

Interrogative Marking of Chinese Sign Language—a Preliminary Investigation

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Abstract

Based on the naturalistic data, both manual and non-manual components of these constructions are described and analyzed, revealing a complex system. Firstly, manual markers in content questions consist of two basic WH signs, WHAT and HOWMANY, forming two series of WH compounding for more specific information retrieval. Particles form the manual marking of CSL polar questions; they are composed of three types: YES, A-NOT-A and certain negators. Non-manual markers (NMMs) function as interrogative markers in two ways: by mouthings morphologically; or prosodically by brow movement. Measured by the spread of brow movement, polar questions without particles are shown to be predominantly marked by brow raising spread over the whole sentence, while brow movement in interrogatives with manual markers seems to function only optionally since the frequency is lower, the spread less regular and statistically insignificant. CSL is argued to be a particle-rich sign language and its causing mechanism is analyzed.

Key words: Chinese Sign Language, interrogative, manual markers, non-manual markers, particles.

1. Introduction

Generally speaking, interrogatives are divided into two basic types for discussion: content questions (or WH questions) and polar questions (or yes-no questions). Practical definitions for either of these are as follows: content questions are used when the speaker specifies the information being asked by using specific question words, such as *what*, *why*, *which*, etc. Polar questions ask whether the statement is the case or not, and can normally be answered by yes or no, so they are also called yes-no questions. There are three main means to mark interrogatives: by lexical features, i.e. question words (including particles), by syntactic constructions, or by prosodic features, i.e. intonation. These three basic tools are often mixed in a specific language. For example, as for English, polar questions are constructed by

addition and inversion of the auxiliary verbs (syntactic construction) while content questions are constructed by fronting of the WH words (question words plus syntactic construction). Still, rising intonation can also be used to construct polar questions in spoken English with certain restraints.

When we turn to spoken mandarin Chinese, we find that a mixed mechanism is also used to form interrogatives. On the one hand, as for marking content questions, *Shenme*, (Pinyin is used for symbolizing the Chinese characters in the paper) literally ‘what’ is the primary WH word in Mandarin Chinese, combining with other nouns to form specific question words, for example, the time *shenme shihou* (literally ‘what time’), *shenme defang* (literally ‘what place’), *duoshao* (literally ‘many-few or much-little, how-many/much’) is a question word used to inquire about the quantity of the thing, and which also combines with specific nouns, for example, money, time, day, month etc., to ask specific questions, like *duoshao tian* (literally ‘many-few day’, how many days). On the other hand, regarding the marking of polar questions in spoken Chinese, various mechanism can be used to construct them. There are basically four mechanisms: a) using the sentential-final particle ‘ma’, which is supposed to be the dominant type; b) using the negators *bu* or *meiyou*, c) using rising intonation; d) using A-not-A or similar construction;

Similar to other sign languages, interrogative constructions in Chinese Sign Language (CSL) are composed of both manual and non-manual components, which is the focus of this paper. However, specific means for the realization of question marking in sign languages vary . CSL interrogatives have been discussed sporadically in the literature (Yang and Fischer 2002, Yang and Wu 2014), but a more general description based on naturalistic data and quantitative study is still need. A broad investigation of CSL interrogatives must be made before carrying out any in-depth research on its special aspects. Therefore, this paper focuses on a general description of CSL interrogative constructions, as a foundation for future further in-depth analysis on relevant specific topics.

Finally, regarding the arrangement of the following sections, Section 2 introduces the relevant literature. Section 3 will disclose the methodology adopted and the process of the data collection, then Section 4, as the main part, is divided into two sub-sections: Section 4.1 deals with manual markers in interrogatives and Section 4.2 with particles in polar question. Section 5 elaborates on the form and function of non-manual markers in interrogatives, and consists of two parts: subsection 5.1 deals with mouthing, subsection 5.2 deals with other

intonational NMMs, followed by discussion (Section 6) and ending with a conclusion. The reason for arranging the paper in this way, i.e. division of manuals and non-manuals rather than the mainstream division of polar and WH questions, is that I attempt to discuss the interaction between question signs and NMMs, since Tang(2006) showed the correlation between them in HKSL.

2 Manual and Non-manual Markings in Sign Language Interrogatives

As far as sign languages are concerned, two mechanisms are employed for interrogative markings: either lexical or intonational marking. The former mainly refers to the application of question words, the latter to the application of non-manuals, since non-manual marking in signed languages is often compared to intonation in spoken languages (Sandler 1999); for example, both are suprasegmental, spreading over a variable number of words in the clause, and both fulfill a similar range of functions.

As for sign languages, lexical markings usually mean manual markings in that the lexical signs are basically manual signs. Therefore manual markings of WH questions are called WH question signs, while manual markings of polar questions are mainly referred to as particles, although in a few cases these can also be used to mark WH questions. On the other hand, intonational markings are basically non-manual markings. Mouthing can be regarded as a special type of non-manual, which seems to function at the morpho-phonological level.

