. This would lead to 'basic' colour terms emerging first for white, black and red, and later for blue and brown. That is, the order of the evolution of colour terms (in either signed or spoken languages) depends on their availability in the environment, but also on how easy the signs are to point out and how easily these signs can become conventionalised. For example, 'blue' develops later than white or black, even though it is frequent in the environment (e.g., the sky). This might be because the sky is not always blue, nor is it always available to point to (e.g., indoors). In contrast, teeth and hair are always available, and so might conventionalise faster (cf. Dingemanse, 2009; De Vos, 2012).

4.4.2. Interaction bias

Quantitative results

Conformity bias

Conformity bias is the bias an individual has to conform to the behavior of others (Boyd & Richerson, 1988; Henrich & Boyd, 1998). In this experiment, participants can either try to adopt the signs that others invent (conformity), or try to promote their own signs. According to the model, signs invented by the signers from Jordan and Nepal were more frequent in the final week ($p = 0.03$). However, the effect size is very small. The relationship between the number of signs someone invents and the number they adopt was also scrutinised, but there is no clear pattern. With a small number of participants, it was necessary to focus on a qualitative analysis of the role of individuals.
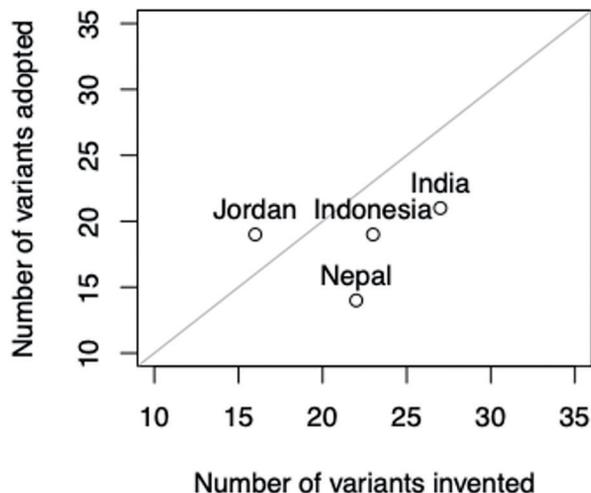
Figure 4.14. The number of signs that each speaker invented compared to the number they adopted

Figure 4.14 compares the number of invented and adopted signs across the four signers. In this sense, 'invented' means that they were the first to use this sign in the experiment transcripts. 'Adopted' means that a speaker used a sign that someone else invented. The gray line shows the points at which rates of invention and adoption are equal. So, the Jordanian signer adopted more than he invented, while the other three signers invented more than they adopted. This might suggest that the Jordanian signer was more receptive and had less of an egocentric bias than the other three signers.

Qualitative discussion

Table 4.2 below illustrates how the conformity bias was in play within the data set. It shows that the Jordanian participant offers the same variant, FLOWER, for 'pink' in rounds 1 and 2, during which the other participants used a mixture of variants, although it is not clear why FLOWER is selected to represent 'pink' as opposed to representing any other colour that is common amongst flowers, such as 'red' or 'white'. In round 1, this offer followed a longer explanation by the Indian participant, who was less inclined to adapt his communication to interlocutors from different backgrounds. (The Indian participant invented more signs than the other participants, as shown in Figure 4.14.) This happened again in round 2, when the Indonesian participant signed CLOWN and RED+BRIGHT and the Jordanian participant responded by offering the FLOWER variant. By round 3, this variant had been adopted by both teams. As all participants used the same sign FLOWER in round 3, there is no variation in this round to note. It is possible to conclude that the Jordanian participant's flexible communicative skills and the ease with which he offered this variant made an impression on his interlocutors which led to both teams selecting this variant. Also, the Nepali participant is skilled at overtly managing the communication, and initiates repair with RED+DARK? in round 2. The Nepalese participant understood TONGUE+FLOWER from the contextual background, and confirmed the notion of 'a light shade of red' by initiating a repair sequence using RED+DARK 'dark red?', to which the Indian answered RED+BRIGHT 'light red'. Thus, in round 3, FLOWER was chosen rather than TONGUE, even though both

of these were expressed by the Indian participant in the second round, because FLOWER is more abstract and does not involve the extra explanation of the difference between the intended colour referent and the shade of the actual tongue being pointed to in real time. Further sequences of turns between the signers are presented in Example 3.4 in section 3.3.3 above.

Table 4.2. Variants for 'pink' produced by each participant during week 1

	team 1	team 2
week1, round 1	India : [TONGUE+RED+DIFFERENT] Jordan : [FLOWER]	Nepal :[RED+BRIGHT+UNDERSTAND?] Indonesia : [BRIGHT?]
week1, round 2	India : [RED+TONGUE+FLOWER] NEPAL: [RED+DARK] India : [RED+BRIGHT]	Indonesia : [CLOWN+RED+BRIGHT] Jordan: [FLOWER]
week1, round 3	Nepal : [FLOWER] Jordan : [FLOWER]	Indonesia : [FLOWER] India : [FLOWER]

The signing from the Indian participant reflected the egocentric bias, for example when he used a non-iconic sign for 'green' (a flat hand on the chest) without any pointing, explaining, or iconically-motivated support. His interlocutor, the Jordanian participant, did not understand it and attempted to resolve the trouble by repeating the sign he didn't understand, and then making an iconic sign for 'tree' and pointing to the green-coloured wall to guess at the intended meaning. In contrast, when the Nepali participant was signing with the Indonesian participant, the former articulated her own variant for 'green' and then signed TREE in a visually iconic way with one hand and pointed to it with the other hand. During the next round, the Indian and

Nepali participants were paired together, and the latter referred to 'green' by pointing to the wall. The Indian participant then seemed to make a restricted offer, but used his own non-iconic sign again. So, it is likely that he understood the meaning of the pointing, and this articulation of his own sign was not a restricted offer but rather an attempt to teach or influence his interlocutor. The adoption of several of the Indian signers' variants by the other participants could perhaps be due to the immersion of all of the signers in an environment where Indian Sign Language was the main visual language. This observation is consistent with Bradford et al.'s (2019) study on the development of the lexicon, where the same pattern of 'home advantage' was found. As mentioned above however, the quantitative analyses do not reveal a statistically significant pattern for the overall data.

'Explicit teaching' does not necessarily mean that the signer gives an explicit meta-indication that s/he is going to instruct the interlocutor on how to use the sign. Rather, it normally involves first establishing the general concept being communicated (e.g., through explaining or pointing to an object in the room), so that both interlocutors can confirm understanding, and then showing the sign for it in an explicit way, e.g., 'Yes, as for [that concept], here is the sign for it, right here'. This often involves pointing at the sign with the other hand. Another situation in which explicit teaching might arise is if the interlocutor signals trouble and asks what a particular sign means. After the explicit teaching, the signer may decide to ask, 'what's your sign for this [concept]?' The other signer will usually just sign it, and will not tend to preface it with 'my sign for this concept is…' However, this is still

regarded as explicit teaching in the data. In ELAN, it was necessary to code these distinctly as two instances of explicit teaching instead of one, even though they occurred in a single sequence and the second instance especially is not prefaced or accompanied by any structure drawing explicit attention to this being teaching or demonstration. One example in the data was somewhat borderline as to whether it should be classified as explicit teaching or something else. This was a sequence where a signer produced a sign at T-1 from his own language meaning 'green', with the hand in a 5-handshape, patting the chest twice; the interlocutor signalled trouble and offered a candidate understanding (Manrique, 2016; Dingemanse & Enfield, 2015), producing a sign from his own language that he believed to be equivalent in meaning to the trouble-source sign. The first signer then signalled an affirmative response by nodding, and repeated his original sign, to confirm that it has the same meaning and to teach the sign. So, this was coded and counted as an occurrence of explicit teaching for the data analysis.

4.4.3. Frequency bias

Quantitative results

As expected, variants that were more frequent in the first week remain more frequent in the second week, demonstrating a frequency bias. Significant interaction effects were also found that suggest a relationship between the frequency bias and the interaction bias. The effects of a variant appearing in a teaching turn, or

T0 turn or being try-marked are stronger if the variant has a higher frequency in the first week. This might suggest that the effects are additive. However, for low-frequency variants, the probability of selection is actually lower if they appear in teaching or try marked sequences. This might suggest that these interactional contexts are polarising. They indicate some uncertainty about the effectiveness of the variant. If the recipient understands, then it might be taken as an opportunity to cement a convention. If they do not understand, then the producer might avoid that variant in the future. This suggests a relationship between cognitive factors and usage, also highlighted in work on language change (Bybee, 2010). These tentative explanations would need to be explored in a larger sample or a dedicated experiment, but the main point here is that there are potential relationships between established transmission biases such as frequency and interactional contexts or metalinguistic aspects that are worth exploring in the future.

Also in relation to frequency, the study considered Zipf's (1935) observation that more frequent words become stronger over time in order to facilitate efficient communication. Zipf's general point is that communication systems should evolve to allow efficient communication. It was observed that more frequent variants tended to be shorter ($r = 0.1$, $p = 0.03$), though the association is similar even in the first week ($r = -0.08$, $p = 0.07$), so the study cannot claim that this feature evolves through interaction.
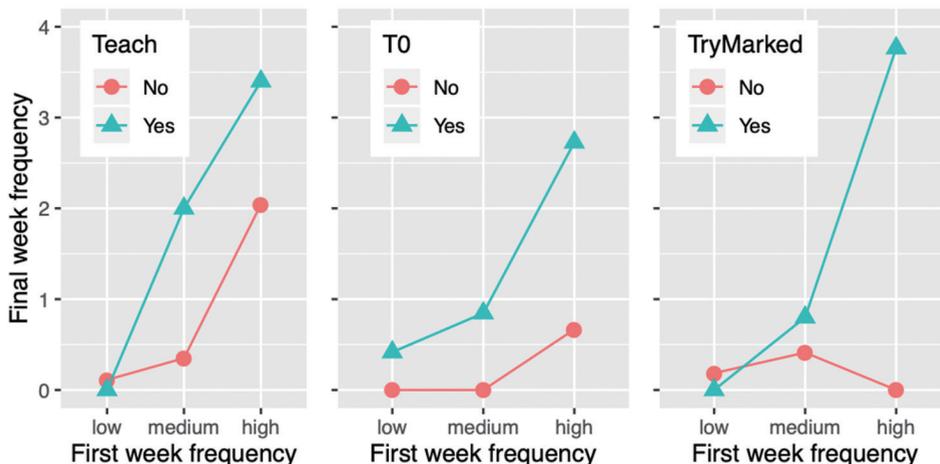
Figure 4.15. Relationships between frequency and interactional effects for teaching (left), T0 (middle) and Try Marking (right)

In Figure 4.15, the effect of frequency over time is combined with three different types of interaction, namely teaching, use at T0, and try marking. In the figure, the vertical axis shows the frequency in the final week. The horizontal axis shows the frequency in the first week, cut into three bins by tertile (breaks at 1, 2, 6, 26). Points on the graph – triangles for 'yes' and dots for 'no' – show mean frequency for a given interactional type and first week frequency bin. Since the purpose is to illustrate the direction of interaction effects, the uncertainty is not shown.

The model that ended up predicting correctly 94% of variants has the following characteristics related to frequency bias:

- if a variant is explicitly taught or appears in a T0 turn, it is more likely to survive if it has a low frequency;

- the size of the frequency effect for these interactional contexts is bigger than reasonably expected;

- the effect of frequency is neutralised by teaching or T0 contexts;

- the interaction between frequency and try-marking is different: if a variant is try-marked then the effect of frequency is even stronger.

4.5. Conclusion

Straightforward models of cultural selection suggest that the most frequent variants will increase their relative frequency (the "frequency bias", Boyd & Richerson, 1988). However, although frequency of a variant in the first week was correlated with its frequency in the final week, the measures of sequential context were stronger predictors in this study. This suggests that it is not just what is said, but when it is said that matters. A poorly motivated variant may be repeated several times between two pairs because it is causing problems. In contrast, an easily understood variant may only need to be used once before the pair can move on.

How should the findings of this study be related to the theory of cultural evolution? In the broad models of genetic evolution proposed by Dawkins (1982) and Hull (2001), the gene is a replicator and an organism is a vehicle that interacts with the environment to cause the replicator to replicate. Croft's model of language evolution

argues that this model also applies to language: the word or phrase is a replicator and the individual speaker is the vehicle (see Croft, 2000). In this study, the different signs are replicators, and the signers are vehicles. However, the analysis found that the type of sequence in which a form is used matters more than the simple frequency of a form. Hull (ibid.) notes that in biology there are many levels of vehicle including the cell, the organism and the species. Therefore, one interpretation of the study is that conversational sequences are vehicles (as well as signers being vehicles). The type of sequence promotes (or inhibits) the replication of the signs within it, just as a particular type of cell supports the replication of the genes within it.

Clark & Brennan (1991) state that grounding depends on the situation. This differs according to whether the communication is taking place in a face-to-face discussion, a lecture, a telephone conversation, written letters, or asynchronous video messages. For example, participants in a telephone conversation cannot rely on visual gestures. This data only looks at the type of grounding that occurs in face-to-face discussion, which is important due to the part it plays in building interaction. For success in their cooperative task, signers need to pay attention to each other, and pay attention to the message being articulated to succeed in understanding each other. Signers react to the building success by continuing to add to the communication. Users of both signed and spoken languages rely on this process of grounding as a means of seeing/hearing the message. This demands attention not only to one's own expression, but also a cooperative action that allows addressees to interact in order to understand the ongoing expressions. According to the

grounding hypothesis, people work hard to build a foundation for their cooperative behavior, that is, to establish a foundation as part of their common ground. The foundation itself is very important in this evolutionary experiment because the cross-signers needed to work together to reach a mutual belief that they are sufficiently well understood.

The results presented here are mostly in accordance with the hierarchy proposed by Berlin & Kay (1969), with two exceptions. Firstly, their hierarchy places black and white before red, but here this order is different as there was more agreement (i.e., fewer variants) for white and red than black. Secondly, the findings for 'yellow' are different to what Berlin and Kay predict. There was a large number of variants for yellow, and little agreement on which to select, even in the final week. For example, Berlin and Kay's hierarchy predicts that pink will have more lexical variation than yellow, whereas the findings in this data were the opposite, with yellow having more variants than pink. The results of this study do not support the view that motivation, in the form of indexicality and iconicity, plays a determining role in selection. However, it is acknowledged that motivation is a vast concept, and this research did not break it down sufficiently into different types of iconicity and/or indexicality. Future studies should establish categories of motivation and non-arbitrariness in linguistic forms so that the effects for various types can be investigated in detail. It is interesting to consider how far the findings of this study are generalisable. A salient part of these findings is in line with what the research has suggested about the interaction bias and conformity bias, even though these have not yet been

investigated in great depth. As noted above, the conformity bias was somewhat influential in the data because the Jordanian and Nepali signers were skilled in accommodating to their interlocutors' choices, while the Indian participant's signing suggested that the egocentric bias was at play.

This study only looked at communication in pairs, not groups of three or more. The results including the extent to which the various biases are influential may have been different if groups were used instead of pairs, because there might be stronger conformity biases depending, for example on the mix and balance of different cultures in a group. Collecting data on cross-signing in groups would also more closely approximate the evolution of International Sign, which has developed gradually across years of international gatherings such as events held by the World Federation of the Deaf. The variants that appear in IS have been selected by participants at these gatherings. Its evolution has been continually driven by the input from new individuals, because the events do not involve the same people each time. There is a tendency for such individuals to conform to the majority, i.e., to the variants that are already in use, but this is not a certainty, and they may also introduce their own variants rather than following the majority in every instance (Efferson et al., 2008).

5. The rapid building of intersubjectivity in cross-signing

5.1. Introduction

The functions of communication include social actions such as speech acts, debate, persuasion, sharing information and expressing thoughts and feelings. At the base of all of these social actions lies an actual mutual understanding by both interlocutors of what is being expressed. If successful, they come to have intersubjective understanding both of that content and the means by which it was transferred. This chapter is about how intersubjectivity is achieved by interactants who do not share fluency in any language. In order to explain the findings of the data analysis presented in Chapter 4, this discussion will provide a theoretical understanding of how intersubjectivity is built and established through various interactive and social cognitive factors. The chapter begins with some preliminaries, in section 5.1.1, which provide a precursory explanation of the nature of iconicity, and the relationship between form and meaning. Zeshan (2015) briefly discusses the concept of intersubjectivity, an important facet of cross-signing which is expanded upon in this chapter in more detail to determine how signers are able to co-create it. Intersubjectivity is the basis upon which mutual understanding in cross-signing communication is built. Interlocutors continue to share linguistic expressions whilst dealing with unfamiliar interactions in an attempt to form mutual subjectivity of mutual construction; the higher the level of intersubjective understanding achieved, the higher the probability of communicative success.

