Repair in cross-signing: Trouble sources, repair strategies and communicative success

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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, a deaf patron in a restaurant who is unsure about what to order may point at the menu with 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 and Zeshan, 2013; Crasborn and Hiddinga, 2015; Zeshan, 2015; Byun et al., 2018). 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

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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 and Spradley, 1985). 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' here (see also Bradford, Sagara and Zeshan, 2013; Zeshan, 2015; Byun et al., 2017).

Cross-cultural communication skills can play a major role in the ability to carry out repair (i.e. the process in which trouble occurs within the interaction and attempts are made to resolve it, as explained in section 1.2 below). These skills equip the cross-signers with an array of tools they can exploit, sometimes in impressive, numerous consecutive repair attempts, to get their meaning across. This study examines these tools and strategies more closely to get an insight into the nature of cross-signers' meta-linguistic 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 study 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. The insights offered here into cross-signing might improve the general understanding of International Sign pidgin and give clues as to its historical development and prospective future path. However, it is important to note that International Sign is largely an agreed-upon means of communication with its own lexical and structural resource base (Supalla and Webb,1995; Webb and Supalla 1994), whereas cross-signing represents an incipient, emerging system with no established rules or forms, in which repair is a key process helping interlocutors to create their shared space of meaning (Zeshan, 2015).

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 1 introduces the study and some

of its key concepts, Section 2 explains the method and data collection, including information about the participants and how the data were annotated. Section 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.[1]

The study of repair in cross-signing may 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 evolution of language. In addition, the study reveals some of the abilities that humans can rely on for communicative problem-solving in the absence of language.

1.1 Cross-signing

'Cross-signing' is a term coined by Bradford, Sagara and Zeshan (2013) to describe the ad hoc communication of signers who do not have a shared language or established conventions to rely on. Although International Sign (IS) and cross-signing are both methods of communication between users of different sign languages, and facilitate cross-cultural social interaction, cross-signing differs from IS. For instance, IS has shared conventions and time-depth (with its use at formal conferences dating back to at least 1976, according to Rosenstock and Napier, 2016), whilst cross-signing does not. Mesch (2010) describes IS as an artificial, symbol-based, hybrid code that is improvised in certain settings, between particular interlocutors. She argues that this makes it too erratic and situation-dependent to be considered a conventional language. IS developed from intensive contact between national sign languages (Mesch 2010). A prerequisite for the successful use of IS is that both people in the interaction already know at least some IS, which usually means they have experience of travel and international communication. If neither or only one of the participants knows IS, then their interaction must necessarily be called 'cross-signing'. Conversations of three or

1 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.

more signers were not investigated within this study, but interestingly, informal observation suggests that when one interlocutor in a cross-cultural group has knowledge of IS and uses IS forms, the others may tend to select those forms for their shared repertoire, and favour them over other forms; that is, the interactant with knowledge of IS, which is perceived as a prestigious lingua franca related to American Sign Language (ASL), may have more influence than the other interlocutors over the evolution of linguistic forms used in the group over time (Byun et al., 2018). Moreover, cross-signing is used only in informal two-way conversations, whereas IS may also be used for lectures or presentations, and is exploited in both formal and informal contexts (cf. Rosenstock, 2008; Whynot, 2015).

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 and Brennan, 1991) through tools and strategies related to turn-taking, repair, and other interactive features of the conversation, such as pointing and joint attention. According to Clark and 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 and Foster, 1998; White, 1998). The multimodality of backchanneling, for example via vocalisations such as "uh-huh" in English or via nodding, has been recognized 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 and 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 3.2).

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.

This study looks closely at how people slowly start to communicate with each other, focussing on their first interactions; motivated by the desire to interact, they surmount obstacles and cooperate to achieve their communication goals. Sometimes the goals may be achieved, but sometimes there may be trouble and both interlocutors may have to make substantial conscious efforts to resolve it, e.g. using repair strategies (Dingemanse et al., 2015).

1.2 Conversational repair

In this paper, 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 (Byun et al., 2018). *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, Jefferson and Sacks, 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. *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, Jefferson and Sacks, 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 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 study 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, Schegloff and Jefferson, 1974; Schegloff, Jefferson and Sacks, 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 receiver of the message (other-initiated repair, OIR). These are discussed separately in the literature. In a repair sequence, there are distinct parts: T0 refers to the instance when the trouble is indicated (e.g. 'sorry, what?'). T-1 is used to mean the actual trouble source, i.e. the utterance that caused a problem (Dingemanse et al., 2015) or misunderstanding (Pietikainen, 2016). T+1 is the turn where a solution is offered. The forms of turns at T+1 and T-1 will be examined further as these are the forms that create 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 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.

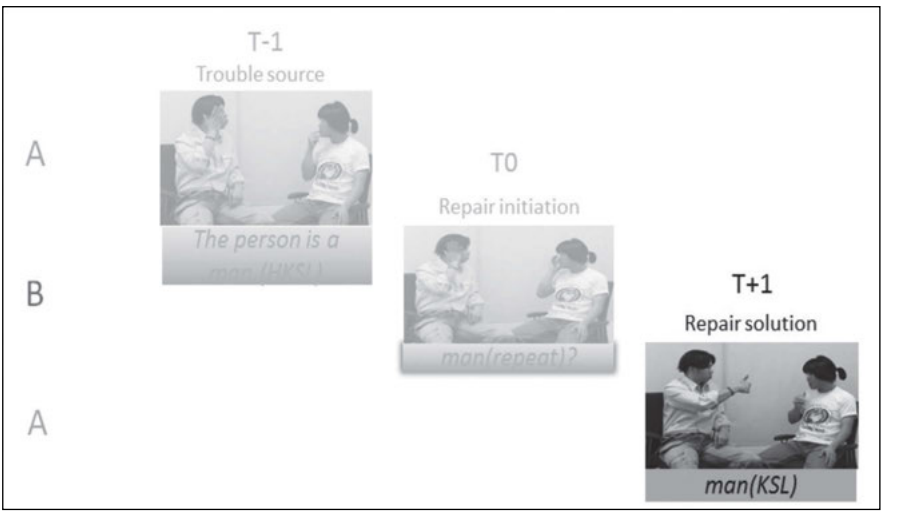


Figure 1. Repair solution (T+1)

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 problem 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 problem 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.'s (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).