2.1 Manual Markings

In the discussion that follows, manual markings are divided into two basic types according to the question type which they modify: the manual signs that mark WH questions are called WH question signs, and the manual signs that mark polar questions are mainly referred to as particles, following Zeshan(2013).

2.1.1 WH question words

According to Zeshan(2006), paradigms of WH question words are various in terms of both size and distinction; they are lexicalized as question words across sign languages. If there is only one WH sign in a sign language, the general interrogative always includes the interrogative ‘what’ as its most basic meaning and then covers the rest of the interrogative paradigm more or less completely. There are also other signed languages with a fairly large

paradigm of question words, though their semantics vary considerably across languages. Most signed languages have question words for at least ‘what’, ‘who’, ‘where’, and ‘when’, while ‘which’, ‘why’, and ‘how’ are less common and are often subsumed under the sign for ‘what’. ‘How many’ is often expressed by a non-interrogative sign meaning ‘number’, ‘many’, or ‘count’. In addition, WH compounds are also found in some sign languages. Typologically, the most common syntactic positions for question words are clause initial, clause final, or both, i.e. doubling of the question word (Zeshan 2004).

2.1.2 Particles in polar questions

A question particle is a manual sign ‘occurring with the actual question in the same prosodic unit’ (Zeshan 2004:32). When we detect a sign that repeatedly and regularly appears in the interrogatives and if, in addition, it is within the same prosodic segment and there is no obvious pause between the main part of the sentence and the sign, it may be regarded as a particle. Though the majority of sign languages seem to mark polar questions by non-manuals, a few sign languages also use sentence-final question particles to mark polar questions like LSE(Zeshan 2004), NGT(Coerts 1992), ASL(Fischer 2006), TSL(Chen 2012), HKSL(Tang 2006). Zeshan(2013) shows that the sign languages in Eastern Asia tend to abound in particles(with more than two particles) while most of the European sign languages have few particles, and if any, their functions are dubious. For example, PALM-UP is commonly found in quite a few languages like NGT, NZSL; it is also argued as a discourse marker rather than a particle, for detail discussion, please refer to McKee and Wallingford(2011). In addition, the syntactic distribution of particles in polar questions tends to be either clause final (the preferred position) or clause initial, or they occur in both of these positions (Zeshan 2004, 2006).

This paper aims to investigate in detail the manual markers as well as the non-manual markers that occur in CSL naturalistic data and presents a full-scale picture of the interrogative construction in a live environment.

2.2 Non-manual markings (NMMs)

As we have discussed, intonational markings are mainly referred to as NMMs, functioning like intonation in sign languages. Mouthing requires to be dealt with as a special

kind of non-manual marker more comparable to tone than to intonation, before we proceed to the discussion of other NMMs.

2.2.1 Mouthings as the NMMs

Mouthing is a type of mouth action that deaf signers use when they are signing, it is derived from spoken language and is traceable to relevant spoken languages, in contrast to mouth gesture, which cannot be traced back to spoken language (Crasborn et al. 2008). There is much debate as to the status of mouthing in sign language. Sutton-Spence & Woll(1999) classified it as the spoken component of mouth action, which is not part of sign language grammar. Similarly, Ebbinghaus & Heßmann (2001) argue that mouthing is co-incidental to sign languages and should be regarded as code-mixing. On the other hand, the opposite view has it that mouthing should be incorporated into sign language systems based on the following reasons: a) mostly it co-occurs with signs of nouns and verbs; b) it goes with signs of open class rather than closed class; c) it is not limited to one sign, rather it may spread over more than one sign, thus functioning at the prosodic level to bind elements within a clause (Bank 2015, Dachkovsky and Sandler 2007). The description and discussion of mouthing of manual markers i.e. WH signs and particles in interrogatives will be covered in 4.1, but little research has been conducted so far as to the role of the mouthing in interrogative constructions.

2.2.2 Facial movements as NMMs in interrogatives

Manual markers and mouthing having been discussed, we now come to deal with non-manual markers which generally function like intonation in spoken languages, since mouthing is regarded as a morphological feature of single signs and is mainly bound with manual signs. There is some research on non-manuals in other languages, including Baker-Shenk(2003), Weast (2008) in ASL and Coerts (1992) in NGT. Facial features include three groups of movement: eye, brow and head, which have been annotated. Brow movement is further classified into two types - brow raising and lowering, brow furrowing, as mentioned in some of the literature. In this paper, it is merged with brow lowering since physiologically one can hardly furrow his or her brows without lowering them (for detailed analysis, please refer to Weast 2008).