The notion of intersubjectivity in the computer sciences literature is characterised by Alterman (2007) as a phenomenon resulting from representation and interaction. His study provided an insight into how intersubjectivity is established in real time, using a computer game in which participants had to cooperate in order to successfully move barrels of toxic waste with tugboats without using speech. Alterman found that it was crucial for them to exchange their ideas with each other and work together to achieve a 'shared sense' of the situation so that they could complete the task. Cross-signers can be seen to exploit both the interaction and the form-meaning mapping in order to develop intersubjectivity, without a separate phase of fixing a common language first. This is a similar observation as that noted by Schegloff (1992), but I here define representation as the form-meaning mapping, as detailed in section 5.3 below. The framework in the present study differs from some prior work on intersubjectivity, such as Tirassa & Bosco (2008). The carefully considered and innovated forms that appear in cross-signing here are a specific type of message form that may not be well-fitted into the term 'linguistic signal' as it has been used in the literature so far. Because cross-signing is a visual medium, interlocutors tend to exploit visually-motivated signs and gestures, sometimes drawing on the surrounding environment, to offer tentative try-marked forms to each other (see section 2.3) which may be either accepted or identified as trouble sources (as was shown in Chapter 4). The extreme frequency with which this process occurs in the cross-signing data makes it impossible to explain the source and rationale of every innovated, try-marked form within the scope permitted here. But by and large, these forms can be described as motivated by common

ground, whether they are common gestures, signs created in the moment, signs selected from a known language, etc. In general, the more apparent the iconic motivation of the form-meaning relationship seems to be to the signer, the stronger the signer's assumption that the interlocutor will understand the form[22]. Therefore, it is more expedient for signers to select visually-motivated forms to offer to their conversational partner. This can be seen as a cognitive process, making aspects of human cognition essential to the study of cross-signing.

It is important not to overestimate the role of iconicity and other types of motivation in cross-signing, as it is only one of several factors. Whynot (2016) found that participants' understanding of forms from International Sign was the same whether the forms had a high or low amount of iconic motivation (see Chapter 1 for a more elaborate discussion). Furthermore, the findings in Chapter 4 on language evolution suggest that iconicity on its own is not predictive in cross-signing and that variant selection may also be subject to an interaction bias. So, when considering how and why cross-signing works, several different factors should be included, not just 'iconicity'. In addition to interaction and form-meaning mapping factors, cross-signers are forced to rely a great deal on shared aspects of general human cognition, because they cannot rely on any shared languages, grammatical structures, phonologies, or any previously agreed forms or systems. Therefore, cognition is a central concern in this chapter.

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[22] Iconicity will be discussed in detail in section 5.3.3.

Deaf people's perception of the world is primarily visual, and their languages make use of the hands, face, and upper body. Therefore, the iconic motivation in signed languages tends to be based on visual appearance and actions, e.g., enacting. This is therefore the type of iconicity on which cross-signers tend to draw. Emmorey (2014), states that iconicity is a structured mapping between a mental representation of the form, and a mental representation of the meaning. This mapping, i.e., the similarity or connection between the form and meaning, is thus not an objectively observable phenomenon, but derives from mental representations (Gentner, 1983; Emmorey, 2014). This means that two people will tend to have different mental representations, and this is most especially the case when they do not even share a language, as their language experiences are likely to be divergent. As a result, one cross-signer may feel that he or she is using a highly iconic and recognisable sign, while the other is not able to perceive any iconic motivation in that sign. This is connected to the notion of 'construal', which refers to an individual's ability to understand something from multiple perspectives, and affects personal cognition, beliefs, ideas and perceptions of the relationship between form and meaning (Occhino et al., 2017). Construal is a kind of filter that influences comprehension, interpretation, and prediction, including when these are related to perceiving iconicity. A signer's individual sensorimotor, perceptual, cultural, and linguistic experiences all impact his or her construal of iconicity. Even two signers who use the same language are likely to have different construals.

There is empirical support for the observation that human beings are sensitive

to iconically-motivated mappings between form and meaning (e.g., for spoken languages; Thompson et al. 2009 for sign languages). Ramachandran and Hubbard, 2001 showed participants two shapes, a rounded one and a jagged one, and asked them which one was called kiki and which was called bouba. Though these are only nonsense words, Ramachandran and Hubbard note that 95% of people state that the rounded one is bouba and the jagged one is kiki, regardless of their own particular language and culture. This 'kiki/bouba effect' demonstrates a universal sensitivity to iconic mappings in much the same way that Thompson et al. 2009 also detected this sensitivity and highlighted its utility in helping people process language, when they tested the response times of ASL signers matching pictures of items to their corresponding sign. The signers' responses were faster when the iconic aspect of the sign was reflected in the picture, e.g., quicker when matching the ASL sign CAT, which refers to whiskers, with a picture showing a cat's face and whiskers versus a picture of a cat's whole body. All languages have iconic form-meaning mappings at multiple linguistic levels, including lexical and syntactic, and most spoken languages feature universal sound mapping, e.g., associating small entities with high pitch and high vibration (Perniss et al., 2010; Dingemanse et al., 2015). However, sign languages are often said to have more iconicity than spoken languages (Taub, 2001; Perniss et al., 2010). Perniss et al. (2010) argue that unlike spoken languages, sign languages use iconic mappings in classifier predicates and event semantics (e.g., distinguishing telic verbs such as 'arrive', which has an end point, from atelic verbs such as 'drive', which has no assumed point of completion). This is defined in detail in Malaia and Wilbur's (2012:

407) study of kinematics of verb sign production in American Sign Language using motion capture data:

> "The results confirm that event structure differences in the meaning of the verbs are reflected in the kinematic formation: for example, in the telic verbs (THROW, HIT), the end-point of the event is marked in the verb sign movement by significantly greater deceleration, as compared to atelic verbs (SWIM, TRAVEL). This end-point marker is highly robust regardless of position of the verb in the sentence (medial vs. final), although other prominent kinematic measures, including sign duration and peak speed of dominant hand motion within the sign, are affected by prosodic processes such as Phrase Final Lengthening. The study provides the first kinematic confirmation that event structure is expressed in movement profiles of ASL verbs, up to now only supported by apparent perceptual distinctions. The findings raise further questions about the psychology of event representation both in human languages and in the human mind."

The conceptual relationship between iconicity and representation is that iconicity is "a resemblance between a linguistic item's form and its meaning" (Taub, 2000), crucially this resemblance may be situated in interaction based on humans' ability to co-create conceptual mappings or representations during the course of a conversation. The notion of 'form-meaning mapping' thus refers to how the

messages or meanings are formed or encapsulated by the interlocutors. Occchino et al. (2017: 113) found that "participants rated their native signs as more iconic than foreign signs" and they propose that "iconicity is NOT independent of linguistic experience", making the point that iconicity is indeed subjective. The group of so-called "productive signs" (Johnston & Schembri, 1999: 136) is particularly relevant in this context. Productive signs include those signs described in the sign language literature as having a high degree of visual iconicity, namely classifiers (Schembri, 2003), size and shape specifiers, and indexical signs such as pointing. For the purposes of this thesis, this category also includes gesture and mime, which is sometimes deployed by signers to resolve a trouble source.

This chapter is organised as follows to deal with the three types of factors that underly intersubjectivity in cross-signing. In section 5.2, interaction between cross-signers is considered, including how this leads to the development of intersubjectivity. Form-meaning mapping in cross-signing is then examined in section 5.3, along with the processes by which the form is selected and comprehended by the interlocutors. Section 5.4 explores aspects of their social cognition that affect cross-signers' communication. Lastly, the emergence of intersubjectivity in cross-signing is evaluated in section 5.5, followed by a conclusion in section 5.6.

5.2. Interaction factors in cross-signing

This section demonstrates how each of the interaction components, namely, turn-taking, repair, grounding and try-marking, are instantiated in cross-signing interactions. This enables a better understanding of the nature of the relatively poorly documented behaviour of cross-signing. At the same time, the focus on cross-signing elucidates these components of the interaction engine in new and interesting ways.

5.2.1. Interaction in context

It is crucial in cross-signing to have the dynamicity of being involved in the interaction, accessing all the contextual clues, and being active in the burgeoning of shared understanding. How does cross-signing highlight the role of context in reaching understanding in an interaction? What new evidence is it possible to obtain from studying this issue in cross-signing? How does the focus on contextual understanding help us to characterise cross-signing better? The phenomenon of cross-signing provides evidence for the primacy of the 'interaction engine', i.e., humans' ability to engage in interaction with each other even when they do not have any language in common (Levinson, 2006). Further support for this notion comes from studies of infants, who can interact with their carers long before they develop a language, and from studies of hearing parents and deaf children, who can interact with each other well before the child learns a sign language (Goldin-Meadow, 2003;

Casillas & Frank, 2017). Similar to cross-signers, people who use spoken languages can draw on iconic visual gestures to interact when they do not share a language. The interaction engine hypothesis is also bolstered by research showing that the structure of human conversations is very similar across languages (Stivers et al., 2009; Kendrick et al., 2014; Kendrick, 2015; Dingemanse et al., 2015); therefore, it can be said that instead of language giving rise to interaction, in fact, interaction facilitates the development of language (Tomasello, 2009; Levinson, 2019). And in this vein, cross-signing can be viewed as emerging from participants' use of the interaction engine.

The interaction engine is essentially comprised of humans' ability to connect with each other's intents and aims. Person A has an aim that they try to make clear, and person B then indicates what they think that aim is and what they are still unsure of. Person A then narrows the potential scope of meaning by clarifying her aim, and this procedure persists in this way, step by step, until the interactional goal is reached. This shows the power of somebody giving feedback over and over to help the person realise the right answer. Turn-taking and conversational repair are two phenomena that facilitate this procedure and enable the sharing and recognition of communicative intent. Grounding and try-marking are also key components of human interaction. Hence, each of these four topics is explored in the context of cross-signing through the rest of this section.

5.2.2. Turn-taking

In cross-signing, as with human interaction generally, people tend to avoid speaking/signing at the same time (Sacks et al., 1974); rather, they take turns in doing so, such that at any given moment, there is a producer and a recipient. The person producing an utterance is the one taking the turn, whilst the recipient attends to the message, typically demonstrates their understanding through back-channeling, and generally awaits their turn to respond to what is being communicated; each person has a different responsibility at different points in the conversation. Turn-taking gives the receiving interlocutor time to think and identify the meaning. The turn-taking system also enables producers to check whether their interlocutor has understood them, because the recipient's back-channeling during the turn and their responding next turn gives an indication of how well the message was received. This continual checking of understanding drives the turn-taking and facilitates the interaction (Sacks et al., 1974). An example of such turn-taking strategy is seen in the data when Signer B informs Signer A: "[ME] [BIRTH] [OLD] [RUSSIA]", meaning 'my hometown is OLD RUSSIA'. During the articulation of [RUSSIA], a strategy of slowing the signing speed and holding a sign is used as a try-marker, that is to say, to check the understanding of the sign. To do so means that Signer B passes the Turn to the recipient (Signer A) to continue the turn-taking and in order to obtain a reaction of Signer A's understanding. Signer B has clearly anticipated that Signer A may not be aware of this country name sign, so he consciously slows the signing and seeks understanding. However, Signer B quickly

recognises the recipient's lack of response (absence of the back channel) as a lack of understanding and immediately follows up by retaking the Turn and adding an extra sign – an index finger point to the right of the signing space at mid-height. By using the index [pointing], Signer B indicates that RUSSIA is a location and not a person or object. In the process, the slight pause between the two signs [RUSSIA] and [Index Point] is so short that it could be overlooked if not carefully viewed. At this point, Signer A, the recipient, takes a Turn and indirectly indicates to the speaker Signer B (who uses a try-marked sign, and shows a request to respond) that he does not know what the sign means. This is indicated through the continuing absence of a back channeling. Retrieving the Turn once again, Signer B uses the signing space in a topographic manner to trace the shape of Russia as it appears on a map and indicates that the location is [RUSSIA] by establishing that [CHINA] is the next country. Signer A now understands that RUSSIA is a location and takes a Turn to confirm that the Chinese location is [ASIA] and that the indicated country is next to it. Thus, through turn-taking, the cross-signers are able to cooperate to identify the relevant gap in understanding and clarify the meaning until reaching an understanding of the information.

Action ascription in turn-taking refers to the cognitive function of a signer identifying the reasons or meaning behind an utterance, connecting this to previous utterances and using it to predict the next utterance (Levinson, 2013). This constant back-and-forth feedback enables interlocutors to hone their message and eventually achieve their communicative goal, somewhat like the games '20 questions' and 'I spy'. It only

works in contexts of conversational turn-taking, and not where communication is primarily uni-directional, as in a lecture (McGregor, 1983). The intensive interaction that characterises cross-signing, e.g., with heightened attention to try-marking and repair due to the lack of a shared code, may require even more action ascription than same-language interaction. This interactive intensity may contribute toward the rapid building of intersubjectivity.

5.2.3. The system of repair and its realisation in cross-signing

The cognitive task of prediction in communication involves both try-marking and repair initiation (see Chapter 2). At T0, repair can be initiated and candidate understandings can be proposed. The interlocutors can use cooperation and teaching. In the event of communicative trouble, they can use recipient design - an approach whereby they produce their message in a way that is tailored to their recipient - to search for linguistic tools that are consistent with what the other person requires (see section 5.3.2). At the same time, the repair sequence is a continuous process, so even at the later stage of T+1 recipient design is still being used. Some researchers claim that the recipient design is mostly used for repair (Horton & Keysar, 1996). As noted in the concluding section of Chapter 4 (section 4.5), the forms of cross-signing are emergent and selected for during the course of interaction, that is, interlocutors work together to reach a mutual belief that they have understood each other in that context of the conversation. The selection of forms involves repair so that familiarity with linguistic tools and signals can lead to faster

interactions, resulting in less frequent and more efficient repair and turn-taking in later interactions between the cross-signing interlocutors. This is illustrated in Figure 4.15 (in section 4.4.3), where the effects of frequency over time in relation to a series of interactional strategies is noted as being selective and developing over time - evolutionary. This is crucial for the process of developing intersubjectivity.

5.2.4. Grounding

This section now turns to the concept of 'grounding' as defined in Clark & Brennan (1991), because this notion provides a very useful way to understand the overall intention behind the phenomena that have been attested in cross-signing, such as back-channelling and repair. Grounding refers to a process whereby the interlocutors make sure they understand each other, in order to develop common ground. The two main factors that influence this process are the purpose or goal of the interaction, and the methods or means by which the interlocutors are trying to achieve this goal. The purpose in the cross-signing conversations could be getting to know each other, sharing information about each other's backgrounds, and establishing meaningful communication. Methods might be email, webcam, or personal narrative. In this cross-signing study, the method is face-to-face interaction which is being filmed for research. A person asking a question needs to know that the listener is likely to understand and will be able to answer. This means that both phases of grounding are required: the presentation phase and the acceptance phase. In the former, the speaker offers an utterance to the listener. In the latter, the

listener gives an indication that s/he accepts and understands the meaning of the utterance. Both of these phases are essential for grounding to occur.

The forms and content used in cross-signing are a key aspect to consider in relation to grounding, as they occur in the context of the 'presentation-acceptance' logic described above. Cross-signers tend to persistently and tentatively try many different forms, and content, in the course of establishing common ground, as can be seen in their use of try-markers, and their agreement on mutually understood forms that are then added to their repertoire. As each form is agreed, the participants increase their common ground. The different types of content identified by Clark & Brennan (1991) are useful to apply here in order to explore what appears in cross-signing. Two relevant types of content are 'references' and 'verbatim'. References include 'alternative descriptions', i.e., a phrase to further identify or clarify an object or person, such as in the English phrase 'Joe, that young man in the park'. In cross-signing, alternative descriptions may take the form of signs from other sign languages, so that a signer may produce a form in their own sign language and then add an alternative description in a language that he thinks the interlocutor is likely to know. For example, if conversing with an interlocutor from Hong Kong, the signer may draw on an Asian sign language that he knows, such as Korean Sign Language; if the interlocutor is from Germany, the signer may use an alternative description in a European sign language they are familiar with. The alternative description may specifically target the interlocutor's assumed background knowledge in this way, or it may take the form of an iconically-motivated sign, or an explanation (see Chapter 3).

Another type of reference is called 'referential installments' by Clark & Brennan (1991). This is often described in terms of one language, with an example from English being the left-dislocation of the referent in the sentence 'your dog, he bit me' (ibid.). In cross-signing, this occurs as a series of forms representing the same referent, which may be from a number of different sign languages, e.g., DOG(KSL)^DOG(CSL)^Handle-lead(CL)^DOG(ASL). One sign might refer to the dog's ears, one to the paws, one to a lead, one to the English word dog through fingerspelling, etc. These installments may continue until the interlocutor signals understanding. Such iconically-motivated visual representations of different parts of a referent are recognised by Wilcox (2004) as metonymic and very common across sign languages. They also appear frequently in cross-signing.