In the context of signaling specific problems or potential trouble sources, previous research (Byun et al., 2018) has demonstrated the use of try-markers by cross-signers. Drawing on Moerman (1988), Byun et al. (2018) define "try-marker" as "a device that is used to indicate a test of the addressee's recognition of a referent. The device is followed by a hesitation pause in expectation of a sign from the addressee as to whether the referent is known to the addressee". An example of how a try-marker is realized in a spoken language is a rise in intonation at on the try-marked constituent in English.

Via their interactions and repair sequences, cross-signers provide each other with opportunities to negotiate signs and meanings and develop a shared repertoire (Zeshan, 2015), and this leads to the emergence and evolution of a mutually-agreed system of communication.

1.3 Research question

The research question for 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 research, 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 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.

2 Methodology

This section explains what kind of data was used in this study, and the size of the two main data sets. In 2.1, the participants are introduced briefly along with relevant details about their backgrounds, in particular their languages and experience of international travel. This is important because the two data sets differ in this regard, with possible implications for the analyses. In 2.2, the annotation process is described, including how categories of repair strategies were developed, and how values were assigned to the data inductively.

2.1 Data and participants

The data for this study come from two sources. The first is a corpus created during the Sign Language Typology project, directed by co-author Zeshan from 2003–2006 at the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands (see also Byun et al., 2018, for details about this corpus). The second corpus comes from one sub-group of participants in the project Multilingual Behaviours in Sign Language Users (Multisign), also led by Zeshan, which took place from 2011–2016. For both corpora, dyads of deaf signers who did not share any 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. Figure 2 shows the interaction pairs in which signers participated in the two projects, and arrows signifying the dyads used for this chapter appear in bold. The abbreviations used to refer to the sign languages discussed in this chapter are listed in Table 1.

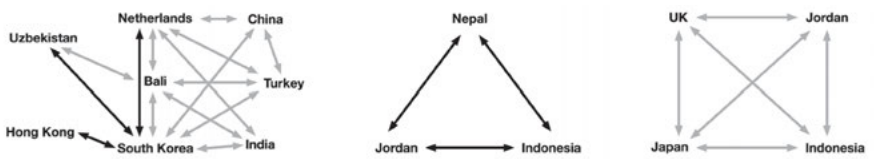


Figure 2. Participant configurations of cross-signing participants (Typology project dyads at left, and Multisign project dyads at right)

Table 1. Abbreviations for the sign languages used in this chapter

Sign Language	Abbreviation
German Sign Language	DGS
Hong Kong Sign Language	HKSL
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

The Multisign signers, two male participants from Indonesia and Jordan, and one female participant from Nepal, had not met previously, and had minimal knowledge of English and no shared sign language. They were filmed on their first meeting in India, where the research took place, and this is the data focused on in this chapter.[2] It was important to film them 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 a deaf leadership programme, and socialised with each other and with other deaf people in their environment (see Bradford, this volume, 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.

The four participants in the Typology group were all males, from the Netherlands, Uzbekistan, South Korea, and Hong Kong. The setting of data collection for this group is described in detail in Byun (this volume). Two of the

2 They also were filmed after one week and after three weeks, but that data is not considered here.

participants grew up in signing environments, with deaf parents. As a group, they 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 had been to an international conference which provided him with about 20 days of immersion in ASL and IS.[3] Signer D had frequently been to Taiwan and thus acquired some Taiwan Sign Language and cross-cultural communication skills. Signer B 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 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 for this chapter.

In contrast, the Multisign participants had very little experience of international or cross-cultural communication. They had no shared language and 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 2 summarises the participants' background details including language proficiencies.

3 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 3.2.2 below. 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.

Table 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

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 researchers. 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.

This study examines only the initial encounters between the participants, as these most aptly display the incipient features of cross-signing, prior to lexical convergence and accommodation.[4] 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 (see Table 3). These data were transcribed using ELAN video annotation software (Sloetjes, 2013). Section 2.2 explains the transcription scheme that was used in these analyses. In addition to annotating the data, three of the partants 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 3.1 for details).

Table 3. Summary of data

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

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

4 For a study that investigates how cross-signing develops over time, based on several subsequent data collection sessions, see Bradford, Michaelis and Zeshan (this volume).

between Signer A and Signer B. This video is exceptional in that the conversation lasted only 10 minutes.

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, this volume). Within the Typology group, three dyads were chosen that all involved the same signer (Signer A, who is also the first author of this chapter) as one of the participants. 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 problematic because we are not analysing patterns in the use of repair strategies at the level of individuals.

2.2 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 shows a screenshot of the data annotation in ELAN.

Figure 3. 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. In total, 88 repair sequences were coded. The coding schema of repair strategies that emerged from the inductive process is summarised in Table 4. 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 4. 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 and 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 our purposes, 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 Repair strategies in cross-signing

This section sets out the results from our research with respect to the two research questions. Firstly, we consider the nature of the trouble source that gives rise to OIR in the sequences investigated here (Section 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. In Section 3.2 we take a closer look at the form of the turn where one of the interlocutors signals the communication trouble (T0). Section 3.3 presents the deployment and frequency of the various repair strategies, and Section 3.4 summarises the results in terms of the differential success of the signers' repair strategies.

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, Jefferson and Sacks, 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 our 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.

In this section, we take 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, our 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 trouble at T0 was followed by a single repair attempt, or whether multiple attempts at repair were necessary.[5] 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 5 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 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 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 et al, 2015), that is, a form that signals a general lack of comprehension. This

5 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.

distribution suggests that either it was rare for signers to have trouble with an utterance overall, or that they preferably chose to target an individual form when initiating a repair.

Table 5. 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 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 Byun et al. (2018) 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 Byun et al. (2018), who 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 4). 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 4. 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.[6] This caused 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 5 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

6 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.

repeats it at T0, using the same handshape but smaller movements, taking up less of the signing space.

Figure 5. 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 problems. 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.

Not unexpectedly, 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 we have offered a qualitative description of examples 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 5. The next section focuses on identifying the form of the T0 turn.