Before dealing with the NMMs in CSL interrogatives, I would like to discuss the distribution of NMM features across various sign languages (see Table 1). NMMs for interrogatives attach typically to either the whole clause or the whole clause minus any topicalized constituents. (Coerts 1992, Zeshan 2006, Johnston and Schembri 2007, Chen 2012, Yang and Wu 2014, et al.). However, a wider and in-depth investigation of NMMs is called for to further look at what exactly constitutes the NMMs in CSL and how these NMMs interact with the correspondent manual markers.

| Table 1 Distribution of NMMs Across the Sign Languages | | | |
|--|-----------------------------------|--------------------------------------|-----------------------------|
| SL | NMM in polar Q | NMM in content Q | References |
| Auslan | Brow raise(br.) , head tilt(ht.) | Brow lowering(bl.), head tilt(ht.) | Johnston and Schembri(2007) |
| ÖGS | chin down | Chin up | Schalber (2006) |
| ASL | Br, ht | bl, head movement | Baker-Shenk (1983) |
| BSL | Br ht | brow furrowing, eye close, head tilt | Sutton-Spence&Woll (1999) |
| SSL | Br, ht | bl, chin up, head movement | Bergman (1984) |
| NSL | Br, ht, body | | Vogt-Svendsen (1990) |
| NGT | br, ht, | bl, chin up | Coerts (1992) |
| TiD | brow movement | hs | Zeshan (2006) |
| IPSL | br, ht | br, ht(back) | Zeshan (2006) |
| JSL | brow raise the final | br or bl, chin side | Morgan (2006) |
| HKSL | br, ht, body forward | bl, (eg) , (mouth open) | Tang (2006) |
| TSL | br | br | Chen (2012) |

3. Methodology

The data was mainly collected in Shanghai, and is supposed to be one of two basic varieties of CSL, but I will refer to the data calling it CSL directly. Free conversations between 2 or more signers in daily life were video-taped over the dinner table, in a park and some other public places. All of the 64 subjects are native CSL signers, mainly middle-age subjects, 34 females and 30 males. All of them were born deaf or became deaf before 3 years old and live in the deaf community. Most of the signers have a background of schooling in deaf school, with ages ranging from about 18 to 72. The data collected from 99 clips of natural data amounting to more than 15 hours have been annotated using ELAN (<https://tla.mpi.nl/tools/tla-tools/elan/>). Two deaf experts were hired to annotate the clips concerning questions in order to guarantee the quality of translation and where controversy arose judgments were made by negotiation with a third native signer. 2096 interrogatives have been identified and annotated. These were classified into four types based on the presence or absence of manual markers, as shown in Table 2.

Q1: polar questions marked only by non-manuals;

Q2: polar questions with manual markers;

WHQ1: content questions without WH manual signs;

WHQ2: content questions with WH manual signs.

Table 2: Frequency of Various Questions in the Data

| Question types | Frequency | Question Markers |
|----------------|-----------|--|
| Q1 | 1304 | Non-manual markers (NMM)s in polar questions |
| Q2 | 123 | Manual markers (particles) in polar questions |
| WHQ1 | 29 | NMMs in content questions |
| WHQ2 | 640 | Manual markers (WH signs) in content questions |

4. Manual markers in CSL interrogatives

This section starts by discussing manual markers (WH signs) in WH questions and goes on to describe particles in polar questions.

4.1 Manual markers in CSL content questions (WH questions)

Manual markers in CSL will be explored according to the following order: the paradigm of WH words, formation of WH compounds, and other WH signs, their frequency and features of WHAT as the primary WH sign in semantic distribution and in the syntactic distribution of WH signs as a whole. Morphologically WH signs can be categorized into two types: simple signs and compound signs.

There are two basic question words in CSL: WHAT, expressed by shaking of index finger, and HOWMANY which is expressed by wiggling of fingers, as shown below in Figure 1; both signs have very high frequency and are quite productive in word formation.

| Figure 1: Basic WH signs | | | |
|--------------------------|--|---------|---|
| CODE | Picture | CODE | Picture |
| WHAT |  | HOWMANY |  |

All the discussion regarding WH signs is based on findings from naturalistic data, therefore, it is far from exhaustive but it nevertheless demonstrates the main features. WH compounds are based mainly on the two basic signs: WHAT and HOWMANY, the first mainly makes up compounds concerning questioning of specific time or space etc., while the latter mainly makes up compounds concerning duration of time and quantity. In addition, there are other simple manual markers, which fall into three main types: WHO series, HOW series and WHY series, with slight differences in semantic or pragmatic usage among the variants.