A third kind of reference is 'indicative gestures', especially pointing, which is intuitively meaningful and frequent across languages. Cross-signers exploit pointing a great deal in their efforts to achieve common ground, including pointing to a sign itself to draw joint attention to a trouble source, which was dubbed esophoric pointing in this thesis (see section 4.4.1). For example, repair sequences often involve Signer B articulating the problematic sign at T0 and pointing to it with the other hand. This enables Signer A to isolate and resolve the problem by explaining the sign's meaning; this suggests that indicative gesture often plays a central role in successful repair and coordination, and therefore in grounding (for more details regarding language in the visual modality, see section 5.3.3.). In addition to references, Clark & Brennan (1991) identify another type of content, known as

'verbatim', which means information that must be understood in an exact way, such as an email address. This is commonly seen in cross-signing when interlocutors use fingerspelling. When Signer A fingerspells a word, such as T-H-E-O-R-Y, Signer B will often ask for a repetition; Signer A will then articulate each letter, leaving enough time in between each one for B to mirror it. In this way, Signer B can both ensure and demonstrate that he has identified the exact word. This type of content is perhaps not as interesting as references in the context of cross-signing, but it does seem to contribute to the process of grounding.

5.2.5. Try marker

A regular feature of interaction factors in cross-signing is the use of try-markers, explained in detail in relation to the rapid building of intersubjectivity here. A try marker, as section 2.3 of this thesis describes in detail, is a linguistic device that is used to test the recipient's recognition of a sign when the signer is unsure of understanding. As an addresser begins to communicate, s/he watches the recipient, taking into account the possibility of non-understanding. At the point in time when non-understanding is suspected, the signer's expression is maintained (Moerman, 1988; Sacks & Schegloff, 1979; Manrique & Enfield, 2015), held by a hesitation pause in expectation of a sign from the recipient as to whether the reference is known. The slow release, or holding, of a sign is typical of this strategy for building interaction, and is executed when the signer is unsure as to whether the conversational partner has understood a particular sign or phrase. The slow

articulation of the sign may continue, providing time to allow the recipient to confirm understanding, or indicate non-understanding, and the speed of signing will resume once the signer is assured that the partner is understanding the meaning of the given information. This interaction factor would usually be accompanied by interrogative non-manual features, especially the furrowed brow, and the interlocutor will often make use of context in order to comprehend the message. If the recipient clearly does not understand, the expression is different from the initiation of the correction, but in many cases, the source of the problem is indicated by repeating the same sign (for further details, see Chapter 2).

If the recipient instigates use of the same handshape as that of the trouble source of the signer, it is immediately understood that the recipient does not understand and the interlocuters begin their attempts to solve the problem (see Chapter 2). To solve the problem, a variety of interaction factors, such as try marking, are appropriately selected so that the recipient can make use of their linguistic background and verbal repertoire of sign language vocabulary (see Chapter 3). In the process, the signer continues to attempt to solve the problem for the recipient's understanding as the interaction continues. This includes checking the recipient's understanding whilst attempting to continue with the interaction. This strategy for building intersubjectivity achieves the same effect as that resulting from turn-taking and action ascription strategies (see section 5.2.1). As detailed in Chapter 2, the focus of a try marker may be on what happens when the signer recognises that the recipient is not understanding the sign before its full articulation, because the recipient has

begun to indicate a problem. In example 5.1 (and illustrated in Figure 5.1) in section 5.3.3, the NGT signer, produces the sign WHY, which is comprised of open hands tapping one on each shoulder and before the sign is fully executed, the recipient begins to replicate the sign, using the same handshape, and this acts as an indication of non-understanding to the signer. Recognising the recipient's attempt to clarify the meaning of the sign, a try marker is put into place to confirm the meaning of the sign. In this case, the try marker is initiated before the communication breaks down and it is this cognitive functioning that allows the interaction to continue with minimal interruption; the try marker serves its purpose of enabling communicative success while maintaining the flow of the conversation.

5.3. Form-meaning mapping factors in cross-signing

This section is about what influences the forms that are used in cross-signing interactions, including their production, which involves recipient design, and their comprehension, which involves abduction proper (section 5.3.2). In section 5.3.3, language construction in the visual modality is discussed, notably the issues of iconicity in the form of signs, and simultaneity of expression in the signed modality.

5.3.1. Production and comprehension

This section looks at production and comprehension in terms of the relationship between recipient design (an aspect of production) and abduction proper (an

aspect of comprehension). In particular, it is useful to consider here whether the traditional way of conceptualising production and comprehension as discrete processes is appropriate, given the recent literature suggesting a more integrated model. For many decades, a two-stage communication model was assumed wherein speaker A produces an utterance, and B comprehends; and then speaker B produces an utterance, and A comprehends. This characterises the production and comprehension as separate activities in the brain, supposedly happening at different times, making it seem as though a person may only engage in one of these processes at a time. However, Pickering and Garrod (2013) argue that it is not feasible to delineate production as distinct from comprehension in a real conversation; participants' contributions overlap with each other a great deal, because conversation is a joint activity rather than the sum of separate turns by two people. (Moerman, 1988) also argue that turn-taking involves interweaving comprehension and production. Therefore, it is doubtful that the brain engages in production and comprehension separately. The two-stage model would appear to be questionable in the light of spontaneous conversational data. In the cross-signing data especially, the joint or shared nature of the interaction and the resulting simultaneity of the production and comprehension is very apparent, with frequent occurrences of backchannelling and try-marking, for example.

Prediction is an essential component of interaction, because it allows one to consider what the next action might be (Pickering & Garrod, 2013; also cf. 'anticipatory interactive planning', or AIP, in Drew, 1995; and 'action ascription' in

Levinson, 2013, which is discussed in section 5.2.2 above). For example, cross-signers often use try-markers because they have predicted that their interlocutor will have difficulty understanding the sign, and then at T0 the interlocutor repeats the sign, confirming their prediction that it would be problematic (see Chapter 2). Prediction also permits one to change their action if it does not fit their prediction, which is seen when cross-signers implement multiple repair strategies in one sequence, that is to say, combining repetition, substitution, and explanation (ibid.).

5.3.2. Recipient design and abduction proper

In cross-signing, the strategies used are motivated by recipient design: signers use what they think their recipient is likely to understand; they adjust to the interlocutor's preferences; they establish common ground. This means that signers and speakers tend to produce their message in a way that is tailored to their recipient, e.g., by taking into account what they assume their addressee thinks and knows. This concept is called 'recipient design' (Sacks et al., 1974). Because the aim in communication is to build shared understanding, people are motivated to deliver their utterance in a way that is specifically suited to their interlocutor.

'Abduction proper' refers to the notion that the addressee forms a number of hypotheses about the speaker's meaning, based on the form of the utterance as well as the nature of the situation and interaction (Blokpoel, 2015). In this process, the addressee takes into consideration the form or signal, and the other evidence

available in the setting, to generate several hypotheses and then selects the best

or most likely one as his or her understanding of the speaker's meaning (see further

below). This suggests that comprehension of an utterance is far from a simple mental

process, but rather involves multiple stages of complex thought and interaction.

Recipient design

Blokpoel et al. (2012) studied recipient design by carrying out an experiment

wherein participants played a communication game using shapes on a screen, with

no use of language at all. Because they were unable to see or speak to each other,

they had to gradually build meanings using movements and rotations of the shapes

on the screen (e.g., a quick side-to-side movement intended to mean 'stop') in

order to complete the task. Blokpoel's hypothesis for this study was that participants

would rely more on heuristics, i.e., agreeing rules and methods in an orderly way,

and less on perspectives, i.e., looking at the situation from the viewpoint of the

other person or people involved and considering one's beliefs about them to inform

behaviour and decision-making. Blokpoel et al. (2012) initially thought, in agreement

with several previous authors, that perspective-taking is quite a complicated and

time-intensive way to adjust communication, and that heuristics would be preferred

because it is simpler. However, the opposite was found, because the participants

brought each other's various perspectives into their recipient design whilst

engaged in the experiment. To test this, an experiment was conducted by Stolk et

al. (2013, cited in Blokpoel, 2015, pp. 32-33) with 52 participants in pairs, using a

Tacit Communication Game (TCG). The 'sender' participant had to communicate to the 'receiver' participant how to move and arrange figures on a game board (by computer/controller) to reach a 'goal' location and orientation. The study found that the participants used recipient design in the TCG; for example, they used longer pauses with children in comparison to adults, and they used feedback from the recipient to adjust their communication. Blokpoel notes that either perspective taking or heuristics can explain these observations. Similarly, in the cross-signing data, to express 'brown' in the colour game (see section 4.2 in the chapter on language evolution for a description of the experiment), participants often pointed to their skin (e.g., face, hand or forearm), which seems a straightforward and readily-available strategy. However, they also signified 'brown' by referring to a shared experience of seeing a particular door which was brown. This attempt to draw explicitly on a shared memory appears to be an instance where the participants used recipient design.

Cross-signers may be seen to use recipient design e.g., in their tendency to make only short utterances in the very beginning of their acquaintance, which is likely to derive from their awareness that the other person does not know their language. It can also be seen in the repair tools they use and those they avoid. For example, repetition of a trouble source, a method in which recipient design is much less in evidence, is used in 12.2% of first repair attempts only. On the other hand, techniques that are tailored to the addressee, such as explaining and using mixed methods, have a higher rate of occurrence (see Chapter 2).

The availability of information about one's interlocutor prior to the interaction affects the way in which one can use recipient design. For example, the cross-signing participants in 2004 only had partial information on who their conversational partners would be, where they were from, what languages they used, etc. So, at their first meeting, they had to rely mostly on general tools and strategies, whereas later they were able to use strategies that more specifically targeted their interlocutor. Much of the cross-signing data is characterised by the interlocutors considering each other's perspectives and extant knowledge, e.g., when attempting to resolve trouble. Their cautious, tentative and methodical production suggests that they are committed to building on what their partner is likely to already know. As was discussed in Chapter 3, most commonly chosen repair strategies bear this out: 26 percent of attempts utilise substitution (i.e., the use of a sign from another language that has an equivalent or similar meaning to the trouble source) as a strategy, whilst giving examples, explaining and exploiting visual iconicity account for 9, 9, and 10 per cent respectively (see section 3.3 for details on each of these strategies).

This means strategies that perhaps involve extensive recipient design are used in more than half of repair attempts, i.e., a majority of the time, with the possibly more rigid strategies of fingerspelling and repetition being in the minority. However, recipient design can also potentially be used with fingerspelling and repetition, so it is not possible to separate conclusively the strategies that do and do not involve recipient design. These data appear to indicate that cross-signers frequently consider their interlocutor's knowledge and experience, and try to hone or shape

their message accordingly, drawing on complex and probably quite taxing cognitive processes throughout the interaction. However, determining to what extent each strategy involves recipient design is outside the scope of the present study and requires further research, for example through post-hoc interviews with the cross-signers themselves (cf. Zeshan 2015).

Communicative trouble and repair attempts occur in all languages, but in cross-signing the substantial length and complexity of the sequences in which these arise, and the persistence shown by the participants in tackling them, is especially notable. These signers seem to repeatedly construct, test, and reject or affirm their own hypotheses about what their interlocutor will understand, throughout the interaction. In doing this testing, try-marking is a powerful tool for allowing a cross-signer to pinpoint a particular structure to check whether their partner understands it. In cross-signing, this normally involves holding a sign, i.e., maintaining a sign statically, and such try-marking is yet another signifier of recipient design. Try-marking via holds facilitates joint attention and enables both interlocutors to verify whether they are achieving shared understanding (as discussed extensively in Chapter 2).

It seems apparent that cross-signers will take advantage of any knowledge they have about their interlocutor, however partial or emergent, to make attempts at recipient design. For instance, one day the Indonesian and Jordanian signers established that they shared the same favourite sport, football. In another conversation later that day, they were discussing air travel, and the Indonesian signer wanted

to convey the concept 'London'. He readily drew on their previous conversation by describing the 'three lions' England football flag, which was quickly recognised by the Jordanian as a reference to London. To benefit from recipient design, the cross-signers not only exploited the knowledge or connections that they had gained directly from a conversational partner, but also harnessed indirect information about who had already interacted with whom. For example, by the time the Indonesian signer and British signer met for their first interaction, they had each already been paired with the Japanese signer, and all were aware of this. So when the Indonesian signer had trouble communicating the concept of 'England' to the British signer, he reverted to the sign he had learnt from the Japanese participant (two fingers tracing under the chin), knowing that the British signer had also signed with him and may be aware of this sign (Zeshan 2015: 248). In the event, this strategy was successful as she did remember the sign from her conversation with the Japanese signer. This demonstrates the efficacy of strategies that are based on recipient design, as well as showing the strong propensity of signers to engage in recipient design, guided by known common ground, as these signers were able to resolve a repair situation with knowledge that they had only acquired a few hours earlier.

Abduction proper

Blokpoel (2015) further argues that there are two processes involved in guessing or predicting the meaning of an utterance. These are called 'inference to the best explanation' (IBE) and 'abduction proper' (AP). IBE is the process of using contextual information to try to determine which from among a set of possible hypotheses is correct, and AP is the process of creating the set of hypotheses from which to choose. For example, if one is at a party and sees one's friend point to her head with a pained facial expression and make a 'house' shape with her hands, one may use AP to create a set of hypotheses (e.g., her hands could be intended as the shape of a boat, a rocket, a roof, a bird's beak, etc) and then use IBE to select the most likely hypothesis (e.g., the context of the party and general background knowledge such as 'she lives in a house' and 'parties give people headaches' leads one to surmise that her hands are making a 'roof' or 'house' shape, and that she probably wants to go home). These two processes can be exploited by both cross-signers and users of the same language; however, it is likely that in cross-signing scenarios they are more difficult and involve more trouble in understanding the message (cf. Schegloff et al., 1977; Schegloff, 1987). This is seen for instance in round 1 of the colour game experiment wherein the signer from India pointed to his tongue to indicate 'pink', and the Jordanian signer was unsure of whether this was intended to refer to a colour or to the concept 'tongue' (see Figure 4.11 in section 4.4.1 of this thesis). The Jordanian signer had to generate these hypotheses using AP and decide which one was correct using the IBE process.

With this in mind, it would seem inaccurate to describe recipient design as an aspect only of production. It also involves comprehension, or at least a prediction of the other's comprehension, e.g., based on what the interlocutor has produced so far. Equally, the formation of hypotheses in abduction proper involves not only comprehension but also production, e.g., mentally constructing tentative utterances. Both recipient design and abduction proper require negotiation, which itself is an outcome of both production and comprehension. Another aspect that suggests the overlap of production and comprehension is the fact that conversation necessitates constant prediction, including planning one's own utterance and guessing what one's interlocutor is likely to say next. Both kinds of prediction involve simultaneous processes of production and comprehension.

5.3.3. Language construction in the visual modality

This section looks at how language construction is aided by the features of simultaneity and visual iconicity in the linguistic signal, which is unique to sign languages. Spoken languages are restricted to linearity and speakers can only utter one word at a time, but signers have two manual articulators (Klima & Bellugi, 1979 and Lillo-Martin, 2006 in (O. A. Crasborn, 2006). This means that they can use various forms of two-handed signing, from signs that always involve both hands to structures where one hand (the 'active articulator') becomes the location for the other (which is 'passive') (e.g., Brentari & Goldsmith, 1993; Sandler, 1993; van der Hulst, 1996; Napoli & Wu, 2003). The active articulator in such structures is usually,

but not always, the signer's dominant hand; sometimes the phenomenon called 'dominance reversal' causes a signer's non-dominant hand to become the active articulator (Frishberg, 1985 and Miller, 2000 in Crasborn, 2006). As explained below, this feature is exploited by cross-signers to facilitate joint attention and conversational repair, which in turn builds intersubjectivity.

In the middle box in Figure 5.1, Signer A uses the OIR strategy of repetition to pinpoint a trouble source, but this is not understood by signer C. Signer A (the author of this paper) then exploits the strategy of pointing explicitly at his own articulation of the trouble-source sign, to target the issue more emphatically. This is comprehended by signer C and leads to a successful repair. Signer A's strategy of pointing in this way with the non-dominant hand harnesses a particular feature of signed languages: simultaneity.

Figure 5.1. Repetition to pinpoint a trouble source

Such pointing strategies often also involve a hold of the sign, i.e., the signer holds the handshape still whilst the repair sequence progresses, sometimes also holding the eyes, head, face, and/or torso still (Floyd et al., 2016). This is similar to behaviour seen in speakers, who tend to 'freeze' at T0, often with their brow furrowed and/or their head tilted backward, forward or to the side. In the case of Signer A, his initial attempts using repetition and a hold to draw attention to the trouble-source sign were not understood by his interlocutor, which (as the researcher recalls from this interaction) is why he decided to point explicitly, as this facilitates joint attention. Speakers also use pointing to establish joint attention, for example by pointing to a relevant object, though as mentioned, they cannot point esophorically to their actual utterance as signers can.[23]

As shown in Example 5.1 (and Figure 5.1), Signer A deploys this integral nature of pointing when he uses it to establish joint attention on the trouble-source utterance, which is a sign for 'why' from NGT. The joint attention then enables Signer C to understand the problem. This is where the turn-taking framework plays an important role, because it allows the interlocutors to narrow down the problem (Levinson, 2013). The framework here includes an embedded sequence, where signer A articulates more than one repair initiation (a repetition of the sign as repair initiator 1, and explicit pointing as repair initiator 2).