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 and 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 1). At T0, Signer A repeated the mouthing, but not the manual component of the sign.

Example 1. Partial repetition of 'Uzbekistan' at T0, using only the mouthing

Signer B:	U	Z	B	E	K
	'uzbek'				
Signer A:		'uzbek'			

Another example occurred when Signer A articulated two adjacent signs for 'study' at T-1 (see example 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 2. 'Study' – only the second sign was repeated at T0

Signer A:	HOW	STUDY(KSL)	STUDY(ASL)	HOW	Pointing(you)	
Signer D:						STUDY(ASL)

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). 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. 'university' – only the second sign was repeated at T0

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

Some trouble-source repetition at T0 was accompanied by other signs or strategies as well. There were 20 such cases in the data. These included 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 and 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 6). 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 7) therefore constituted a restricted offer, and the sign is accompanied by a questioning facial expression.

Figure 6. Sign for 'August' referring to a wall calendar

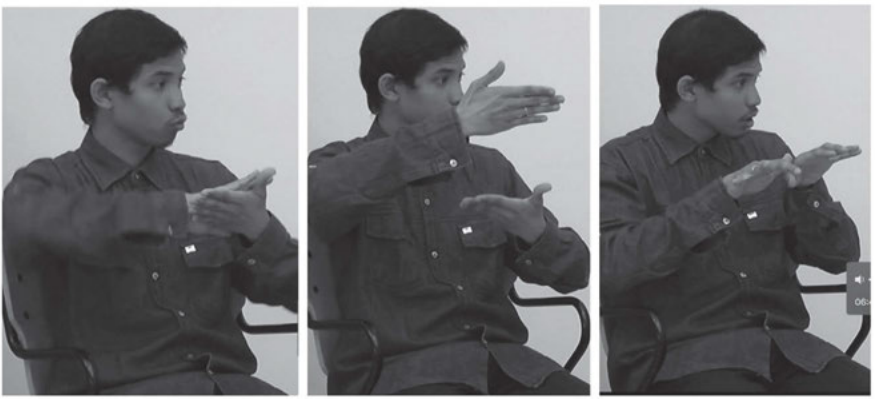


Figure 7. Sign for 'computer' used as a restricted offer

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 8). 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 8. 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. Pietikainen (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 Byun et al., 2018) 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 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 (3.3.1), literacy (3.3.2), substitution (3.3.3), explanation (3.3.4), examples (3.3.5) and productive signs (3.3.6). Signers' reasons for selecting these strategies are also considered. This section provides a necessary background to the subsequent section, 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 6 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) and Dingemanse (in press). 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 6. Distribution of sequences of other-initiated repair by number of attempts

	1 attempt	2 attempts	3 attempts	4 attempts	5 attempts		Total sequences
Typology group	22 (26.8 %)	6 (7.3 %)	3 (3.6)	1 (1.2 %)	1 (1.2 %)	1 (1.2 %)	34 (38.6)
Multisign group	31 (37.8 %)	10 (12.1 %)	5 (6.0 %)	2 (2.4 %)	1 (1.2 %)	5 (6.0 %)	54 (61.3 %)
Total	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 6, 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.

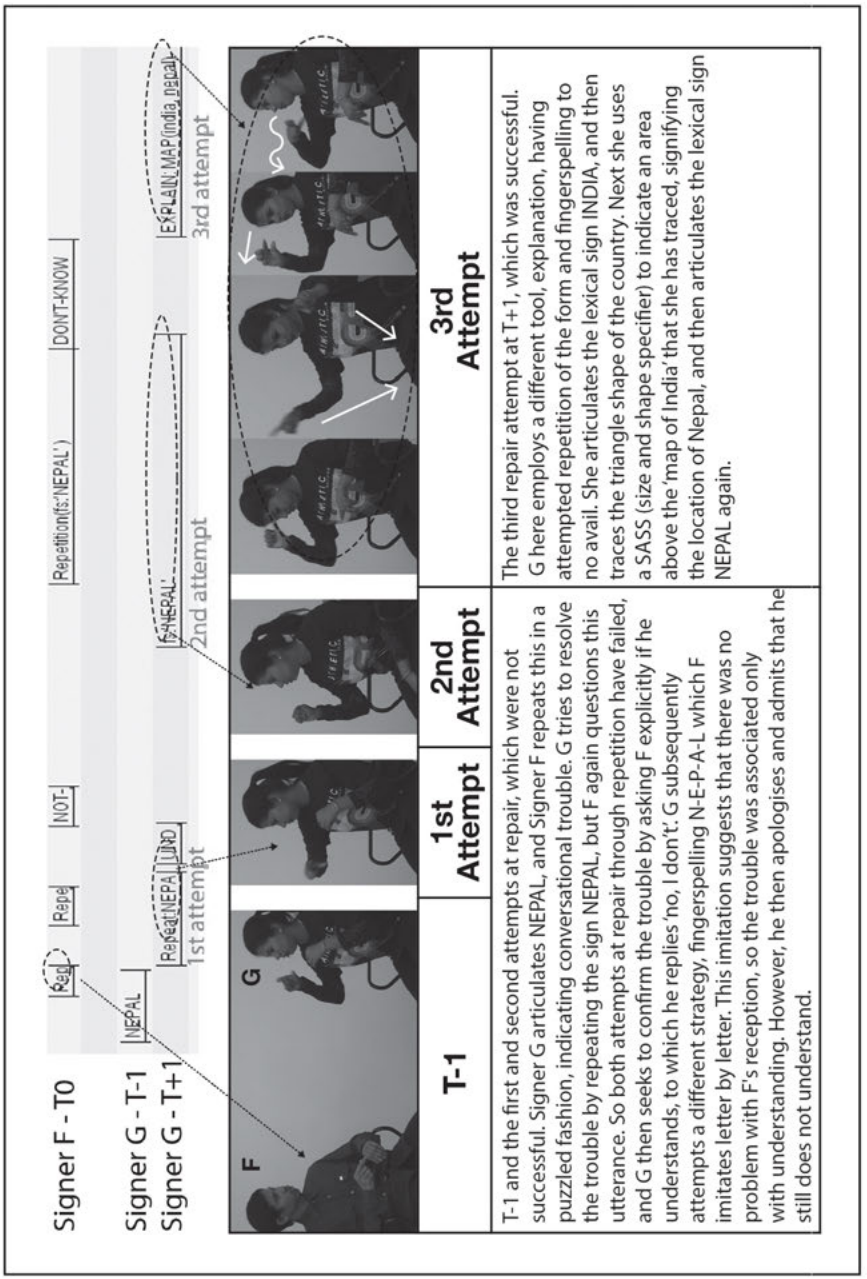
Table 7 shows the distribution of individual *repair attempts*, since a repair sequence can include more than one individual repair attempt. Signer C, Signer E and Signer G produced trouble sources, followed by repair attempts, more often than the other participants. Moreover, three of the aforementioned 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 7 is to provide an overview of overall repair frequency, and the frequency of repeated repairs.