4.1.1 Formation of the WH Compounds

The identification of compounds rather than phrases is based on the practical principles propounded by Sutton-Spence & Woll (1999:102): a) the initial hold of the first sign is lost, b) any repeated movement in the second sign is lost; c) the base hand of the second sign is established at the point in time when the first sign starts; d) there is rapid transition between the first and second sign; e) the first sign is noticeably shorter than the second. According to the above principles, it seems that the WHAT series tends to add a specific time or noun for a

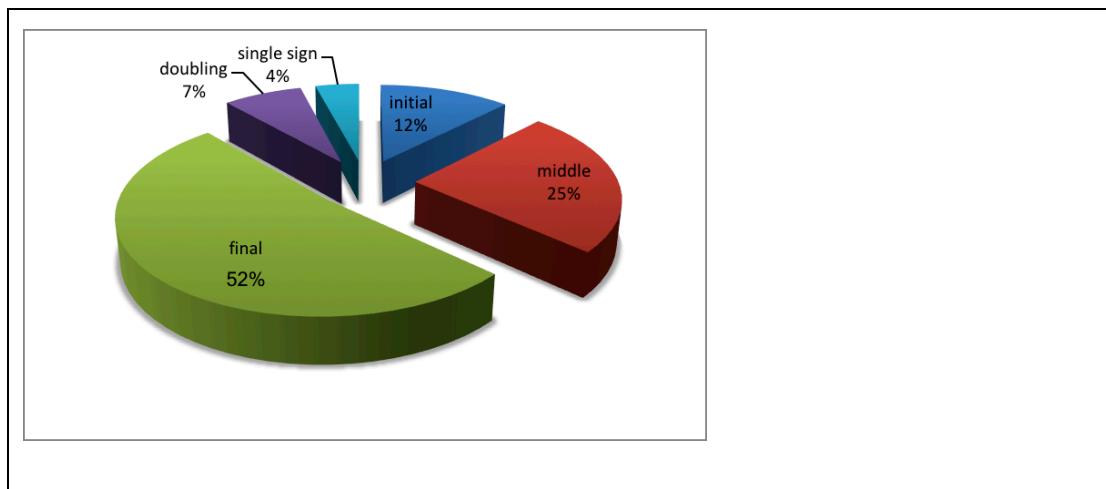
more specific inquiry with two morphemes being clearly seen, while sometimes the position of some signs can be exchanged (For example, WHAT+PLACE), so they belong to a loose compound. While for the HOWMANY series, the formation is more merged, whereby those compounds shown in the right column require only one photo for each; normally the handshape and wiggling movement are kept for HOWMANY and incorporated into the place of the other morpheme, in which the movement and handshape are dropped.

Therefore, the compounds that are based on WHAT seem to be more transparent and less fixed, with WHAT and the other morphemes appearing to be independent and those based on HOWMANY tending to be more fixed, for example, HOWMANY-DAYS, where the morpheme DAY is assimilated and only the position is kept in the compound.

4.1.2 Features of WHAT

In the data, WHAT is by far the top 1 sign in the frequency list, appearing 340 times, followed by HOWMANY (74 times) and HOW (38 times).WHAT is by far the most frequent WH signs in the data, and further analysis will be made with regard to its polysemy. We find that WHAT can function as ‘what’, ‘how’, ‘why’, ‘where’, ‘which’ and ‘who’, which is equivalent to a general WH sign, though there are other WH signs for specific function. However, its primary meaning is ‘what’, occurring 246 times out of the whole 340 times. Thus WHAT tends to be a general question sign in CSL, with the meaning of ‘what’ as its core, with other WH signs tending to be function-specific. In order to see the syntactic distribution of the WH signs, they are categorized into four types: sentence-initial, sentence-middle, sentence final and single sign. In all the 640 WH sentences, sentence-final signs account for 52% of the occurrence as shown in Chart 1. This suggests that the syntactic distribution of WH signs is not fixed, though WH finals appear in over half of the sentences. There is a tendency for WH signs to be sentence-final.

Chart 1 Syntactic Distribution of WH Signs



4.2 Manual markers (particles) in polar questions (Q2)

The interrogative manual markers can be divided into two types according to their morphological features: simple sign and compounding signs. There is one simple manual marker in the data: YES, we call it ‘tag-like’ particle. The compound manual markers consist of a series of words, and their form is semantically and di-morphologically positive-negative coordinating together, including GOOD-BAD, YES-NO etc., which is also called A-NOT-A construction in spoken Mandarin. YES tops the list of all the particles with 72 occurrences followed by GOOD-BAD.

4.2.1 YES and its function

| Figure 2 | Sign YES in Quotation Form | description |
|----------|----------------------------|--|
| PICTURE | | Crossing the index and middle fingers, moving vertically, often with mouthing ‘si’ related to Chinese word YES |

The sign YES is a very common sign, mainly functioning as an expression of affirmation in the conversation. However, when YES is used as a question marker, its mouthing is not the Chinese counterpart ‘SHI’, but rather co-occurs with /ma:/ or /a:/ (Chinese polar question marker) or something else. So if mouthing is counted as a part of the sign, the particle YES can be regarded as another sign, forming a minimal pair with YES as affirmation. It can function independently as a question marker. Let us look at the following examples. There

are two YES in sentence A. However, the first one is a linking verb like ‘be’, and the second one is a question marker. Please refer to Example (1). Interestingly, the answer B is echoed by the same YES sign. So we can see this sign as an expression of confirmation, common in dialogue.