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[23] Please note that further differences between pointing in signed and spoken languages remain a prominent domain of enquiry (Fenlon et al., 2019; Cooperrider et al., 2021).

Example 5.1.

1	C : WHY(NGT)+WHAT+I+LIKE+BOOK 'Because I like books'	(trouble source)
2	A : WHY (repeats sign)	(repair initiator 1)
3	A : pointing&WHY 'What does that sign mean?'	(repair initiator 2)
4	C : WHY(ASL) 'The meaning is 'why' (as expressed in ASL)'	(repair 1)
5	C : WHY(NGT) 'It is the NGT sign for 'why''	(repair 2)

The turn-taking framework and double repair initiation then enables Signer C to use recipient design to construct a repair attempt. He believes Signer A to be aware of the International Sign alphabet (which is very similar to the ASL alphabet), and uses the W-Y sign for 'why', which Signer A understands. Signer C then immediately refers back to the trouble source sign to clarify that 'that is also the meaning of this sign', using an explicit teaching strategy, which contributes further toward the building of shared knowledge. In contrast, there is no way for speakers to refer simultaneously to their own utterance, due to the linearity of spoken language and the limitation of having only one articulator. A speaker cannot, for example, hold a word still to attract joint attention to it and refer to it whilst explaining it and/or participating in a repair sequence. It is also perhaps more difficult for speakers to deal with repair when the trouble source is an unfamiliar form, e.g., one that they do not know. Whilst it is possible for a speaker to point to the chin/mouth and demonstrate how to pronounce a term correctly, once the word has been spoken, it is not accessible in the environment in any comparable way to the visual holding of a sign[24] and the interlocutor must rely on their memory to try to re-articulate the word

or refer to it in some other way, e.g., 'the word you said before…' On the other hand, signers are able to articulate and hold a form static.

Signers can use holds and pointing as strategies because sign languages allow simultaneity. They can also use iconicity as a first-attempt strategy. The interactions in repair sequences where these strategies are used help signers to agree and negotiate signs and build intersubjectivity in this process. The visual modality of sign languages creates a higher number of iconic visual mappings, as noted by Perniss et al. (2010).

This visual iconicity helps signers to ground language in their sensorimotor systems and make links between words and the world (Perniss & Vigliocco 2014). Signers use visual means to agree and negotiate meaning. Taub (2000: 47) states that iconicity "involves the manipulation of mental imagery", wherein a language user creates a form or sign to reflect a real object or image. This occurs in a process of image selection, schematisation, and encoding, as shown in the diagram in Figure 5.2 (from Taub, 2000).

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[24] Of course, when words are written, they have the same affordances as signs and can be accessed and pointed to in the environment.
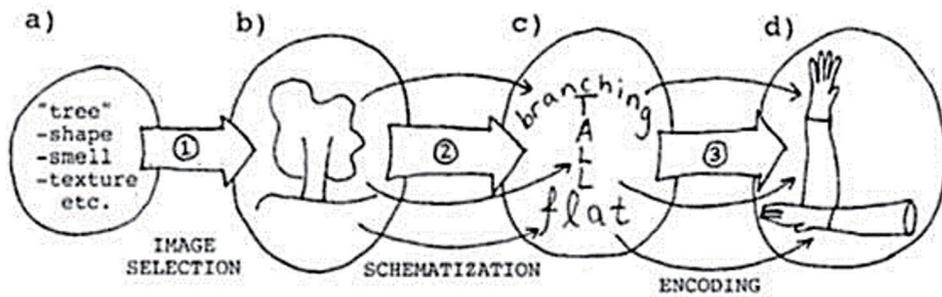
Figure 5.2. Analogue-building process for American Sign Language TREE

The diagram depicts how aspects of a concept are selected and 'schematised' before being encoded into a form that can be expressed with the relevant articulators of a given language, in this case sign language. As shown, for the concept 'tree', there are many potential characteristics, but only some of these (e.g., 'shape') are selected for schematisation and encoding. 'Tree' is an example of where the whole item is encoded as much as possible, i.e., the sign for 'tree' shown in Figure 5.2 includes the 'trunk' and the 'branches'. Some signs only encode part of the object, e.g., 'floppy ears' are encoded in the Korean Sign Language sign for 'dog', and 'paws' are encoded for 'dog' in Chinese Sign Language. (The dog's face is also arguably encoded in both of these signs via non-manual features, especially in the CSL sign which has a 'wawa' mouth pattern that evokes the image of a dog's bark.) Informal observation suggests that both of these signs are relatively easy to understand for those unfamiliar with KSL and CSL, and perhaps even non-signers, because of their visually iconic motivation. However, a person's perceptions of how iconic a particular sign or word is, are often dependent on that person's culture and language background. For example, the differentiated pronoun-classifiers for

'man' and 'woman' in KSL may seem highly iconic to a KSL signer, but not iconic at all to an ASL signer. As mentioned in 5.1 above, Occhino et al. (2017) call this 'construal' and state that iconicity is 'mediated' subjectively, using personal bias. Their research suggests that language users rate signs from their own language as being more iconic than signs from other languages. Therefore, it is not possible to say that a sign is objectively 'more iconic' or 'less iconic', and this makes the notion of iconicity rather difficult to investigate. People's beliefs about and perceptions of iconicity are linked to their own language-specific experience. However, it is still possible to characterise the cognitive work involved to some extent. For example, designing your message so that you believe it is more transparent for the addressee (this overlaps with recipient design); trying to grasp the iconicity in a sign addressed to you, even if your own sign uses a different iconic basis; keeping track of which kind of iconicity has worked well for your interlocutor, so that you keep drawing on it later. These are all types of cognitive work that have to do with the iconicity vs. arbitrariness of the linguistic signal, and the cognitive work has to be done regardless of whether something is considered iconic or arbitrary.

5.4. Social cognition and background knowledge

Social cognition factors contribute greatly to the ability to reason and analyse an unfamiliar message: they provide the basis for background knowledge and assumptions. Both social cognition and metalinguistic perceptions are at play in successful cross-signing. These social cognition factors are the basic foundations

to building intersubjectivity and they are skills that a person must have at their disposal before attempting communication in a cross-signing environment. Without these basic social cognitive foundations of language, an interlocutor may struggle to initiate the language repair tools essential to building intersubjectivity. They may not have the capacity to take the time to negotiate the interaction or the cognitive ability that is required to process messages being sent and received during cross signing. Heightened social cognitive skills at work during cross-signing interaction make it possible for the interlocuters to interact with the ability to apply sequencing, modification, grounding, and try-marker accommodations. The meaning negotiation necessary for language construction is also difficult, as is the process of forming mutual subjectivity. When social cognition skills are in place for both parties, the interlocutors have the awareness and the capacity to build up intersubjectivity. Cognition is also at the heart of discussions in section 5.5.

The efficacy, pace and speed of production and comprehension are influenced by language users' knowledge and awareness of several aspects of social cognition, which allow interlocutors ways of judging what the other is likely to take for granted. The aspects that cross-signers may draw on can be categorised broadly as consisting of human knowledge, cultural knowledge, the local context, the conversational setting, and the communicative experience (see section 5.4.1). With regards to human knowledge (e.g., pointing to a body part) or the shared setting (e.g., pointing to a nearby object), such strategies are associated with shorter interactions in repair sequences. Use of the local context can also be correlated

with less interaction, but this depends on whether the aspect of the local context is something readily remembered by the interlocutor. If this is not easy for the interlocutor to recall, reliance on the local context may trigger a lengthier interaction. Cultural knowledge is even more variable in this regard and dependent on whether the specified piece of information is culturally salient to both parties. For example, drawing on an awareness of football may be successful with an interlocutor whose cultural background includes this sport, but would not have been effective with someone from a culture wherein football is not popular. Overall, reliance on cultural knowledge seems to be the least likely to correlate with shorter interaction times; the local context and especially the shared setting and human knowledge are all more commonly associated with shorter interactions. The effects of social cognition on the length of interaction are explored in more detail in section 5.4.2.

5.4.1. Aspects of social cognition

This section focuses on signers' social cognition, which can be seen as being comprised, in this context, of five aspects of knowledge: knowledge derived from experiences common to all humans; knowledge derived from one's culture; knowledge derived from communicative experiences; knowledge derived from the local context, and knowledge arising the shared setting of the conversation itself. Firstly, human experiences are those that are shared amongst all people due to our common anatomy, such as lips being pink/red or teeth being white. Cross-signers often appeal to this type of knowledge, especially when communicative trouble

arises. In Dingemanse's (2009) terms, this phenomenon can be characterised as resorting to terms for 'stable common ground' using the 'selective advantage of body-part terms'. Terms for body parts are highly privileged in language evolution, e.g., because they are more likely to be monomorphemic (ibid.), so it is perhaps unsurprising that iconically-motivated and indexical reference to shared human anatomy appears to be a powerful tool in emergent signing varieties (de Vos, 2011; this thesis Chapter 4).

The second aspect of social cognition is culture, which in cross-group interaction does not necessarily contribute toward common ground, because cultures vary a great deal. Of course, language is an integral part of culture, and vice versa, so people who want to communicate successfully must develop an understanding of each other's culture (Brown, 2007: 165). People's use and understanding of language is very intimately connected to their cultural experiences, lifestyles and traditions. The more disparate these are for two people, the more difficult their communication is likely to be. This is borne out in the cross-signing data, which reveals that the signers with the most dissimilar cultural backgrounds in a particular semantic domain tend to experience the most communicative trouble (see Example 3.13 in Chapter 3, where the Jordanian and Indonesian signer have trouble related to the concept of 'age'). On a more specific level, while many cultures have police officers, some do not: mountain communities in Nepal do not have a typical police force. Therefore, the Nepali cross-signing participant had difficulty understanding visually-motivated iconic references to 'police officer', e.g., indicating a helmet

or holster. On the other hand, any shared cultural similarities can be exploited to aid the interaction and cross-signers may be more easily assisted by their shared cultural practices. For instance, some of the cross-signers were from cultures where football is very popular, and they were able to resort to football-related concepts as an area of common ground (see the 'three lions' example in section 5.3.2). It is also possible to refer to commonly known cultural phenomena when the two cultures at play do not share the same practice, such as a reference to Santa Claus, which is very prominent in commercials and pop culture.

The aspect of communicative experiences refers to the experiences in communicating with other people in one's lifetime, in particular the degree of diversity and variability. For instance, if a signer has had to face a large number of communicative challenges, e.g., due to frequent communication with non-signers without support from interpreters, this builds their capability of negotiating the meaning-making process with others, which is also needed in cross-signing. Moreover, some sign languages have much more internal diversity, e.g., dialectal diversity and age differences, than others. Experience with increased diversity is another supportive factor that may influence cross-signers. (Zeshan, 2019) lists such factors as facilitating more effective cross-signing. The three factors discussed so far are general and do not relate to any specific instance of cross-signing. Rather, they facilitate background social cognitive skills and knowledge that can be recruited for cross-signing. The next two factors are specific to individual cross-signing events.

The immediate or local context is the fourth part of the background knowledge contributed by social cognition. In the case of the cross-signers in this study, the local contexts were Nijmegen in the Netherlands or Lucknow in India (as described in section 1.5.1). Because the two groups of participants came to these places for the data collection, they became sources of shared knowledge, as all of the participants were experiencing the context together, in the same space and time. They could therefore draw on their knowledge of what happened 'yesterday', 'a week ago', etc, using their common time frame. Their immediate experiences within the data-gathering period were often assistive in their communication. For example, to convey the concept 'brown', one participant described an experience that had occurred on the previous day, when he and his interlocutor had made their way around the building to reach a particular door, which was brown (see Chapter 4 for these and other colour reference strategies). Another example is their use of a sign for 'England' as described in section 5.4.2 above (from Zeshan 2015).

The fifth kind of background knowledge contributed by social cognition is the conversational setting, i.e., awareness of and access to the immediate environment. For example, in a sign language lab, there may be tables, dividers or screens, papers, chairs, etc, and the interlocutors are all able to see and refer to these items. This knowledge of the shared setting also includes the fact that person A knows that person B knows about these items and knows that person A knows, and so on, such that they have mutual knowledge (Sperber & Wilson, 1982). The setting can then be exploited in the interaction, e.g., by pointing to a nearby object to help

one make a conversational repair, or by considering the items in the room when guessing what the interlocutor's utterance might mean. This can help to establish grounding. Therefore, knowledge of the shared setting can assist the process of cross-signing. The first three types of knowledge, i.e., human, cultural, and local, are types of background knowledge that the signer has prior to the interaction and brings to it. However, knowledge of the shared setting normally develops as the interaction is unfolding, so it cannot really be considered 'background knowledge'. In cross-signing, being able to draw on the shared setting is a vital component in building common ground, which is needed for effective communication and very difficult to generate through other means because the interlocutors by definition do not share a language.

5.4.2. Relationship between length of interaction and cognitive factors

In order to consider the relationship between the length of the interaction and cognitive factors, this section considers aspects of social cognition that cross-signers may draw upon, which can be categorised broadly as cultural knowledge, local context and human experience (Figure 5.3). The diagram shows how types of shared social cognition are likely to lead to different amounts of interaction time for successful communication, with longer amounts of interaction indicated by the length of the arrow.
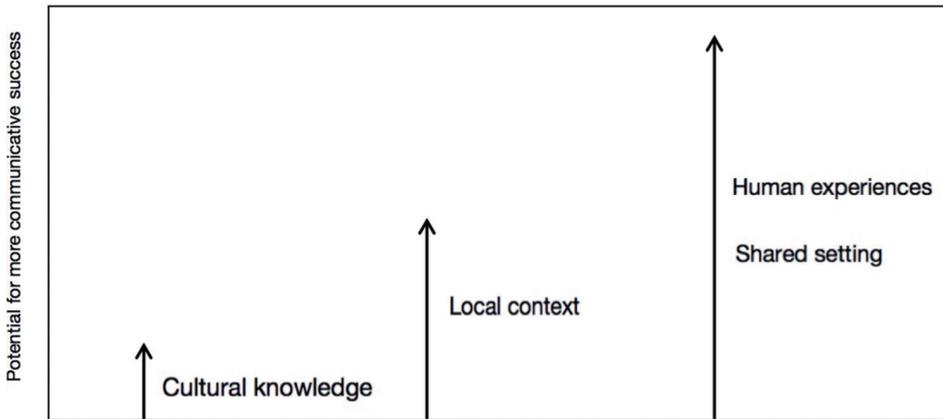
Figure 5.3. Amount of interactional work needed
for communicative success in relation to cognitive factors

In relation to social cognition, reliance on 'cultural knowledge' is not as
advantageous as other factors in regard to the length of interaction time required to
achieve communicative success, hence the short arrow, although it is dependent
on whether the specified piece of information is culturally salient to both parties.
For example, drawing on an awareness of football may be successful with an
interlocutor whose cultural background includes this sport, but would not have
been effective with someone from a culture wherein football is not popular. It is
possible to hypothesise that reliance on cultural knowledge seems to be the least
likely to correlate with shorter interaction times. Use of the 'local context' (also part
of this shared social cognition) can also be correlated with long interaction length,
though not to the same extent and hence the longer arrow. However, this depends
on whether the aspect of the local context is something readily remembered by
the interlocutor. If this is not easy for the interlocutor to recall, reliance on the local

context may trigger a lengthier interaction. Reliance on 'human knowledge' (e.g., pointing to a body part) or the 'shared setting' (e.g., pointing to a nearby object) to achieve communicative success is associated with shorter interactions in repair sequences, hence the related arrow in Figure 5.3 is very long, indicating a shorter length of interaction to achieve communicative success.

Furthermore, it is important to note that what seems 'transparent' in one culture or language may not be in another. For example, a sign for 'police officer' may make reference to a holster, and this would not necessarily be transparent in cultures where police officers do not carry guns. Similarly, people using a language where the 'i' handshape using the extended pinky is used to signify 'person/woman' may feel that this is transparent, but for someone who uses a language that signifies 'person/woman' in a different way, this would not be transparent. In summary, the form-meaning mapping in cross-signing is highly variable, and results from interaction that involves simultaneous cognitive processes of production and comprehension, aided by different types of pre-existing knowledge. Specifically, in these interactions, the forms are co-constructed and influenced by recipient design, abduction proper, and signers' knowledge of the world and sufficient metalinguistic capabilities. The interplay between these phenomena ultimately contributes toward cross-signers' intersubjectivity.