Table 7. Distribution of first and repeated repair attempts

	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 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 paper but would be a fascinating area for future research.

Example 4. Multiple repair attempts (Success at 3rd attempt)



To provide a broader overview of the results, Figure 9 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.

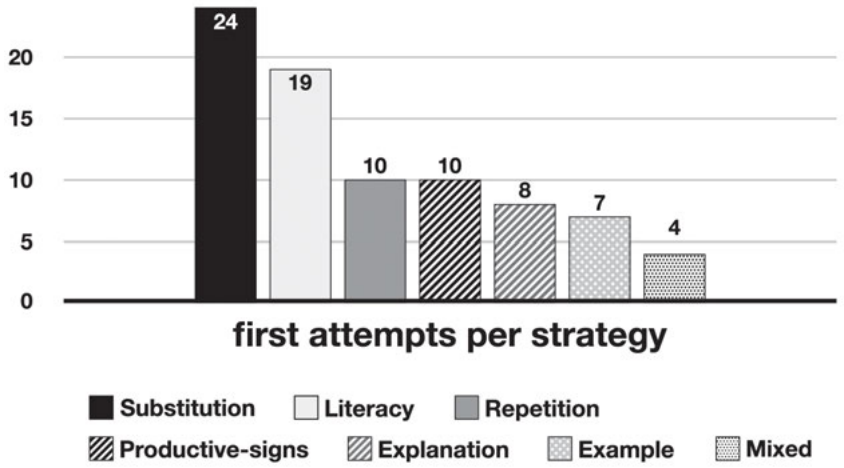


Figure 9. Number of first attempts per strategy

Not unexpectedly, we find a great deal of variation with respect to how frequently each of the strategies occurs with the individual participants. This is summarised in Figure 10. 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.

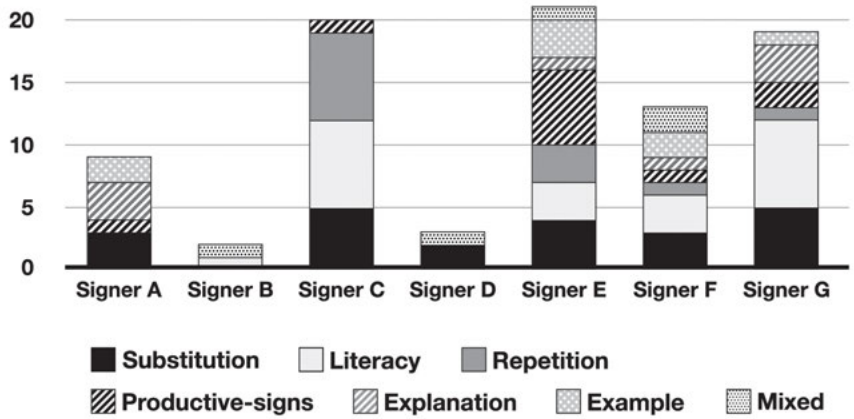


Figure 10. Individual variation in the use of repair strategies

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. And of course 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, we focus on instances of first repair attempts only, 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.[7] The plentiful first attempts in the data enable this approach to provide a useful picture of participants' strategies and assumptions at initial contact.

7 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.

3.3.1 Repetition

Repetition refers to the repeating of a trouble source, as in the first repair attempt in Example 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 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 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 his/her 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.

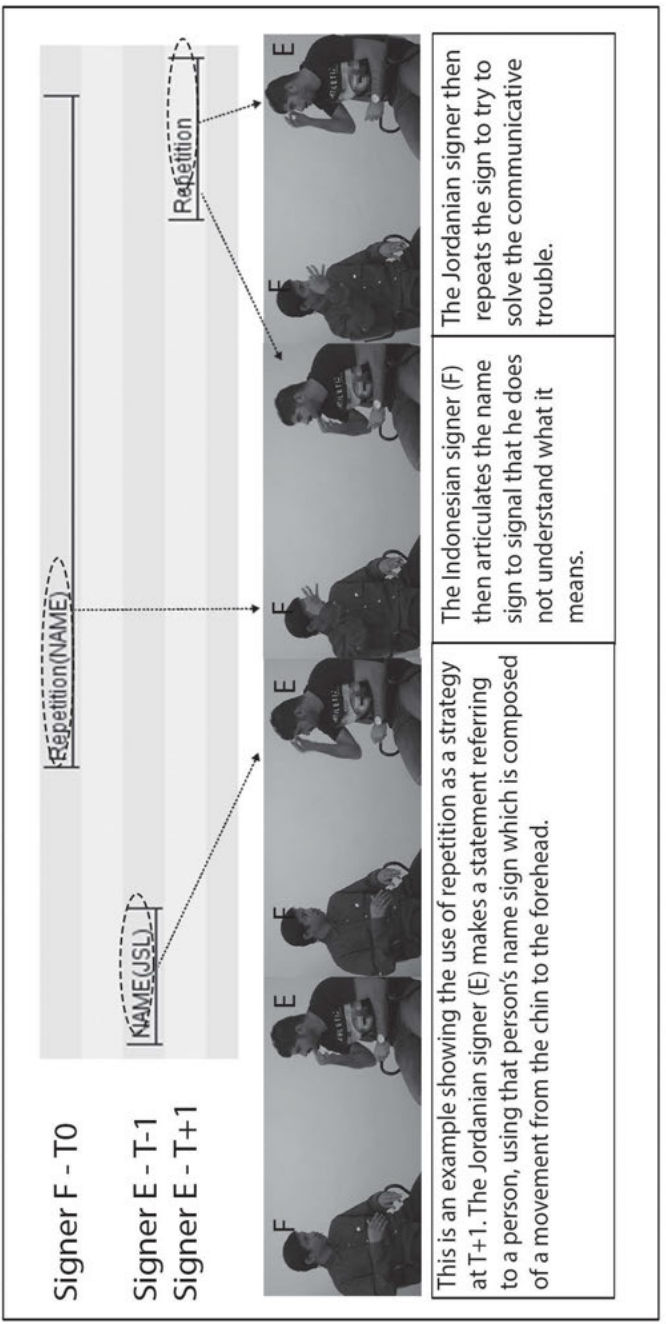
Sometimes a form is repeated within T-1 ; that is, the repetition occurs before the interlocutor has signalled a problem with understanding at T0. These cases are not included in the count for repetition as a repair strategy at T+1, but are assigned to the T-1 turn. Moreover, if the repetition produced 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. Byun et al., 2018).