(1). a) A: YESETERDAY Q (name) YES BEIJING PERSON/YES

B: YES

A: Is Q(name) yesterday (we met) from Beijing, right?

B: Yes.

Figure 3 Snapshots of Example 6

| YESTERDAY | Q (name) | YES | BEI | JING |
|-----------|----------|-----|-----|------|
| | | | | |
| | | | | |
| PERSON | YES | | | |

(2) YOU/FIRST/LIKE/HIM/YES

Did you love him first?

(3) S-M/HE/NO/WHAT/FRIENDS/NO/YES

SM(name) does not have any friends, right?

In examples 2 and 3, YES as a particle exhibits the following features: morphologically it co-occurs with mouthing /a/, and prosodically it is always located sentence-final and there is no pause or break that separates it from the other part of the sentence, i.e. it belongs to the same prosodic segment as its preceding constituent. Therefore, it can be regarded as a particle in the polar question. It is suspected that YES as a particle is converted from its function as a question tag, thus why Example 3 can be translated into English as a tag question. Unlike Ma in Chinese which is a pure question marker, YES also performs other functions, as a

discourse marker for affirmation in dialogues. Owing to its above-mentioned features, it can be classified as a tag-like particle.

4.2.2 A-NOT-A construction and its derivatives

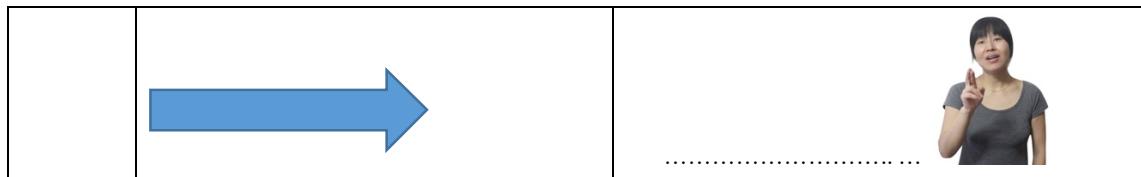
1) Morphological description of two typical A-NOT-A particles

Here A-NOT-A is used to refer to a kind of compound which functions as a particle in CSL. They are different from A-NOT-A construction in Mandarin in several ways: morphologically, many of them are further modified and look like a single sign; syntactically they behave differently from the typical A-NOT-A construction in mandarin. Two typical A-NOT-A signs are now described in detail: GOOD-BAD and YES-NO. There are two variants of GOOD-BAD, the first compound is signed by alternatively spreading the thumb or the little finger, and the second compound is signed by simultaneously wiggling the thumb and the little finger. It is widely believed that the second variant is the further fusion of two morphemes ‘GOOD’ and ‘BAD’. The first variant is also found in the data, in the emphatic expression, though the second variant appears much more frequently in free conversation, and is less transparent in meaning, see Figure 4.

The process of compounding is also shown in other compound marker like YES-NO, which seems to transform through three stages. The first variant, borrowed from spoken Chinese YES-NOT-YES is generally found in signed Chinese. The second is composed of YES plus its horizontal movement with one syllable reduced looking more like a sign. The third one is signed by repetitious twiddling between the index finger and the middle finger; this form is found in free conversation among the deaf.

Figure 4 Evolution of GOOD-BAD and YES-NO

| | | | |
|--------------|---|---|---|
| GOOD-B AD |  |  |  |
| YES-NO |  |  |  |



These compound markers are mainly located at sentence-final position, however it is also possible that they are located initially or doubled, or in the middle, as instantiated by examples (4) - (6) below.

(4) MATCH-MAKING *GOOD-BAD*

How about the match-making?

(5) ECONOMY DEVELOP *GOOD-BAD PT*

Is the development of the economy there ok?

(6) *GOOD-BAD LIGHT GOOD-BAD*

Is the light (weight) good (for health)?

2) Other A-NOT-A particles

Other compounds that can function like manual markers in polar questions include HAVE-NOTHAVE, FEAR-NOTFEAR, CAN-NOTCAN etc. It seems that these are still in the early process of lexicalization, and syntactically more random, as shown in examples 22 and 23, which suggests that they may be recent direct borrowings from Mandarin not yet internalized into the CSL system.

(7) *HAVE-NOTHAVE YOU BOY FRIEND HAVE SUPERVISE*

Has your boyfriend supervised you?

(8) *FEAR-NOTFEAR WIFE HAVE LOVE-AFFAIRS*

Don't you fear that your wife will have love affairs?

3) VV construction

VV construction is a construction of polar question in which the doubling of a verb in the sentence-final position can function as a question marker. Besides, there are some VV constructions inserted at the peripheral position of the sentence as a manual marker in CSL polar questions and it also doubles in some sentences. It is noticed that the VV construction seems to be a combination of verbs proceeding and they always occupy the peripheral position, that is sentence-final or sentence-initial. For example:

(9) *BAG NEED NEED*

Do you need the bag?