5.5. Intersubjectivity

The aspects of cross-signing that were discussed in sections 5.2, 5.3 and 5.4, mean that intersubjectivity can be established quickly even where there is no common language. When humans can understand each other due to having a common background, or 'shared sense' of a situation, then they can successfully communicate and coordinate with each other. This shared sense, referred to as intersubjectivity, is the foundation for human cognition. Verhagen (2008) explains that language users aim at convincing or influencing each other through perspective management, assessment, and intersubjective cognitive coordination, rather than being orientated toward opposition or control, as might be argued from a behaviourist standpoint. Conversational participants collaborate and gauge each other's understanding continually to create a shared mental space (Zeshan, 2015), i.e., intersubjectivity. Two people can establish intersubjective knowledge through social interaction (Von Glasersfeld, 1995; Steffe & Thompson, 2000; Alterman, 2007) by reciprocating and approximating each other's language until they have assimilated each other's conceptual structures and agreed on the meanings of their interactions. The goal of the reciprocation process is to understand each other's conceptual structures well enough for assimilation, that is, building common knowledge through mutual sharing, but not necessarily to arrive at identical conceptual structures.

Von Glasersfeld (1995) emphasises that interaction is important in creating

intersubjective knowledge whilst also having a social function. The veracity or viability of a person's intersubjective knowledge can be confirmed when their interlocutor says or does what the person predicted. This circumstance is known as 'second order viability' (Von Glasersfeld, 1995: 120). It helps to generate intersubjectivity between individuals because it contributes to a belief that the other person shares one's concepts, actions, goals and emotions, which increases their perceived authenticity or veracity. When the other person affirms or fulfills one's predictions or assumptions, this makes one confident about the existence of shared knowledge. The process of predicting, checking and verifying the other person's understanding aids this construction of intersubjectivity. Similarly, Clark and Brennan's (1991) concept of grounding is useful to characterise how an interlocutor provides new information to her/his conversational partner, who then accepts this information, to build their shared knowledge. When this is repeated over time, their common ground increases. The first interactions between a pair of cross-signers typically involve a large range of variants, as the signers try, and then either retain or discard, an array of forms and structures. As the number of variants being used in the conversation decreases, the communication becomes more effective and efficient, because the signers' intersubjectivity is increasing. This sub-section examines the notion of intersubjectivity and how it develops within cross-signing contexts.

Intersubjectivity includes shared awareness of linguistic conventions. However, Zeshan (2015) notes that this intersubjectivity is only present when the interlocutors are able to use the same language or have some common language to draw upon,

which is not the case in cross-signing. The intersubjectivity that derives from, and can be increased by, such shared conventions is not available to cross-signers, as they lack a common language background. Thus, the only conventions that they may exploit to begin constructing intersubjectivity are communicative (versus strictly linguistic) patterns and processes, such as negotiation, that occur cross-culturally. Specifically, Zeshan (2015) finds that cross-signers use an Introduce-Accommodate-Persist (IAP) procedure to agree on what forms to add to their shared repertoire. Cross-signers use IAP sequences such as in the following example:

1. **Introduce**   a signer introduces/suggests a new sign to the conversation;
2. **Accommodate**   the other signer copies the sign;
3. **Persist**   both signers accept and continue using the sign.

On their initial meeting, the creation, suggestion and introduction of potential forms is very frequent as the cross-signers attempt to guess what their interlocutor will understand most readily. This phenomenon is confirmed by Chapter 4's study of the selection and resulting evolution of colour-related lexical items in cross-signing. Participants were recorded completing a task once a week for three weeks. Their first attempt took them 2 hours and 17 minutes, whereas their second and third attempts took 1 hour and 47 minutes, and 1 hour and 21 minutes, respectively. This substantial decrease over time may be indicative of the large initial investment made by the participants in suggesting or introducing various forms to be accepted into their pool of common conventions. For instance, in the first week, five sign types

(44 tokens) for 'pink' were produced by the four participants in total across their six pairings, including pointing to the tongue, producing a form referring to 'flower', using a sign for 'red' followed by one for 'light(er)', articulating a reference to 'clown's cheek', and referring to the red dot decoration (Bindi) worn on the forehead. This initial proliferation of offerings cannot be simply characterised as 'participants using iconicity' because the specific iconic motivations or relationships of signs and meanings are themselves established linguistic (language-dependent) conventions, which again are not available to people with no shared language. Instead, this observation of communicative determination and eventual success might be best explained as participants harnessing a range of language-independent, human communicative conventions such as turn-taking, repair, try-marking, and recipient design. These powerful processes built intersubjectivity among the cross-signers from the very first moments of the first meeting, increasing it dramatically over time. By the third week, this resulted in the five offerings for 'pink' being narrowed to just two variants (nine tokens, or 1.5 tokens on average per pairing), namely those based on references to 'flower' and 'tongue' (Chapter 4).

The initial presence of myriad variants makes the communication relatively slow and hence time consuming. As a common repertoire is built, the communication becomes faster and more efficient (Zeshan, 2019), and causes greater confidence in the interlocutors, all of which means that intersubjectivity is increased. Of course, this applies to only two cross-signers at a time, and the idiosyncratic nature of cross-signing means that just because a pair of cross-signers establish

intersubjectivity and a shared repertoire, it does not necessarily follow that others will benefit from this or be able to understand the interaction (although after multiple meetings of the various permutations of the cross-signing pairs, there is some noticeable convergence among the signers, especially in terms of the lexicon; see Chapter 4). This suggests that recipient design is a very high priority for cross-signers, and that their production and offerings will depend to a great degree on who their conversational partner is, and their assumptions or predictions regarding that person's background and knowledge.

Other studies on language evolution have examined the tension between ease/ speed of production and ease of recognition/comprehension, both of which are desirable for minimising effort (following the 'principle of least effort', Zipf, 1949), but which sometimes conflict. For example, a perhaps easily recognisable sign referring to 'pink' was made by pointing to the tongue, but this sign is awkward to articulate as it involves drawing explicit attention to a protruding tongue, which is unusual and highly marked in some sign languages (but see Lutzenberger et al. 2022 on Kata Kolok). It seems that overall, in cross-signing the factor of recognisability is of overwhelmingly greater importance than ease/speed of articulation, so the drive toward 'least effort' is not necessarily an accurate way to depict evolution in cross-signing. A more appropriate concept is the 'minimisation of collaborative effort' (Clark & Wilkes-Gibbs, 1986), i.e., making all forms as recognisable as possible to maximise the interlocutor's chances of comprehension, which also requires ample time for frequent checking and verification of understanding. This minimisation of

collaborative effort assists the aforementioned process of grounding, with repair and try-marking playing key roles in this and the concomitant development of intersubjectivity (Dingemanse, Roberts, et al., 2015).

The nature of selection and evolution in cross-signing means that over time there is slightly more abstraction (i.e., the use of more abstract forms), but even so, cross-signers are subject to some amount of insecurity about this, leading them to persist in exploiting iconically-motivated forms. They may agree on an abstract form, but later revert back to an iconically-motivated form when the concept is mentioned again. As mentioned in Chapter 4, the paired participants did not remain in the same pair throughout; the interactive sequences involved moving from one partner to the next, hence they were met with various concepts, and the process at times involved returning to a previous iconically-motivated form until the sign language expression for each concept was agreed upon by group bias. This may be due, then, to the multiple permutations of the signing pairs and iterations of the cross-signing conversations; it is possible that a signer may forget that they have already used and agreed on a more abstract form with a particular interlocutor, and mistakenly resort to the more iconic variant. This may be similar to the effect of iterated learning on systematicity and increased abstraction noted by Garrod et al. (2010), who found that learning through interaction leads people to use more symbolism in graphical signs whereas learning through repetition or iteration does not.

Drawing on the concepts that have been discussed so far, the discussion now turns

to take a closer look at the rapid intersubjectivity that has been observable in cross-signing. From their first meeting, the cross-signers begin proposing possible variants, forms or phrases for acceptance or rejection by their partners, using a range of tools or strategies, such as explanations and visual iconicity, within the multimodality of communication. This basic pattern of proposal and acceptance (or rejection), into which fit the manifold metalinguistic strategies that cross-signers are able to employ (Zeshan, 2015) is a key facilitator of intersubjectivity in cross-signing. The other main facilitator is recipient design, put into play through interaction that also includes turn-taking, repair, and try-marking. It is recipient design that, alongside the interaction framework (i.e., the metalinguistic strategies set within the IAP process), seems to be the force behind the rapid building of intersubjectivity in cross-signing. These factors permit cross-signers to approximate each other's forms and meanings, and pull each other into the intersubjective space, using conceptual blending as described by Zeshan (2015). The present perspective builds on this notion but takes a different theoretical angle by examining the tools of conversation and how intersubjectivity increases through the back-and-forth of natural interaction using turn-taking and repair, the establishment of grounding, and active cooperation between the signers.

Cross-signers' intersubjectivity is fluid and changeable, and likely to be expanded over time due to the interlocutors' adaptations and interpretations of their experiences, and their resulting increases in agreed-upon signs. Their intersubjectivity will not necessarily result in the same representation of what was

communicated, but intersubjectivity may be established even though the cross-signers' conceptualisations may not align. In fact, at times the cross-signers departed from a seemingly 'successful' conversation (e.g., featuring only minimal, brief occurrences of repair) with wholly different conceptualisations of what was discussed. They reported that they shared an understanding with each other, but when they each viewed the data alongside the researcher, it transpired that they did not have the same beliefs about what took place. In one case from the 2004 data set, a (Korean) signer used a form that he intended to mean 'sign language' but which the other signer (who was Turkish) understood to mean 'process' (see Zeshan, 2015). This form appeared to be unproblematic throughout the interaction, but after the coding was carried out and a brief post-hoc interview was done to check the coding with the participants, it was revealed that each signer had assumed a different meaning and had not realised that their partner did not share this meaning. Thus, although some intersubjectivity seemed to be achieved, it was based on disparate individual constructions of knowledge. Because knowledge is developed from a cognitive process organised by the individual themselves, there are limits to intersubjectivity because two people's knowledge constructions will always differ to some extent.

The fact that cross-signers by definition are from different cultural and linguistic backgrounds means that the intersubjective space developed with one interlocutor may be of limited value with the next. However, some observations of cross-signers suggest that across a number of weeks and pair interactions, they may eventually

share an intersubjective space among the group, e.g., four signers. This may be encouraged for example by the fact that keeping track of different intersubjective spaces specific to different interlocutors is mentally very taxing, so a signer may mistakenly (or deliberately) use forms with one person that were actually agreed for use with another person. But more research on larger groups of cross-signers is required to investigate this further.

In sum, the various factors that make cross-signing possible are proposed in Figure 5.4, which shows how the interplay of several factors leads interlocutors to establish intersubjectivity, which in turn is the basis for communicative success. These include interaction factors and social cognition factors, as well as 'form-meaning mapping' factors, which are discussed in detail in earlier sections of this chapter.
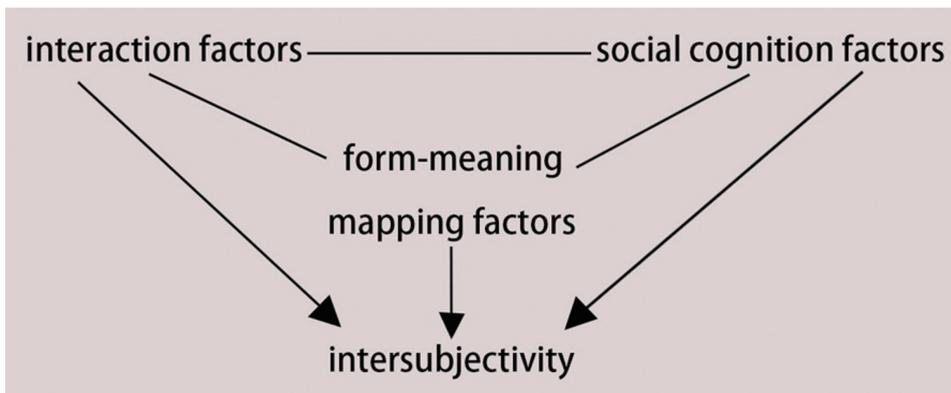

Figure 5.4. Factors of intersubjectivity for communicative success in cross-signing

As earlier chapters have shown and Figure 5.4 illustrates, communicative success occurs when interlocutors are able to have a sustained conversation, even if there are misunderstandings. Success involves resolving misunderstandings, rather than communicating without any occurring at all. In fact, communication may continue with unresolved misunderstandings and sustained conversation will lead to communicative success as it continues. It is proposed in this study, then, that communicative success in cross-signing develops when a combination of factors come together. The initial meeting between two people who have no previous shared expectation or understanding of each other is of particular interest, as it is during these initial communication difficulties that cross-signing begins, at the level of immediate interaction. The first step towards intersubjectivity involves taking time to build up understanding of each other's way of expressing meaning and is therefore a laborious initial stage. During this initial stage, the person receiving the information is working to comprehend what s/he believes the conversational partner to be saying and meaning, and when communication is attempted, communication failures are successively reduced and the potential for communicative success increases. This is as much about concept building as it is about language building, as both interactants work towards concept sharing and ultimately to mutual understanding. Intersubjectivity takes time to develop, and the dynamic interaction moves from one interlocuter to the other in a slow and steady process, each person reasoning and analysing the formal characteristics, as the message is gradually understood. There is no quick fix to building intersubjectivity; it is the transferral of meaning through communicative strategies that repeatedly fall with instances

of doubt and subsequently rise with moments of understanding, as the factors of intersubjectivity increase steadily and move towards communicative understanding.

Cross-signers each have their own knowledge constructions based on their beliefs, expectations and assumptions, or in other words, others' mental states. The emergence of intersubjectivity is based on these, so two people will usually have partially different conceptualisations, even if they have established intersubjectivity. The development of intersubjectivity is supported by rapid interaction, and repeated IAP (Introduce-Accommodate-Persist) sequences allow interlocutors to align each other's forms and meanings. Having said this, it is clear that cross-signers may leave a smooth conversation with a shared sense of intersubjective understanding and communicative success, yet diverting representations of what this entailed.

5.6. Conclusion

This chapter has focused on the rapid building of intersubjectivity, paying particular attention to the combination of factors that come together in order for communicative success in cross-signing to develop, as shown in Figure 5.4 above. Different sub-aspects of the three factors have been reviewed – interactive factors, form-meaning mapping factors, and social cognition factors – in this chapter and shown that there is a lot of interaction between these different factors and their sub-aspects. It is relevant to conclude that when one factor is activated, often another factor also comes into play. Cross-signing interaction is enabled by the offering

of signs for acceptance, which over time leads to the building of intersubjectivity. The interaction is helped by grounding that takes place between the two people in the pair. Through grounding, an understanding emerges and intersubjectivity can develop. It has been interesting to explore how cross-signers are able to build intersubjectivity without any previous grounding or shared conventions. The visual nature of sign language, coupled with highly conscious and sustained eye contact, assists this process. It is also facilitated by the framework and mechanisms of conversational turn-taking because these give the signers a way to check understanding, keep track of the interaction, and consider previous and forthcoming turns. This includes thinking about what gestures or forms from specific languages have been used or could potentially be used, and assessing the possible reasons behind their interlocutor's utterances or language choices, i.e., making use of action ascription (Levinson, 2013). The timing of turn-taking, particularly the expected gaps between turns, acts as a meta-signal that signers can use to confirm understanding and identify trouble (Levinson, 2016).

In addition to looking at the signers' attitudes and cognition, it has been worthwhile to consider how sign language itself affects intersubjectivity in cross-signing. Each cross-signer has existing knowledge of at least one sign language. This language gives them a pool of possible signs to propose or offer, and they may make their selection from this pool by considering the recognisability of the iconic motivation in the different variants. The utterance must be accompanied by careful checking for understanding or lack thereof, and readiness to initiate a repair sequence if need

be. Try-marking, turn-taking, and negotiation are also deployed in this process to maximise communicative success. The extreme cognitive workload represented by these many demands in cross-signing scenarios is perhaps offset to some degree by harnessing the most visually iconic signs and gestures to augment recognisability as much as possible. This can be seen as a minimising of the distance between form and meaning, so that the addressee has greater surety and is required to make fewer guesses or assumptions as to the meaning of the utterance.

The interactive function of cross-signing is vital in explaining how participants are able to establish intersubjectivity. Interaction also drives the evolution of a shared code in cross-signing because the interlocutors are under pressure via the turn-taking system to quickly suggest an alternative form if the first one is not understood. This pressure is what causes the signers to generate alternative forms, which creates variation, and this group of varied forms is then used as the pool from which the signers can select. Thus, interaction facilitates the emergence of variation as well as the efficient selection of forms, and this gives rise to the rapid evolution of a shared linguistic repertoire.

Returning to the issue of International Sign, this form of communication also requires such negotiation, because this is not a fully-formed language with its own conventions and standard. A signer with no knowledge of International Sign may use interaction to develop intersubjectivity with a particular group of International Sign users, but would not necessarily be able to transfer this to a different set of

IS users in a different context. It is a context-dependent, flexible system that, like cross-signing, is heavily reliant on recipient design.