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

Example 5. Repetition



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 and 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, Schembri, Evans, and Cormier (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).

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.

3.3.2 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 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 3.4). 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.

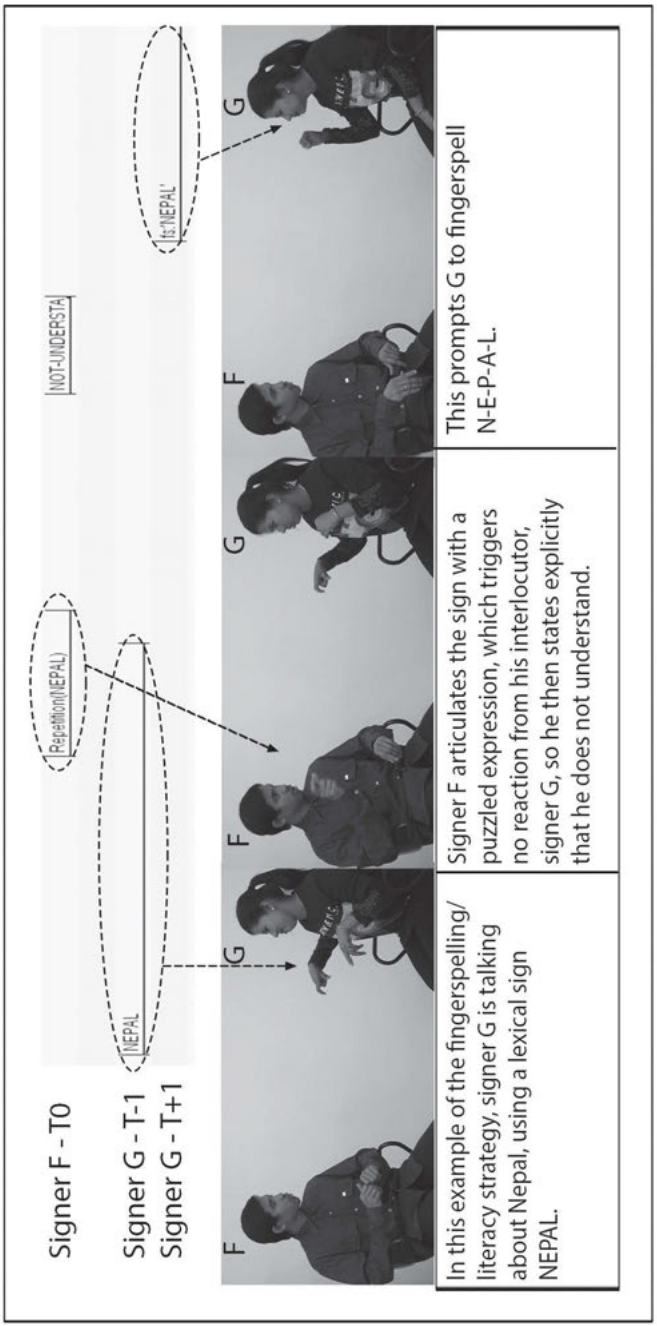
Possibly, this favourable view toward literacy-based strategies is due to the status of English as a worldwide lingua franca, especially in technology and remote communication, and/or perhaps it reflects the great importance typically placed on writing and fingerspelling skills throughout deaf education. 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 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 and 1998, in Johnston and Schembri, 2007: 322) states that in Auslan, for example, fingerspelling is