- (10) CAN CAN EVERYDAY CONTINUE WORK-OUT YOU

Can you persevere with your work-out every day?

- (11) 00 AFTER ACCEPT CAN CAN

Do you mind making friends with the people born after 2000?

4.2.3 Negators functioning as manual markers in polar questions

Though the examples in my data are only a few (no more than 15 for each sign), several negators also function ad hoc as manual markers in polar questions, which include the main negators in CSL: NOT and NO and other two less frequent signs: LIKE-NOT and PALM-UP. All these four words are negators or are strongly negation-oriented. LIKE-NOT is a verb incorporating negative meaning, and PALM-UP is supposed to be mainly a negation that developed from the gesture.

Figure 5 Negators as manual markers

| SIGNS | NOT | NO | LIKE-NOT | PALM-UP |
|--------|---|---|--|---|
| PHOTOS |  |  |  |  |

When we look at the accompanying NMMs, the head movement is the head tilt rather than headshaking, which is typical of negation, and the mouthing are /ma/, /ba/, /a/ etc. rather than the corresponding representation of Chinese, like /bu/, /mei you/. Typical of polar questions with manual markers, brow movement is not obvious and often optional and their spread is not too regular, sometimes spread of the rest of the sentence except the marker. As for syntactic position, they are located sentence-final, except LIKE-NOT which seems to be an exception, see (16) where it is located at the initial position. Furthermore, some of them are not only distributed in polar questions but can also appear in content questions being located at the end of the sentence.

- (12) SKY RAIN GO HOME NOT

Shall we go home since it's raining?

- (13) UPDATE NO

Have you updated (your mobile phone software)?

(14) I REGESTER PHOTOGRAPH PALM-UP

Have I been successfully registered in photographing match?

(15) SELF CARRY LIKE-NOT?

How come you don't bring (your own) pen?

(16) LIKE-NOT HE EAT

Wouldn't he have dinner?

To conclude, negators seem to be able to function in polar questions. However, it is uncertain if they can be regarded as particles, since their function as negators is retained, though bleached to some extent when they mark polar questions, especially for NO and NOT. LIKE-NOT, originally a negative verb, is more flexible in syntactic distribution. PALM-UP can mark both polar questions and content questions, though its position is fixed, sentence final. However, in most of the examples it appears in negative context.

5. Non-manual Interrogative Markers in CSL

5.1 will be devoted to the function of mouthing and 5.2 will be given to the analysis of intonational NMMs in CSL interrogatives.

5.1 Mouthing and Manual Markers

Though it is prevalent in the natural sign languages, the position of mouthing in sign languages has been heatedly debated in the field. This section argues that mouthing can form a part of manual signs and is sometimes indispensable in interrogative marking. Almost 600 manual markers and relevant mouth actions found in the data are analyzed, three conditions of mouth action in interrogatives are annotated around the question signs in particular: mouthing, mouth gesture and non-mouth action. As for mouthing, Crasborn et al (2008) offers a working definition: a) borrowed from spoken language, and b) lexically associated with the manual component of the sign. So accordingly, the above principle also applies to the identification of CSL mouthing: it can be traced to some particular spoken Chinese or to parts of it, whether these sounds can be heard or are visible but not voiced out. In annotation 373 mouthing is found as well as 37 occurrences of mouth gesture and 207 occurrences of non-mouth action concurrent with question signs. Looking at Table 3, regarding WH signs, four top WH signs and particles are respectively observed and their counterpart moutings are counted, with Chinese pinyin included to show the current spoken Chinese. We can see that the occurrence of mouthing accounts for about 2/3 of all interrogatives, though there are slight differences among manual signs.

Table 3 Mouthings of Manual Markers

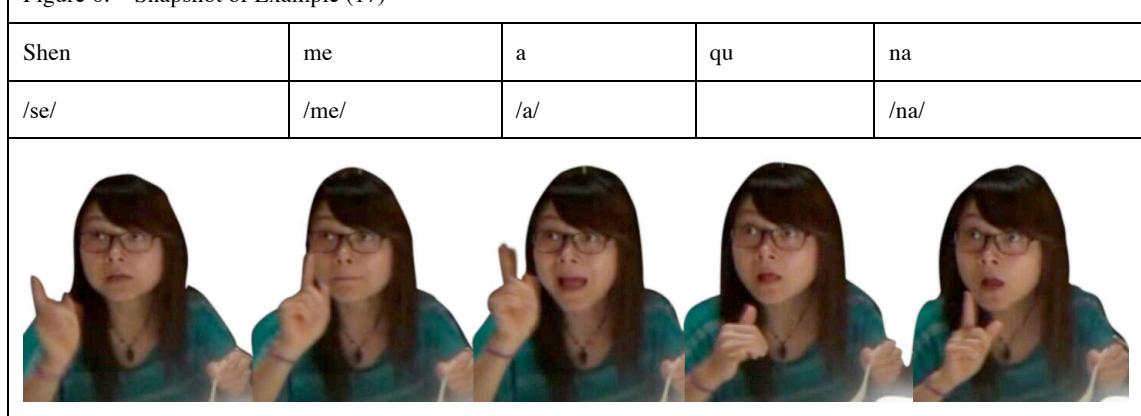
| WH signs | total | Mouthing | perc. | Chinese pinyin |
|------------------|--------------|-----------------|--------------|-----------------------|
| WHAT | 263 | 156 | 59% | /shenme/, /sei/, /na/ |
| HOWMANY | 86 | 53 | 62% | /duoshao/, /ji/, |
| WHO | 32 | 20 | 63% | /sa nin/, /sui/, |
| HOW1 | 21 | 15 | 71% | /zenme/ |
| summary | 402 | 244 | 61% | |
| particles | total | Mouthing | perc. | Chinese pinyin |
| YES | 56 | 31 | 55% | /ma/, /a/ |
| GOOD-BAD | 20 | 14 | 70% | /hao/bu/hao/ |
| HAVE-NOTHAVE | 8 | 4 | 50% | you/me/you |
| YES-NO | 5 | 2 | 40% | shi/foulbulmei |
| summary | 89 | 51 | 57% | |