The findings discussed above suggest that recipient design influences the decisions made by cross-signers, especially with regard to try-marking and the selection of repair strategies. The participants seem to take into account their interlocutor's perspective and background knowledge, as well as their language(s), when devising strategies for conversational repair or making the choice to try-mark an utterance or form. Evidence for this includes the higher rate of success for repair strategies that tend to require more recipient design, such as explanations, substitutions, and the use of visually-motivated iconicity (see Chapter 2). There seems to be a pervasive and careful consideration of the other signer's perspective in cross-signing interactions, which is likely to contribute to the development of intersubjectivity over time. As a signer learns more about their interlocutor and shared knowledge emerges, the signer is able to exploit recipient design to a greater extent, as seen in the 'three lions' example in section 5.4.2 above.

This chapter has explored how intersubjectivity in cross-signing arises from interaction and the offering of variants. This requires participants to draw on recipient design and on their metalinguistic knowledge, as they have no shared background and no existing intersubjectivity at the outset. This process is boosted by the persistence and skill in ensuring understanding (Crasborn & Hiddinga 2015), which is a consequence of the large amount of communicative experience

with repair and try-marking that most deaf people have relative to the majority of language users. Deaf people share the experience of constantly negotiating their communication with hearing people, which gives them far more experience with repairs than a typical hearing person would have.

6. Conclusion and discussion

This research study on cross-signing has examined how cross-signers develop a shared system of communication, and the processes that drive their interactions and innovations. Cross-signing has been described and situated with its own communication strategies in comparison to home signing and International Sign. Chapter 2 revealed that cross-signers make use of various linguistic tools in order to establish communication and to initiate repair during the process. The third chapter presented an in-depth examination of data, which revealed trouble sources and found that specific repair strategies lead to communicative success. In Chapter 4, the research explored the interactive sequences that gradually enable the selection of expressive forms and revealed how intersubjectivity is built stage by stage. Chapter 5 paid further attention to the building of intersubjectivity, finding that specific interaction factors, form-meaning mapping factors and social cognition factors are features of cross-signing that together enable the intersubjectivity to build.

This concluding chapter will focus on three specific areas that warrant discussion at this ending point in the thesis. Firstly, a section on language emergence will draw conclusions related to the development of intersubjectivity in a certain context, and then the following section will return to the relationship between cross-signing and International Sign, providing concluding remarks from a modern perspective. The final section will revisit the positionality of the researcher as a Deaf sign language user who also took part in the first data collection activity that is presented in the study.

6.1 A window on language emergence:
Implications and limitations

The findings from this study on cross-signing have wide implications for understanding language emergence. Cross-signing involves real-time construction of an interlanguage, and the speed with which this can happen in the visual-gestural modality opens up a unique perspective on language emergence. This section comments on some of the particularities of cross-signing in the context of language emergence, as well as setting out relevant limitations of the study and areas for fruitful further research.

This thesis analysed the emergence of an interlanguage in cross-signing contexts. In Chapter 4, the researcher developed an experimental semiotics task, where choosing colours was the main purpose of the conversation. This choice of semantic domain is very pertinent because it is subject to substantial variation among sign languages influenced, among other factors, by specific cultural aspects. The methodology has been carefully designed by Tamariz et al. (2014), but this is the first time that this kind of study was applied to cross-signing, with the goal of focusing on the rapid evolution of language in a more or less natural setting. This was possible because the researcher considered cross-signing at different stages of use and approached it with ecological validity. The strategies used by the cross-signers are developed until a common sign is established as the shared sign among the signers. The study found overall that there are two kinds of

vehicles in cross-signing, and in conversation in general: (1) the language user; and (2) the conversation sequence. Furthermore, the type of interaction promotes the replication of the signs (and words for spoken languages).

With respect to the choice of expression form introduced in Chapter 4, it seems that the model in which language selection is made by content bias and coordination bias can be applied to other interactive types, such as computer games. There is also the potential for emergence of language in a cross-signing context to be understood through the notion of 'recipient design', the approach to message production that is tailored to the recipient, which was explored in detail in Chapter 5. The strength of this notion is its rooting in the model of intersubjectivity factors presented in section 5.4, which includes interaction factors, social cognitive factors, and form-meaning mapping factors. This model of intersubjectivity mechanisms may be applicable to the emergence of other types of languages, such as International Sign and home sign. From the point of view of linguists and psychologists, it is said that the home sign system created by hearing parents and their deaf children when communicating with each other is situated in a setting where there is usually no connection with other deaf people (Goldin-Meadow, 2003). Deaf children who use home sign do not normally live in the same household with other deaf people, and they can only use this communication method with a very small network as a mechanism to continue communication or to facilitate its expansion.

Future research, then, may be able to apply the model of intersubjectivity factors to

the area of home sign communication, which is developed from idiosyncratic gestures and is perhaps a first and temporary language or may remain as the person's only language. Since the seminal work by Goldin-Meadow (2003), many new insights have been gained from research in non-Western and rural contexts, which have shown how diverse home sign situations can be. This includes individual home signers and small groups of deaf people in settings that have been referred to as "communal home sign" (see Jepson, 1991 for India; Yau, 1988 for China; Nyst et al., 2012 for Mali; Zeshan, 2010 for village sign languages). More research is needed to determine the process and factors that lead to the development of conventionalisation in idiosyncratic home signs (Reed, 2022). International Sign and home sign have a common feature in that they are not languages with substantial locally and temporally stable communities of users, such as is the case for national sign languages. However, International Sign has a wide range of communicative capabilities through its far-reaching network of users and offers opportunities for in-depth interaction; more research is needed to determine the capacity of home sign to enable in-depth communication and to function as a full communication method, given its relatively small network of users and transmission within a family. Both International Sign and home sign make effective use of iconicity in order to express concepts through visual forms but the extent to which iconicity is helpful to each process, and the extent to which metalinguistic awareness aids the development of each, certainly requires further study. Considering the communication between home sign users in the light of the models and concepts developed in this thesis would provide an additional opportunity to examine the origin of language (Safar & de Vos, 2022).

In real-life communication, various and complex occurrences related to environmental factors may occur. For instance, in the process of cross-signing for the first time in 2004, the researcher had a conversation with a Turkish deaf person, and when the deaf man fingerpelled something that was not comprehended, instead of saying that the researcher did not know the meaning of the fingerpelling, he took out an electronic dictionary from his bag and directly confirmed the meaning of the fingerspelling. But for the study of how cross-signing fundamentally works, it is better not to rely on material help such as translation platforms or even an electronic dictionary, but to allow cross-signers to solve communication difficulties on their own or to find linguistic strategies to communicate more successfully, as this study has shown to be possible (see Chapter 4 in relation to comprehension of colour signs, for example). In addition, the process of real-time language construction in the visual modality (section 5.3.3) is a linguistic benefit of sign language that throws a unique light on language emergence. A particular affordance of the signed modality is the effective option of the sign for the specific object/concept being shown on one hand, as the other hand points to the held concept and explains what it means at the same time. This manipulation of one-handed signing for additional visual stimulus during cross-signing, for which the term 'esophoric pointing' was coined in this thesis, is remarkable and deserves further research.

This study does have limitations in relation to its findings regarding real world language emergence, which are due to the settings and methodologies used.

Firstly, it is important to note here that the data collection activities were conducted in a studio or laboratory with the intrusion of video camera technologies, as mentioned in the description of data collection in section 1.5.3. Therefore, the ecological validity cannot be said to be perfect in that the cross-signers did not communicate in their everyday context or natural environment. In addition, this research study was largely bound to focus on communication in pairs due to the experiment designs. Hence, it may be difficult to transfer the obtained results to natural cross-signing situations where group sociolinguistic factors may override some of the findings of this work. Future studies would benefit from exploring cross-signing data in the real world (e.g., in major urban environments of the Global South, where new contact varieties of languages are rapidly evolving). Considering social processes of language emergence will shed light on cross-signing in natural ecologies and the acts of identity that are at the root of such new varieties.

Moreover, the laboratory setting has affected the grounding in terms of the degree to which the cross-signers share common ground with each other. The use of social knowledge, sign language expression strategies, and interaction strategies vary depending on environmental factors, and it would be interesting to conduct a related research experiment in the future. For example, at a Korean restaurant with a Deaf friend a while ago, I needed to communicate to the waiter that I wanted 'rice for 2 people' and did this by using a culturally common gesture for rice (based on the holding of a rice spoon to the mouth) and for the number 2 (the index and middle fingers extended) that hearing people who speak Korean would use. This

shared cultural knowledge, and the context of the restaurant and the dishes that had already been served (pork – which is always accompanied by rice in Korea), provided effective linguistic tools to enable communication. Research into shared social and cultural knowledge, and its impact on cross-signing communication, would be beneficial.

In the controlled environment such as this study, language data for cross-signing research must be strategically collected, and the researcher must be mindful of the purpose of the data collection, and of the limitations therein. The research reported here was carried out with a limited studio set-up and limited experimental guidance materials, and in the future, it is necessary to conduct further studies with various guidance materials and in various environments.

There are also limitations in not knowing the communicative ecology that has actually taken place outside the laboratory. Of course, deaf people in the real world will navigate environmental factors and such, and there is a general tendency to communicate and solve problems using linguistic tools in the shared setting, such as mobile phones or other objects in the immediate environment that present as communication aids. An interesting question is whether future work could usefully be done by an online video communications platorm, such as Zoom – it would be an easy way to collect cross-signing data, but there would be no affordances from the shared environment. However, this use of external resources and strategies falls more in line with translanguaging (Kusters et al., 2017), whereas cross-signing

is a process of building communication by the negotiation of existing repertoires between the signers, who determine to solve communication problems through repair and resolve.

Finally, conversation is complex; it is multi-modal and interactive. People express themselves differently and in different ways, which presents a natural limitation of this study in that the findings are guided by the selected participants and their cross-signing experiences and abilities. This study accordingly shows different success rates when using repair (see section 3.3.3). A study related to the difference in communication method according to the linguistic backgrounds of the participants was not conducted because the data were limited. In future research, there would be potential for a study on the difference in communication strategies between the deaf participants with deaf parents vs. the deaf participants with hearing parents. For example, participant Signer B with deaf parents tended not to request a repair sequence, whereas participant Signer C with hearing parents seemed to be more likely to perform this task of needing clarification if unsure of a sign. With regard to the use and modification of verbal strategies and try markers, the differences between the processes used by the two participants in repairs seemed to be about background or experience, so this would be an interesting topic in future studies. One observable difference in their linguistic strategies is that Signer C used more fingerspelling and mouthing than Signer B, and that Signer B, more than Signer C, used motivated representation (i.e., iconic signs), considering that the receiver might not understand it.

There was, in this study, also a difficulty due to the lack of sufficient data to analyse what kind of relationship there is between the participants' backgrounds and their communication experiences. There are clearly interactive events when interlocutors are from the same country but communicate in a different language modality: that is, either a sign language or a spoken language. Despite the different language modalities, there are shared communicative features, such as the tool of gesture, which both interlocuters will share and utilise during interaction. They may also share written language skills and this tool of literacy will aid the communication as they continue to work out each other's interaction strategies. It is also worthwhile exploring different types of communications, e.g., from 2006 to 2012, a group of signing deaf people went to Hong Kong as part of an Asia Pacific Sign Linguistics Research and Training Program. Here I was able to meet many deaf people and we all came together in order to contribute to the compilation of a dictionary of Asia Pacific sign languages and we were able to build communication based on our international language experiences. There is certainly scope for future study in the data collected under this project, as there was a mix of deaf people from many nationalities. Further data could be collected to examine cultural background similarities and differences, and any distinctions among the sign languages. A similar methodology could also be applied to data collected by Rathmann (2020) to explore developments across the same signer or in situations where many interlocutors are present. Using social cognitive factors and interaction factors, they will gradually develop a method for communicating, and future research would benefit from exploring the process by which this develops; this is seen in recent

cross-signing research into how tactile and bodily signals are incorporated in dialogues (Mesch & Raanes, 2023).

6.2 The relationship between cross-signing and International Sign (IS)

This study clarifies the differences between cross-signing and IS. Many deaf people grow up with limited linguistic advantages and with less equal rights than the majority (hearing) group because the language of the majority hearing society is different from the language of the deaf sign language users living in that society. When deaf sign language users interact with hearing people who do not know sign language, a communication barrier exists, and solving the problem of interaction involves relying heavily on gestures. Conversely, when deaf people meet other deaf people of the same nationality, there is a natural sense of shared experience, and a human network develops that enables the minority group to communicate with those of the same language and culture. In addition, when deaf people meet other deaf people from a different nationality, the same sense of shared experience often exists (Moriarty & Kusters, 2021), as each deaf person in this scenario is attempting to use cross-signing beyond her/his own country's sign language. Through increased travelling and communicating with deaf people from different nations, and through increased online video communications due to Internet access (such as video call or Zoom), gestures and signs have developed enough to reduce boundaries between deaf people from different nationalities. This unique situation

has created the benefit of providing a tool to study the phenomenon of meeting face-to-face and trying to communicate without a shared language.

The data used for part of this study were collected in 2004 at the Max Planck Institute for Psycholinguistics in a laboratory. The institute brought deaf people of various nationalities together and provided a forum for academic workshops and intern opportunities at different times during its activities. The current writer accepted an offer of employment at MPI in 2004, and soon met a Turkish deaf colleague who had limited skill in International Sign and attempted cross-signing in order to communicate. Six months later, the researcher met a deaf person from Hong Kong and again had an opportunity to interact through cross-signing due to limited International Sign use. These meetings invoked the initial interest in the difference between the form of communication before and after the cross-signing process had occurred. This also developed the researcher's own communication skills and the decision to contribute to the collection of data used for the write-up of Chapter 4, and to begin a Ph.D. degree in 2014 to explore cross-signing. This has led to this study's findings that there are common principles that interlocutors apply when there is a motivation to understand each other. With some customised vocabulary (Supalla & Webb, 1995), coupled with frequent checks of understanding, what is produced is almost like a language. Data from cross-signing can throw a very important light on meaning-making, language construction, and how intersubjectivity is built.

There are further conclusions to draw regarding the differences between International Sign and cross-signing at this closing point in the thesis. Firstly, many International Sign users share some customary forms of International Sign, but as experienced receivers of different degrees and types of International Sign, they intentionally try to understand their interlocutor's sign language and at the same time take care of their reactions when they are in the role of addressee (see Chapter 3). In cross-signing, however, the forms have to be built up through use of linguistic tools until they become conventionally agreed between the interlocutors, which takes time. Secondly, although International Sign is to some extent conventional, the changes and processes can also lead to the fact that many language variants are chosen by conceptual bias and can be changed by coordination bias, according to human competence (see Chapter 4). Above all, through interaction, mutual sharing of the world and language is established in a specific discourse, and mutual beliefs about the world are shared. In the process, the interaction becomes faster and also improves the output. In the case of cross-signing, the lack of mutual knowledge means that mutual sharing of language and beliefs must first be slowly established through linguistic tools until the cross-signers learn more about each other's worlds.

Unlike conversations between people who use the sign language of a particular country, the likelihood of observing cross-group interactions increases when signing International Sign or cross-signing. It is conceivable that the lower the opportunity to access the media or online communications, the greater the sociolinguistic variation. In addition, deaf people who grew up in rural areas, where it is not easy to

meet other deaf people, may not know the sign language of the country due to lack of exposure. Where many deaf people live in the same location, their gestures and sign language are shared. Raviv et al's (2020) study notes that small community networks reveal "the greatest variation in their convergence, stabilization, and emerging structure patterns"; different types of interaction patterns need to be considered in this area as well.

Cross-signing refers to a pattern of communication without shared language knowledge, and where there is no customary communication between two people, they meet at an intersection and enter into cross-signing; they are immediately in the process of establishing a common ground (Chapter 4). International Sign, however, has developed as a language through time and convention, though it is also influenced by the language background of its users. Some of the International Sign used at the WFD conferences has also been evolutionary and is 'hypercentral' (Hiddinga & Crasborn, 2011) in a larger setting, while cross-signing is not customary and represents an interaction procedure that communicates in one-to-one first-time encounters.

6.3 Positionality as a deaf researcher

This section explores the stance, or positionality, of the researcher in relation to the study, and to its context and its participants. Firstly, it is important to note that the researcher is a deaf person and therefore comes from a culture that is the same

as the participants in this respect. This is considered as a strength of the study, as it evoked a sense of sameness, with some of the participants showing a sense of 'the researcher is a deaf person, like me'. A rapport was easily formed when the language providers saw that the researcher was a deaf person and there was not much difficulty in establishing interaction on this common ground. Although the author's status as a deaf researcher was indeed a critical and relevant factor in establishing the participant-researcher status, I suggest that even more crucial to both the interactional rapport and the analytical insights is my previous cross-signing experience, which goes back as far as 2004, ten years before the start of this doctoral study. This study was able to draw on the fact that I had been a participant and had taken part in being filmed for the data collected in 2004, and I was subsequently the researcher in charge of the multi-sign data collection in 2014. As a prior participant, with experience of grounding in cross-signing, and now as the researcher, with a direct role in controlling and reflecting on the various experiences of the cross-signers, these two roles with a 10-year time difference were able to be drawn upon, particularly in the initial planning of the multi-sign data collection. Therefore, in this cross-signing study, the deaf researcher directly participated in the ethnographic context, that is, in Nijmegen in the Netherlands and in Lucknow in India, and this study benefitted from the researcher's prior experience of cross-signing and prior involvement in cross-signing data collection as a participant at the data collection event in 2004.