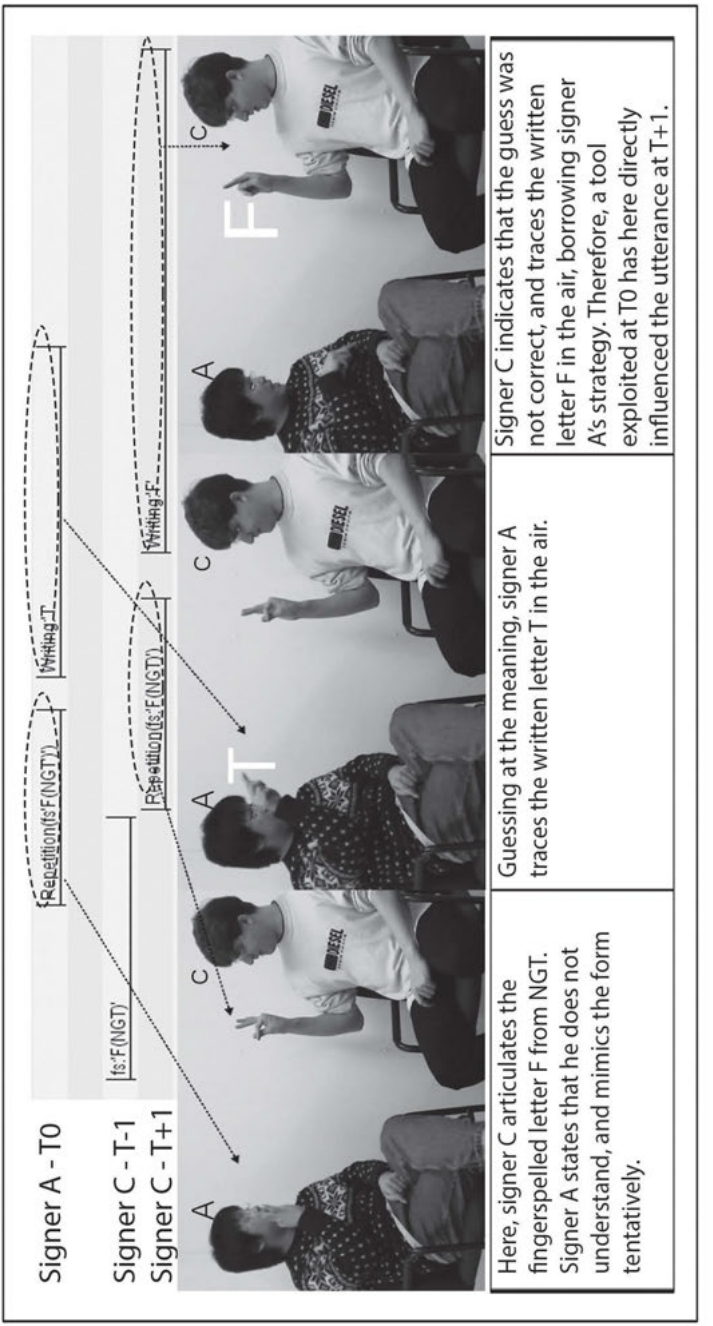
commonly employed to convey English proper nouns and concepts that have no lexicalised Auslan sign. Thus, abstract concepts like 'culture' and 'theory' may frequently need to be fingerspelled in cross-signing, as there is no immediate visually iconic means of portraying them, especially in the first meeting when the shared code might be minimal.

The fingerspelling in the data often featured noticeable holds, even at first attempt. Groeber and 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 and 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 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 6. Literacy strategy for clarifying a proper noun



Example 7. T+1 signer accommodating strategy of T0 signer



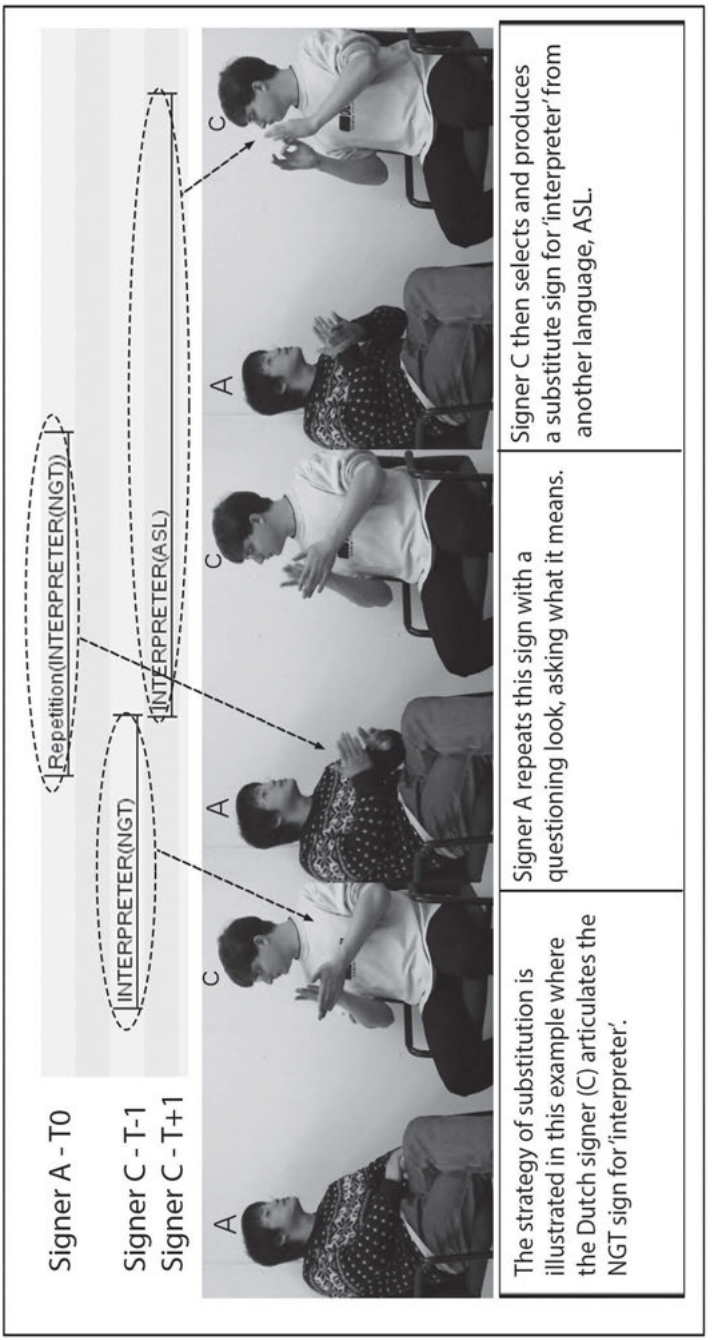
3.3.3 Substitution

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 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.

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 Dorneyi 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.

Example 8. Substitution



3.3.4 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 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.