Since the relation between signs and mouthing is not one to one projection but rather multiple to multiple, WHAT has various mouthing counterparts due to its own polysemy, thus /shenme/ ('what'), sui('who'), and /na/('where') are all found co-occurring with WHAT. However, it appears that the choice of different mouthing is not arbitrary. More often than not, mouthing is the only element to disambiguate between a minimal pair, see example 17

(17) WHAT/GO/WHAT

What and where to go?

Figure 6: Snapshot of Example (17)



As shown in Example 17 (Figure 6), the same sign WHAT appears both at the beginning and the end of the sentence but the mouthings are different, the initial one is /senme/(WHAT), the final mouthing is /na/(WHERE). So it is the mouthing that makes the difference. Actually, the signer appears to intend to articulate the mouthing emphatically with exaggerating mouth shape. To sum up, though mouthings of question words are not fully correspondent to spoken words, they seem to form part of manual markers, in some instances being indispensable. Mouthing is an important part of interrogative manual markers, whether for WH signs in content questions or for particles in polar questions.

5.2 Intonational NMM in the Interrogatives

Now based on the literature in 1.2, two questions regarding CSL arise:

Question 1: Which of the NMMs among the movements of eyes, head and brows are statistically dominant?

Question 2: How is the primary NMM distributed among the various questions types, i.e. Q1, Q2, WHQ1 and WHQ2?

5.2.1 Analysis of Non-manual Components

Accordingly, 1431 sentences have been selected and closely annotated, with 802 Q1, 111 Q2 and 518 WHQ2 (WHQ1 is not taken into account due to scarcity in numbers and will be dealt with separately later). 5 layers of non-manual components that may be involved in marking the interrogatives have been annotated in addition to the case of neutral position: brow raise, brow lowering, eye gaze (towards the addressee), eye widening, head tilt and neutral, which means there seems to be no NMM for the interrogatives. Table 4 shows the frequency of various non-manuals that may mark the interrogatives in 1431 interrogative sentences.

Table 4: Potential NMMs Frequency among Q1, Q2 and WHQ2, totaling 1431 sentences

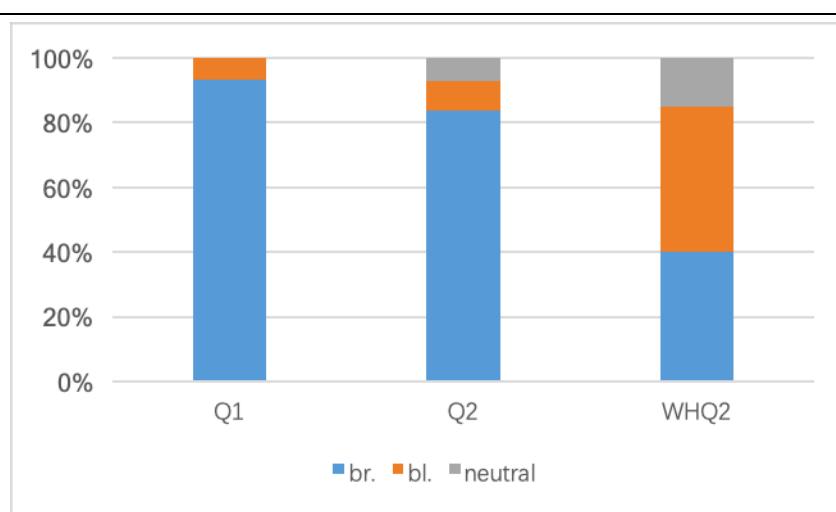
| NMM | Q1 | Q2 | WHQ2 | Total percentage (%) |
|---------------|-----|-----|------|----------------------|
| Brow movement | 802 | 103 | 441 | 94.1 |
| Eye gaze | 794 | 98 | 512 | 98.1 |
| Eye widening | 113 | 25 | 32 | 11.9 |
| Head tilt | 224 | 15 | 111 | 24.5 |

| | | | | |
|---------|---|---|----|-----|
| Neutral | 0 | 8 | 77 | 5.9 |
|---------|---|---|----|-----|