As a deaf person who is fluent in more than one sign language and has built

up various linguistic repertoires, prior involvement in cross-signing interactions rendered me highly prepared for dealing with problems in communication that occur in the cross-signing context. This prior experience also aided the writing of Chapter 2, where an in-depth analysis was made possible by the researcher's ability to make use of the experience of seeing and responding to the receiver's reaction to an expression, that is, T0 in the canonical repair sequence. At the beginning of the study, a hypothesis with respect to this was established. Based on the data analysis, it is noted that the probability of identifying the importance of first-hand experience would have been lower for a hearing researcher without prior cross-signing experience due to the absence of such metalinguistic skill and the limited development of a linguistic repertoire for cross-signing. This linguistic experience plays a key part in successful cross-signing interactions.

Unlike studies of specific language structures, cross-signing research is an under-explored field that requires consideration not only from a linguistic perspective, but also from the perspective of other academic disciplines, including cognitive science, sociology, and anthropology. Throughout this study, the researcher benefited greatly from an opportunity to reflect on life as a deaf person, and to consider various related fields whilst contributing cultural capital as a deaf researcher at the same time. However, as there are relatively few hearing scholars who can communicate in a signed language, the opportunities for productive personal interaction and detailed academic discussions available to a deaf scholar are thus limited. This communication barrier with most hearing colleagues was

compounded by the difficulty in securing an interpreter at times, as sign language interpreters must be booked several weeks in advance, making spontaneous interactions with non-signing colleagues impractical. In addition, there are very few sign language interpreters with knowledge related to the study of sign languages or linguistics, which hinders the interpreting process, and again made it difficult to freely communicate in the academic field.

Academic information sharing is an important aspect of any doctoral degree, as is access to information on a broader level. Growing up in Korea as a member of the deaf community, there was a 'right of access' to information, i.e., interpreting services or written subtitles were provided for national television news broadcasts, and for some events at which hearing people speak and dispense information. But the reverse was rarely true, i.e., the ability and desire of deaf people to 'produce' their own information and to share it with hearing audiences was generally not recognised. Due to these limited opportunities to be purveyors of information, deaf people often feel deprived of the right to produce and share academic information. When this researcher first used cross-signing at the Max Planck Institute for Psycholinguistics in 2004, that was an opportunity to build and share academic research through direct communication with deaf peer scholars. Also related to difficulties in accessing information is the dearth of publications in sign language format. Currently, the only sign language-related publication which publishes research in sign language format is the Deaf Studies Digital Journal (DSDJ) of Gallaudet University in Washington D.C. There, the language options for publication include English as a spoken language

(which is subtitled), and American Sign Language or International Sign as signed languages. The current limitation in this area is that mainstream academic publishing companies do not subscribe to the same level of access for scholars who use sign language. More sign language-related publications with research results made available in a signed language need to be created. In this respect, hearing scholars have far more opportunities to acquire knowledge through their literacy skills and by virtue of educational privileges.

Given the limitations set out above, it is relevant to consider what is needed in order for deaf people with academic potential to excel as deaf academics. According to Harris et al. (2009), there is a need for deaf scholars to "seize academic power", and as increasing numbers of deaf scholars are obtaining positions of researcher (rather than research assistant), there is clearly a move in the right direction in this area. The future will hopefully see deaf scholars moving into the higher levels of academic hierarchies, such as assistant professor, associate professor, and professor. Many deaf people work in a system that does not offer equality of opportunity. Furthermore, as part of the academic world, the field of sign language linguistics has its own language, rules, behaviours, methods, and beliefs, and these are based on the values of the majority hearing society. Kusters et al. (2017) suggests that hearing researchers working in the sign linguistics field have a moral responsibility to recognise their 'hearing privilege' and to support deaf researchers' careers, and the future should see increasing opportunities in co-publishing, co-editing, and joint funding applications.

A positive future would also see the field of deaf studies being increasingly led by deaf people, with the development of research practices being guided by Kaupapa Māori principles (D. O'Brien, 2017) as principles of deaf-led research: 1. Use of sign language; 2. Self-determination; 3. Identity preservation and 4. Community development. This should also facilitate academic and social activities for deaf people in order to develop relevant expertise and also to develop the discursive fluency related to the general values of hearing societies that are so often required. Here, the role of the sign language interpreter is again pivotal. When an interpreter is cognisant of the culture of deaf people, they can play a culture mediation role and facilitate opportunities for deaf people to demonstrate their professional competence through meaningful, real-time communication. A designated interpreter with specialisation in academic interpreting can empower a deaf person to be transformed from passive client recipient of information to an expert provider of information (Hauser & Hauser, 2008). The provision of this high level of interpretation, in the future, will enable a deaf person to become an excellent driving force for academic activities.

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Appendix A

A-1   A-2   B-1   B-2
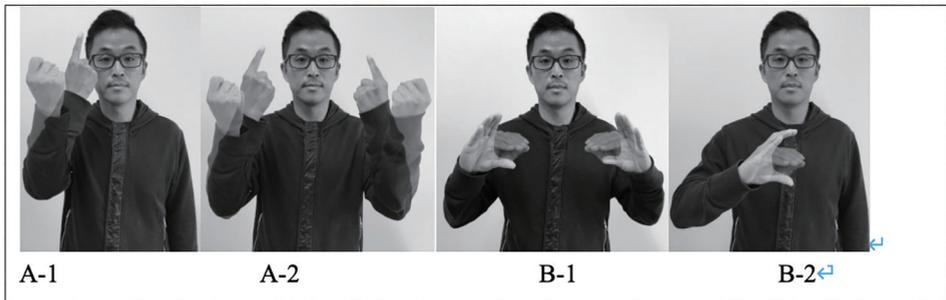
Specific, dedicated signs for technical concepts from linguistics are still somewhat rare and only used by small groups of scholars, so it is beneficial here to take the opportunity of circulating some of these forms; this also may contribute toward explanations of the concepts themselves. Figures A-2 and B-2 are two signs that have been used to mean 'intersubjectivity'. Both are two-handed signs that imply a process involving two interlocutors or participants. Figure A-2 is a sign from ASL, derived from UNDERSTAND (see Figure A-1). These two signs differ in that ASL sign, like the concept of intersubjectivity in general, most commonly refers to the shared understanding between users of the same language. As mentioned in section B-2, intersubjectivity has a different character for cross-signers, and therefore the researcher has originated and exploited the sign in Figure B to refer to 'cross-culture intersubjectivity' rather than 'same-culture intersubjectivity'. This sign is motivated by forms related to the concept of 'increasing' or 'building up' (see Figure B-1), which is a more appropriate reflection of what happens in cross-signing. Cross-signers enjoy little if any of the clear, immediate understanding that is often experienced by same-language signers; instead, cross-signers gradually build a shared resource base which increases their understanding over a period of days, weeks or months.

Appendix B

Studio Environment

The culture and setting of India is by nature extremely visually colourful, and it is not surprising that the environment in and around the university was filled with an array of different colours. This made it challenging to secure a room in which the availability of coloured items was minimal so that participants could not rely on pointing to them when describing specific colours to each other in the experimental tasks. Eventually, a minimalist room with pale green walls was found, which can be seen in the picture below. This figure also shows that the participants had solid red dividers to shield their view of each other's pictures and colour chips. In addition, they were able to see the tan-coloured chairs against the wall, and the view from the window. From the window they could see green trees and a white, often very cloudy sky. The use of colour was minimised by having the participants and coordinator wear black. The participants were advised that they should not rely on pointing, and pointing appeared to be minimal. However, it was noticed that a few times they pointed in a clandestine way, e.g., holding the hand close to the body and pointing backwards or sideways. This was possible for the green wall, but perhaps less so for the red divider, which would have required more obvious outward pointing.

Arranging for all participants to wear the same colour, and sourcing a room at the university that was one solid colour but was also large and suitable enough to set up lighting and cameras, was difficult in this context. Also, Lucknow often has power outages, which required us to vacate the building temporarily until the lights came back on. Problems with lighting can have a large effect on an experiment that relies on people identifying and describing specific colours, and

it was a challenge to ensure that the lighting was correctly positioned so as not to cause glare, as well as to manage the data gathering process in the midst of frequent power cuts.

Set-up

Figure 1 above indicated that two dyads at a time were filmed. It was initially unclear how the experiment coordinator would be able to manage two dyads simultaneously. However, the chosen studio was sizable enough to permit two dyads to work at the same time. Furthermore, the coordinator was able to orchestrate and devise a setup that enabled him to oversee all four of the participants at once, whilst ensuring that participants could see and manipulate items on their side of the desk but not their interlocutor's side, and making certain that the camera could capture the signing and visual materials.

Appendix C

The table below summarises the colours used in each round, which were
identified by giving each one a number. The numbers highlighted in yellow were
the colours that were the same across both pictures.

		Stimulus	Colours for participant 1	Colours for participant 2
Week1	First time 1	Picture 1	58.24	1, 9,13, 22, 10
		Picture 2	4.95	16, 24, 8, 5,7
		Picture 3	4.21	18, 19,17,11,23
	First time 2	Picture 4	13.17	6, 7,23, 24,9
		Picture 5	5.43	3, 11,18, 8, 12
		Picture 6	21.78	14, 22,13, 15, 17
	First time 3	Picture 7	4.62	12, 21,15, 1, 7
		Picture 8	8.81	2, 5,20, 22, 24
		Picture 9	21.79	8, 23,6, 13, 11

The table above gives an indication of the kind of planning that was carried out
prior to the experiments to ensure robust organisation and reliable use of the
materials. The actual table used is much longer, encompassing all of the dates
and rounds, but for the sake of brevity only the part related to the first week of
data-gathering is shown here. The numbers in yellow, which indicate colours
that were the same across both pictures, are also not repeated after that one
use in the week; i.e., 1 and 9 do not appear after the first row. This was done to
maximise discussion about as large a range of colours as possible.

Appendix D

Alternative strategies

Explicit coordination by the researcher was avoided even where participants were producing stilted monologues or lists of the colours in their picture, which they tended to do at first, merely pausing between each item to give the matcher a chance to select the appropriate colour chip (e.g., 'Okay, the first item is red. The second is blue. The third is light green… Good, your turn now.') The participants were able to discern on their own that this was not a fruitful way of engaging with the task, and they shifted to shorter and more conversational turn-taking (e.g., 'The colour on my picture is red. What colour do you have?). This allowed them to complete all components of the task satisfactorily by carefully going through their five coloured items together, rather than one participant listing her five and then the other listing his five.

Appendix E

The abbreviations used to refer to the sign languages discussed in this thesis are listed in the Table below:

Abbreviations for the mentioned sign languages

Sign Language	Abbreviation
German Sign Language	DGS
Hong Kong Sign Language	HKSL
Indian Sign Language	ISL
Indonesian Sign Language	BISINDO
Jordanian Sign Language	LIU
Korean Sign Language	KSL
Nepali Sign Language	NSL
Russian Sign Language	RSL
Sign Language of the Netherlands	NGT
International Sign	IS

Nederlandse samenvatting

De meeste menselijke communicatie vindt plaats tussen mensen die dezelfde talen spreken of dezelfde gebarentalen gebruiken. Desondanks is communicatie tot op zekere hoogte mogelijk als er geen gemeenschappelijke taal is, zoals elke toerist of reiziger wel weet. Hoe dit werkt is van theoretisch belang (Levinson, 2006). Een mooi gebiedom dit menselijk vermogen te verkennen is cross-signing, dat wil zeggen de communicatie die ontstaat wanneer dove personen die verschillende gebarentalen gebruiken elkaar voor het eerst ontmoeten en in staat zijn om de beeldende mogelijkheden van gebaren te gebruiken om communicatie te bewerkstelligen.

Hoofdstuk 1 biedt enkele essentiële concepten en discussies met betrekking tot cross-signing om het te plaatsen in een actuele context en te verkennen in relatie tot andere fenomenen, zoals International Sign. Ook is er een inleiding gegeven over intersubjectiviteit, samen met een initiële beschrijving van de taalkundige profielen van de deelnemers en de onderzoeksgegevens die de grondslag vormen voor deze studie.

Het volgende hoofdstuk, Hoofdstuk 2, biedt een gedetailleerde analyse van eerste ontmoetingen tussen cross-signers en de stadia die zij doorlopen om hun aanvankelijke communicatieve uitdagingen te overkomen. Hier ligt de nadruk vooral op other-initiated repair (OIR), dat wil zeggen wanneer een gebarentaalgebruiker duidelijk maakt dat hij of zij het niet begrijpt en zo reparatie van de voorgaande

gesprekbeurt initieert. OIR-sequenties bestaan doorgaans uit drie opeenvolgende beurten (Dingemanse, Roberts, et al., 2015), met inbegrip van de probleembeurt (T-1), de signalering hiervan (T0), en de beurt die een probleemoplossing biedt (T+1). Het idee is dat T-1 een bron van 'moeilijkheid' voor de lopende interactie bevat, oftewel de 'probleembeurt' is, en dat T+1 een 'probleemoplossing' biedt, hoewel gebruikt in de huidige literatuur, wordt vermeden in dit onderzoek om de communicatieve kwesties die ontstaan op een positievere manier te benaderen. Dit versterkt het idee dat dergelijke uitdagende sequenties natuurlijk zijn en een integraal onderdeel van menselijke communicatie vormen. De ecologie van cross-signing maakt dit communicatiesysteem vatbaar voor een groot aantal uitdagende sequenties, maar deze vervullen zeer nuttige (universele) functies in het creëren van begrip tussen gebaarders.

Deze sequenties lijken een universeel principe te hebben (ibid.). In de meeste gevallen waarin dergelijke OIR zich voordoen, voorziet de signer van de probleembeurt (T-1) mogelijke moeilijkheden en markeert de uitspraak met try markers (Moerman, 1988; Sacks & Schegloff, 1979) wat leidt tot een pauze om herkenning uit te nodigen. De gebaarders gebruiken hierbij herhaling van gebaren, prosodische verlenging en oogcontact met de geadresseerde. Bovendien zorgt het try-marken van T-1 voor snellere reactietijden van T+1 ten opzichte van T0. Deze bevinding suggereert dat gebaarders in deze eerste ontmoetingen actief mogelijke uitdagingen anticiperen en door middel van try-marking OIRs mobiliseren en faciliteren.

Hoofdstuk 3 richt zich specifiek op communicatieve reparaties bij cross-signing, inclusief de identificatie van probleembeurten, reparatiestrategieën en communicatief succes. Gebarentaalgebruikers kunnen communicatieve uitdagingen tegenkomen die voortkomen uit het ontbreken van een gedeelde conventionele taal en daarom specifiek gerelateerd zijn aan kruistaligheid. Reparatiereeksen zijn essentieel om het coöperatieve proces van taalcreatie in kruistalige settings te begrijpen (Dingemanse, Roberts et al., 2015). Daarom richt dit hoofdstuk zich ook op Other-Initiated Repair (OIR) sequenties die gericht zijn op het gebruik van nieuwe gebaren: de drie opeenvolgende beurten, inclusief de probleembeurt (T-1), de signalering hiervan (T0) en de beurt die een oplossing biedt voor het communicatieve probleem (T+1). Bij T0 reageren de aangesprokenen vaak door het gebaar dat de uitdaging vormt te herhalen, waardoor restrictive repair wordt gestart. In afwezigheid van taalkundige conventies gebruiken gebarentaalgebruikers een breed scala aan semiotische hulpmiddelen om referentie op te lossen bij T+1, waaronder logische inferentie, iconische afbeelding en parafrase. De individuen die aan dit onderzoek hebben deelgenomen, variëren natuurlijk in potentieel relevante dimensies, zoals taalkundige en internationale ervaring en de leeftijd waarop gebarentaal is verworven. Verdere analyses zijn gericht op het identificeren van bewijs van variatie in metalinguïstische vaardigheden op basis van de verscheidenheid aan hulpmiddelen die beschikbaar zijn bij T+1, evenals het aantal ingebedde reparatiereeksen dat nodig is om referentie op te lossen. Een algemene overweging die voortvloeit uit deze dataset heeft betrekking op de rol van metalinguïstische vaardigheden. Voorlopige

bevindingen tonen variatie in zowel het succespercentage bij het oplossen van referentie als de diversiteit van metalinguïstische structuren die worden gebruikt. Het blijft nog te onderzoeken hoe dit kan correleren met individuele achtergronden, zoals de leeftijd waarop gebarentaal is verworven, vloeiend zijn in meerdere gebarentalen enhet al dan niet hebben van internationale dove sociale contacten.