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 problem source sign by drawing explicitly upon the context in question. Examples include the following:

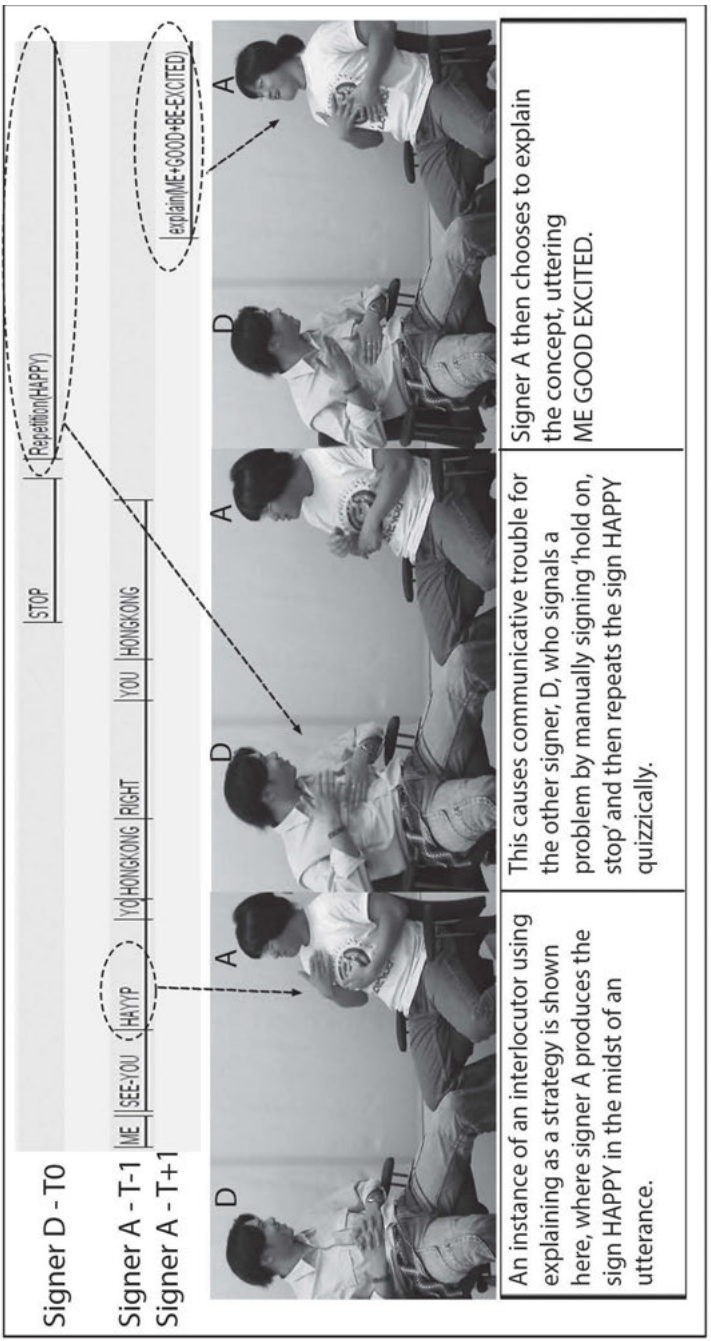
Example 10.
Trouble source: HAPPY (performed on the chest)
Repair: 'work, achieve, feel ecstatic, grin, cheer out loud, heart is full'

Example 11.
Trouble source: WORRY (in neutral space at head height)
Repair: 'effort, bad result, fail, wonder how (to fix), scratching my head'

Example 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.

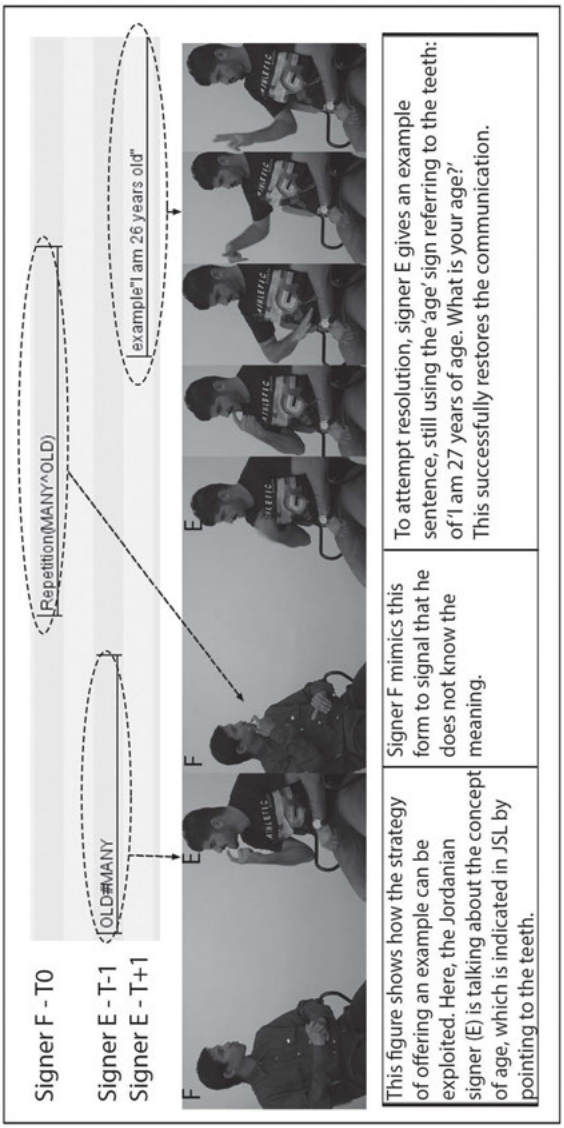
Example 9. The Explanation strategy.



3.3.5 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 13).

Example 13. Deployment of the example strategy



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,[8] whereas out of eight instances of explaining, only one involved try-marking (see Table 8). 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.

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

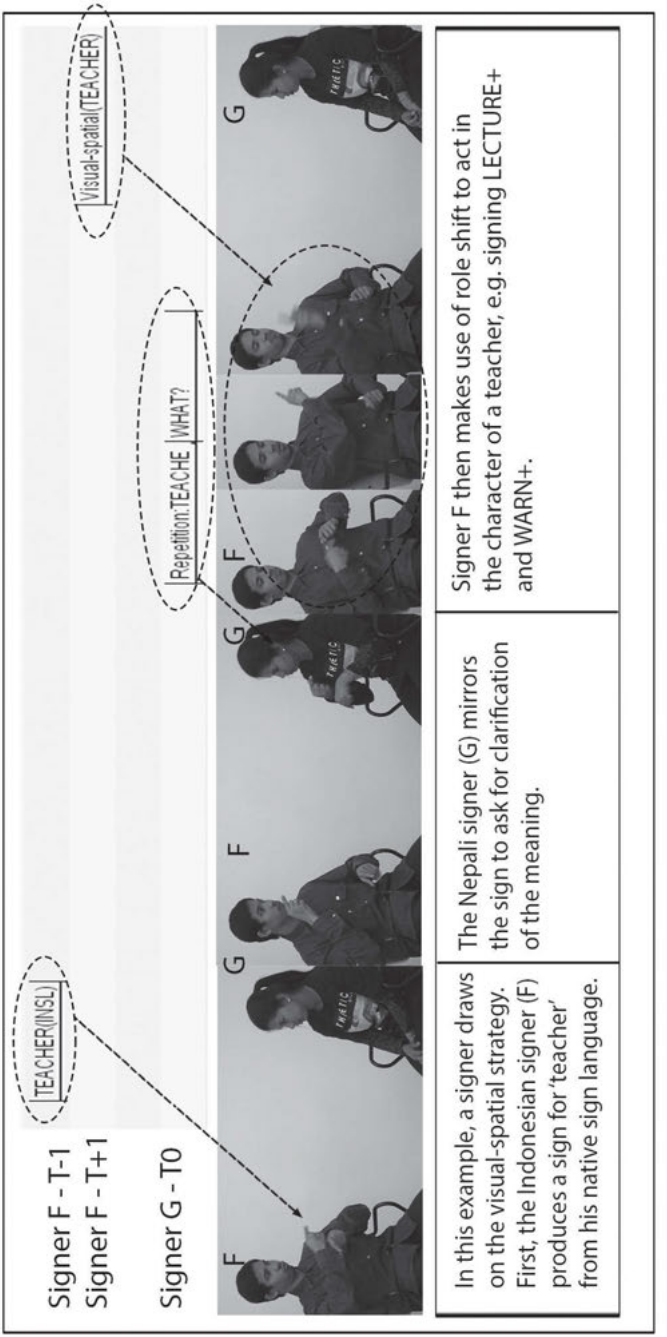
	Example	Explanation
With try-markers	4	1
Without try-markers	1	5
Undetermined	2	2

3.3.6 Productive Signs

As set out in Section 2.2, 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 and 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 and 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 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 14. Deployment of the Productive Signs strategy



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.

3.4 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 research, we 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., this volume). 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 meta-linguistic 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.[9]

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 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 9 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).

9 Note that this figure is different from the subset of 82 repair sequences in Table 6, in which we have deducted from the total number of 88 sequences those 6 sequences where repair was ultimately abandoned at any point in the repair sequence.

Table 9. 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 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 11.

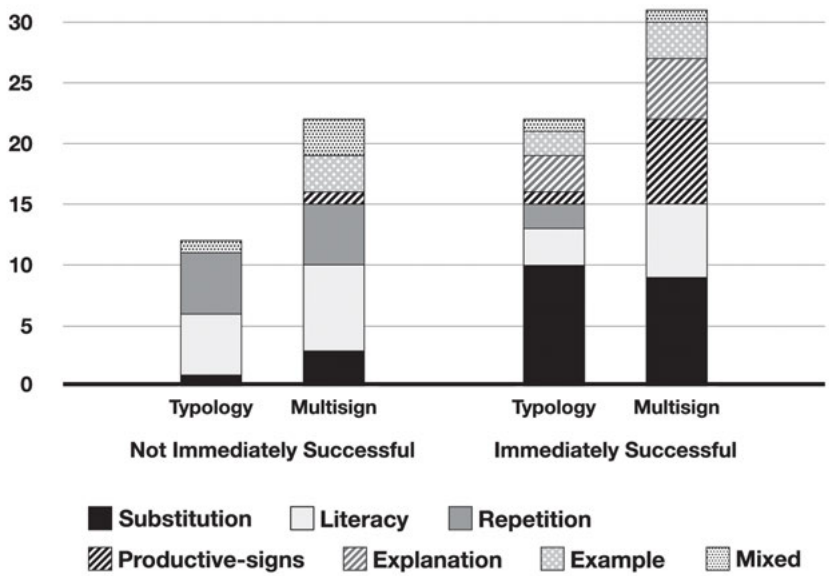


Figure 11. Comparison between first attempt success rates per strategy for the Typology group (left) and Multisign group (right)

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 12 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).

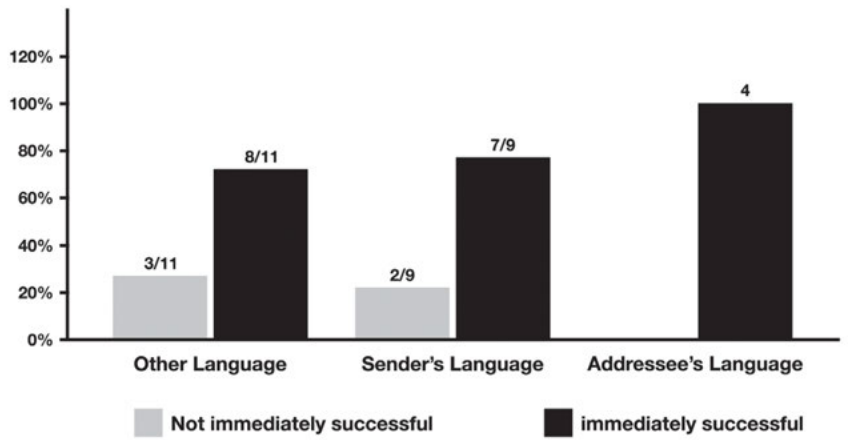


Figure 12. Success of substitution in 1st attempt repair strategies according to provenance of signs

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 9, 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.

4 Conclusions

This chapter has highlighted the considerable skills displayed by sign language users in cross-signing interactions. We 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, our 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, Byun et al, 2017), particularly with respect to the initial meetings between signers (see Bradford, Michaelis and Zeshan, this volume, for a comparative study tracking cross-signers' interactions over a longer time period).

The study of cross-signing is an innovation in sign language linguistics. Besides the interest in cross-signing itself as an emerging jargon, part of the potential of this research also lies in improving our general understanding of International Sign pidgin, which is itself severely under-researched. Cross-signing may provide clues as to the historical development of International Sign, and the way in which it may have emerged over time.

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 trouble 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 it 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, we need 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.

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, 1974; Blokpoel, 2015). 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, we do 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.

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