Hoofdstuk 4 onderzoekt de manieren waarop interactieve sequenties de selectie van expressieve vormen beïnvloeden bij cross-signing. Hier ligt de specifieke focus op de evolutie van het gedeelde repertoire onder gebarentaalgebruikers gedurende meerdere weken terwijl zij communiceren over bestaande taal- en cultuurgrenzen heen. We kijken naar twee mogelijke factoren die de selectie van expressieve vormen beïnvloeden (cf. Tamariz et al., 2014): content bias (waarbij de meer iconisch-gemotiveerde en/of makkelijk-articuleerbare vorm wordt geselecteerd) en coordination bias (waarbij deelnemers proberen elkaars gebruik te matchen). De dataset bestaat uit een 325-minuten durend corpus van eerste ontmoetingen tussen koppels van gebarentaalgebruikers van Nepalese Gebarentaal, Indiase Gebarentaal, Jordaanse Gebarentaal en Indonesische Gebarentaal. Opnames vonden plaats bij de eerste ontmoeting, na één week en na drie weken, waarbij de eerste en laatste bijeenkomst hier worden gerapporteerd. De deelnemers variëren natuurlijk qua taal- en internationale ervaring en hun leeftijd van gebarentaalverwerving. Gestructureerde dialogen verzameld werden met behulp van een Director-Matcher taak. In deze taak hebben de Director en de Matcher minimale afbeeldingen met verschillende kleuren, naast een set kleurkaarten waaruit

zij moeten kiezen op basis van de beschrijvingen van de Director. We codeerden en onderzochten de verschillende kleurexpressies die door de deelnemers werden gebruikt. Het semantische veld van kleur werd gekozen voor dit onderzoek naar de evolutie van gedeelde communicatie omdat het visuele domein van kleur voldoende abstractieniveaus behoudt en gebarentaalgebruikers iconisch potentieel biedt. Deelnemers gebruikten aanvankelijk een breed scala aan strategieën, waaronder wijzen, articulatie van gebaren voor veelvoorkomende objecten met die kleur (bijv. verwijzend naar eenblauwe ader op de pols van de niet-dominante hand en het aangeven van de stroom van bloed uit de ader met de dominante hand om 'rood' uit te beelden) als ook hunhun eigen gebarentaalvarianten. Echter, drie weken later begonnen deze individuen dezelfde vormen te gebruiken, zoals de Indiase gebarentaalgebruikers variant voor 'groen' en de Nepalese gebarentaalgebruiker's geïmproviseerde 'boomstam'-variant voor 'bruin'.

Om deze snelle ontwikkeling van communicatie te onderzoeken, richt hoofdstuk 5 zich op het fenomeen van intersubjectiviteit in de context van cross-signing en hoe dit snel wordt opgebouwd vanwege de unieke communicatieve strategieën die beschikbaar zijn voor cross-signers. Cross-signing creëert een vruchtbare domein om cognitieve aspecten van taalgebruik te onderzoeken, zoals communicatieve problemen en hun oplossingen, omdat de gesprekspartners geen gedeelde taalstructuur of conventionele code hebben om op te vertrouwen en alleen kunnen putten uit visueel gemotiveerde vormen of gebaren en pragmatische principes van gesprekken. Een cognitief probleem in context is het tot stand brengen

van intersubjectiviteit. Wanneer mensen elkaar kunnen begrijpen omdat ze een 'gedeelde zin' van een situatie hebben, kunnen ze succesvol communiceren en coördineren met elkaar. Deze gedeelde zin wordt 'intersubjectiviteit' genoemd; het is feitelijk de basis voor menselijke cognitie en wordt veroorzaakt door zowel interactie als representatie (Alterman, 2007). Eerdere studies door Zeshan en collega's hebben gesuggereerd dat cross-signers snel intersubjectiviteit opbouwen en hun communicatieve doeltreffendheid vergroten (Zeshan, 2015). Dit hoofdstuk zal daarom de belangrijke vraag behandelen: wat stelt cross-signers in staat om snel hun intersubjectiviteit op te bouwen? Het antwoord op deze vraag zal zowel representatie omvatten, dat wil zeggen formele kenmerken zoals gebarentaaluitdrukkingen gemotiveerd door visuele iconen (Emmorey, 2014); en interactie, dat wil zeggen communicatieve kenmerken zoals het beurtwisselsysteem (Levinson, 2016). Het effect van intersubjectiviteit op taalconstructie zal ook worden overwogen. Door zich te richten op intersubjectiviteit en andere begrippen uit conversatieanalyse, of CA (bijv. Schegloff, 1992), adresseert dit hoofdstuk een lacune in de literatuur omdat de meeste studies van interculturele gebarentaalcommunicatie (bijv. studies over Internationale Gebarentaal) zich hebben gericht op lexicale en grammaticale kenmerken en/of productie- en interpretatieproblemen in plaats van begrip en interactie.

In hoofdstuk 6, de conclusie, ligt de focus van de discussie op drie specifieke gebieden: ten eerste wordt teruggekomen op het onderwerp van taalontwikkeling en worden de bevindingen samengevat met betrekking tot de effectiviteit van

context in de ontwikkeling van intersubjectiviteit; vervolgens wordt de relatie tussen cross-signing en International Sign opnieuw onderzocht, waarbij afsluitende opmerkingen worden gegeven vanuit een herzien perspectief; tot slot ga ik terug naar mijn positie in het onderzoek als dove gebarentaalgebruiker die ook deelnam als participant aan de eerste dataverzamelingsactiviteit. Conclusies worden dan getrokken over vele aspecten van het opbouwen van intersubjectiviteit en van het belang om de rol te begrijpen die dergelijke factoren spelen in cross-signing.

International Sign Summary

한국수어 요약

한국어 요약

보통 사람들은 같은 언어(구어나 수어)를 사용하는 사람들과 대화하지만, 모든 관광객이 공통된 언어가 없는 상황에서도 어느 정도 의사소통이 가능하다. 이러한 상황에서는 교차 사인하기라는 영역에서 어떻게 의사소통이 이루어지는지가 이론적으로도 흥미롭다 (Levinson, 2006). 이 능력을 탐색할 수 있는 좋은 영역은 교차사인하기(cross-signing)이다. 교차사인하기는 서로 다른 수어를 사용하는 사람들이 처음 만나 수어의 도상적 어포던스를 사용하여 의사소통을 시작할 수 있는 경우를 말한다.

1장에서는 국제수화와 관련된 현재의 맥락과 교차사인하기와 관련된 주요 개념과 논의를 소개 했다. 또한 상호주관성을 소개하고, 참여자들의 언어적 배경과 관련된 데이터를 설명하였다.

2장에서는 교차사인하기 사용자들의 첫 만남과 의사소통의 첫 문제를 해결하기 위한 과정에 대한 조사가 제공된다. 이 대화에서는 이전 차례에서 발생한 문제를 해결하기 위해 타인개시 수정(OIR)이 사용되었으며, 이에 대한 연속체가 일반적으로 3차례 구조를 가지고 있음을 알 수 있다. 이 연속체에는 문제소스 차례(T-1), 수정 개시(T0), 문제해결 차례(T+1)가 포함되어 있다. 이러한 연속체들은 보편적인 원칙을 가지고 있는 것으로 보인다. 대부분의 경우, OIR이 발생하는 때에는 문제소스 차례(T-1)의 수어사용자가 잠재적인 어려움을 예상하고 시도표지 (try markers)(Moerman, 1988; Sacks & Schegloff, 1979)로 발화를 표시하여 일시적인 중단을 유도한다. 이러한 시도표지에는 반복, 제스처적 유지, 운율적 길이 조절 및 수신자를 바라보는 시선 등이 있다. 또한 T-1이 시도표지로 표시되면, T+1의 T0 대비 더 빠른 응답 시간이 가능하다. 이 결과는 '첫 만남' 상황에서 수어사용자들이 잠재적인 문제 상황을 미리 예상하고 시도표지를 통해 타인개시수정(OIR)을 활용하여 촉진하는 것을 보여준다. 이러한

제안은 향상된 메타언어학적 인식이 의사소통 능력의 한계에서 이러한 문제를 처리하는 데 활용될 수 있다.

3장에서는 교차사인하기의 수정을 위한 문제의 원인, 수정 전략 및 의사소통 성공에 대해 구체적으로 다루고 있다. 수어사용자는 공유된 기존 언어의 부재로 인해 의사소통 문제를 겪을 수 있다. 이러한 문제를 해결하기 위해 수정 연속체를 활용하는데, 이는 언어와 부분적으로 독립적인 협력적 과정이다(Dingemanse, Roberts 외 2015). 이 장에서는 타인개시 수정(OIR) 연속체를 중점적으로 다루는데, 이는 문제소스 차례(T-1), 수정 개시 차례(T0) 및 문제해결 차례(T+1)를 포함하는 세 가지 차례 구조이다. T0에서 수신자는 문제의 소스가 되는 수어를 반복하는 것으로 제한적인 수정을 시작하는 경우가 많다. 수어 사용자는 T+1에서 참조를 해결하기 위해 논리적 추론, 도상적 묘사 및 다르게 말하기 등 광범위한 기호학적 자원을 사용한다. 분석은 T+1에서 사용할 수 있는 다양한 도구와 참조를 해결하는 데 필요한 내장된 수정 연속체의 수에 따라 메타언어학적 능력의 증거를 식별하는 것을 목표로 한다. 이러한 데이터 세트에서 발생하는 한가지 일반적인 고려 사항은 메타언어학적 능력의 역할과 관련이 있다. 예비 조사 결과에 따르면, 참조 해결의 성공률과 사용되는 메타언어학적 구조의 다양성 모두에서 차이가 있는 것으로 나타났다. 이에 대한 연구는 아직 진행 중이며, 수어 습득 연령, 수어 구사능력 및 국제적 농인의 소셜 네트워크와의 연관성을 조사할 필요가 있다.

4장에서는 상호작용 연속체가 교차사인하기에서 표현 형태의 선택을 조절하는 방식을 살펴본다. 우리는 언어와 문화적 경계를 넘어 참여자 간에 공유된 레퍼토리가 몇 주 동안 어떻게 진화하는지를 살펴보면서, 내용 편향(더 도상적이고/또는 쉽게 표현할 수 있는 형태가 선택되는 것)과 조정 편향(참가자들이 서로의 수어 표현을 맞추려고 시도하는 것)이 표현 형태 선택에 미치는 영향을 조사한다(참조: Tamariz 외, 2014). 이 연구에는 네팔수어, 인도수어,

요르단수어, 인도네시아수어 사용자들의 첫 만남에 대한 325분 분량의 말뭉치가 사용된다. 이 데이터세트는 첫 만남, 1주일 후, 3주 후에 이루어진 녹화를 포함하고 있으며, 첫 만남과 마지막 만남을 보고한다. 디렉터-매처(Director-Matcher) 작업을 통해 수집된 구조화된 대화를 분석한다. 이 과제에서 디렉터와 매처는 최소한의 구별이 가능한 색상 이미지와 디렉터의 설명에 따라 선택해야 하는 색상 칩세트를 가지고 있다. 우리는 이 대화에서 사용된 색상 표현을 코딩하고, 공유된 의사소통의 진화를 조사하기 위해 색상의 의미론적 영역을 선택한 이유는 색상의 시각적 영역이 충분한 수준의 추상성을 유지하면서도 도상성 잠재력을 지니고 있기 때문이다. 참가자들은 다양한 전략을 사용하여 색상을 수어로 표현하였는데, 처음에는 해당 색상을 가진 일반적인 사물을 가리키거나, 비우세손의 손목에 있는 시각적인 정맥을 우세손으로 가리켜 색상(빨간색)을 표현하기도 하였다. 혹은 각자가 각자의 고유적 변이를 사용하였다. 그러나 3주 후에는 모든 참가자들이 같은 형태를 사용하기 시작하였다. 예를 들어, '녹색'은 인도수어의 자의적인 [녹색]으로, '갈색'은 네팔 수어사용자를 비롯한 변이로 즉흥적으로 [나무줄기]를 표현하는 식이다. 후자의 도상성 동기화와 전자의 발화 용이성은 내용-편향이 작용한다는 것을 시사한다. 조정-편향도 그룹이 한 변이를 선택하는 데 영향을 미치는 것으로 나타났으나(참조: Tamariz 외. 2014), 이러한 편향보다도 상호작용 자체가 형태의 선택을 더 강하게 주도한다는 것이 발견되었다. 이러한 결과는 상호작용 연속체에서 공유된 의사소통이 진화함에 따라 형태 선택이 어떻게 조절되는지에 대한 중요한 인사이트를 제공한다.

5장에서는 교차사인하기의 맥락에서 상호주관성 현상을 살펴보고, 이를 빠르게 구축하는 방법을 다룬다. 교차사인하기는 공유된 언어 구조나 관습적 코드가 없기 때문에 시각적으로 유도된 형태나 제스처, 대화 원칙 등의 특징을 사용하여 의사소통과 수정 이슈와 같은 언어 사용의 인지적 측면을 연구하기에 적합한다. 이 연구에서는 언어사용의 인지적 문제 중 하나인 상호주관성의 확립을 중요한 주제로 다룬다. 상호주관성은 서로 상황을 공유함으로써 서로

이해할 수 있게 되어 효과적으로 의사소통하고 조율할 수 있는 기초적인 요소이다. 이러한 상호주관성은 인간 인지의 기반이 되며, 상호작용과 형태적 특징 모두에서 빠르게 구축할 수 있는 방법을 다루게 된다. 이 연구에서는 상호주관성과 관련하여 시각적 도상성에 기반한 수어표현과 같은 형태적 특징과, 말차례갖기 체계와 같은 의사소통적 특징을 고려한다. 또한, 상호주관성이 언어 구성에 미치는 영향도 고려하며, 이를 통해 이문화 수어 커뮤니케이션에 대한 새로운 인사이트를 제공하고자 한다. 기존의 연구는 주로 생산 및 해석의 문제를 다루고 어휘 및 문법적 특징에 초점을 맞추었으나, 이번 연구에서는 이해와 상호작용에 관한 연구를 다룸으로써 이전 연구에서 다루지 않았던 영역을 채우고자 한다. 대화분석 또는 CA(e.g., Schegloff, 1992)의 상호주관성과 기타 개념을 고려하여 상호작용 관련 연구의 공백을 채우려고 노력할 것이다.

6장에서는 세 가지 분야에 대한 결론적인 논의가 집중되어 있다. 먼저, 언어 발생에 대한 문제로 돌아가서, 맥락의 효과성이 상호주관성 발전에 어떤 영향을 미치는지에 대한 연구 결과를 요약하고 있다. 둘째로, 국제수화와 교차사인하기의 관계를 다시 살펴보고, 현대적인 시각에서 결론적인 의견을 제시한다. 마지막으로, 연구자 본인이 첫 번째 자료 수집에 참여한 농인 수어 사용자로서,연구에서의 내 지위에 대해 생각해본다. 이 장은 전반적으로 상호주관성 발전의 다양한 측면에 대한 결론을 도출하고, 교차사인하기의 환경에서 이러한 요인이 수행하는 역할을 이해하는 것이 중요하다는 점을 강조한다.

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My third supervisor Connie guided me through the academic process, and was instrumental in enabling me to feel like a true part of the scholarly community at the Max Planck Institute (MPI) in Nijmegen, where all of the other students and academics were hearing non-signers. Communication in the department was often very challenging, on top of the incredibly complex research, and I sometimes felt overwhelmed. Connie suggested to me that as a PhD student at MPI, I was a small fish in a large pond, but that once I completed my thesis, I would be a large fish in a small pond. Keeping this thought in my mind helped me to surmount many obstacles and stay committed to my work during difficult times. I am so very obliged to her for helping me to believe in myself. Her academic support was invaluable as well. She was in contact with me every single day and never failed to give me guidance at every stage of my research and writing. I cannot thank her enough for the incredible amount of work she has done as my supervisor.

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Curriculum Vitae

Kang-Suk Byun was born on September 16, 1980 in Jeonju, South Korea, and grew up with Korean Sign Language as his native language, acquired from his deaf parents. In 2012, he obtained a master's degree in Theoretical Linguistics from Chungnam National University by analyzing and categorizing gender-related verb vocabulary in Korean Sign Language using morphosyntactic analysis. He was later invited to the doctoral program as a student position within the Language & Cognition group at the Max Planck Institute for Psycholinguistics. After completing his PhD coursework, he has been actively involved in the development of Korean Sign Language by teaching Sign Language Linguistics and Conversation Analysis at Kangnam University and Korea National University of Welfare. Currently, he is working as a researcher and teacher in the MA/PhD program at Kangnam University (Yongin) and participating in the Korean Sign Language Corpus Project as a researcher. In addition, he is part of the research team that is preparing the KSL national proficiency exam, which is expected to be launched soon. As a postdoc at Radboud University, he is continuously conducting cross-signing research in addition to his other academic pursuits.

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