With reference to Table 4, first, let us look at the movement of eyes in the data: eye gaze and eye widening. Eye gaze appears most frequently; however, eye gaze may not be a marker for interrogatives. Since interrogatives in the data are mainly from dialogues in free conversation, eye gaze at the end of sentences functions mainly as a tool for presenting the turn (Vogt-Svendsen 1990). As most of the data is collected from dialogues it is not surprising that eye gaze appears to be widespread at the end of sentences. As far as eye-widening is concerned, its frequency is 22% in Q1, 6% in Q2 and 11% in WHQ2, and they do not often last through a whole sentence, mainly appearing in the second part of the interrogative. Therefore, eye-widening may not be a regular interrogative NMM in CSL. As for head-tilt, its frequency is 13% in Q1, 22% in Q2 and 42% in WHQ2 and its overall frequency is 28% in interrogatives. When 130 sentences are randomly selected, containing both head-tilt and brow movement, we find that these overlap in the timeline in 65% of the sentences.

Moving to brow movement as shown in Chart 2, we find that overall brow raise far outnumbers brow lowering (1050 vs. 296). And brow raise, brow lowering and neutral position of brow are complimentarily distributed. In Q1, brow raise accounts for 93% and brow lowering occupies 7%; while in Q2, brow raise, brow lowering and neutral make up 84%, 9% and 7% respectively. Finally, in WHQ2 they account for 40%, 45% and 15% respectively.

Chart 2: Frequency of Brow Movements in Q1, Q2, WHQ2



5.2.2 Further Investigation of Brow Movement

Having clarified the role of brow movement in interrogatives, let us further measure its spread(or scope) in CSL to see if brow movement can be compared to intonation in some spoken languages. As for spread measurement, as a basis for discussion, three spreads are labelled as following:

Spread Type 1: spread covering the whole sentence;

Spread Type 2: spread covering part of the sentence;

Spread Type 3: spread covering one single sign (however, if one sign is a whole sentence, it will be allotted to 1, so 1br or br1 means brow raise covering the whole sentence)

According to the statistics for over 1000 sentences, in total, spread covering whole sentences accounts for 76%, spread covering part of the sentence 8% and spread covering single signs (mainly the last word) 16%. When we look at the different brow movements, brow raise spread over the whole sentence is found in 602 out of 642 sentences in Q1 accounting for 94%, for Q2 whole sentence brow spread is found for 69 out of 114 accounting for 61%, and for WHQ2 about 52%. Similarly, the spread of brow-lowering accounts in total for 85% or 41 out of 47 sentences in Q1, 82% out of Q2 and 51%, or 105 out 206 sentences in WHQ2. To sum up, brow movement normally spreads over the whole sentence in Q1, less often in Q2 although the frequency is still dominant, and least often in WHQ2 barely spreading over half of the sentence in WHQ2, with one third of NMM spread falling on a single sign. When we further examine those brow movements that overlap with WH signs, they only account for one third of the total occurrences. This suggests the spread of NMMs in WHQ2 is not predictable at all.

5.2.3 NMMs in WHQ1

There are 29 content questions without WH signs, which means the NMMs are their sole markers. Examining the data respectively, NMMs in WHQ1 are brow movement (half raise and half lowering) covering the whole sentence. It seems that these sentences simply drop the WH signs, which are supposed to be provided by the receiver; the speaker expects the person

he or she talks to be able to infer his hints and cues from the context and to complete the gaps. Thus, we can deduce from the answers what has been omitted.

(18) HAPPEN TIME

When did it happen ?

(19) GLASSES-WEARING THINK NAME

What's the name of the teacher who wore the glasses?

To sum up, as for Question 1, brow movement is the dominant NMMs in interrogatives, with head tilt as secondary and optional NMMs. While other NMMs, like eye gaze, eye open etc. seem to be irrelevant in marking interrogatives. Within brow movement, brow raise is the most salient feature in Q1 and Q2, and one of the two most frequent NMMs in WHQ2. As for Question 2, how brow movement functions and interacts with the manual markers in different question types is summarized as follows:

1) Brow raise in Q1 and Q2

According to the statistics, the brow raise spread over the whole sentence is the primary non-manual marker in Q1 (90%) and brow raise spread over the whole sentence accounts for 63% in Q2, which is much lower than Q1 and higher than WHQ2. Similar to WHQ2, the brow movement fall on the single sign occurs in 34% of the sentences in Q2. No NMM is found in about 13% of the sentences in Q2, which is also similar to WHQ2.

2) Brow movement in WHQ1 and WHQ2

NMMs in WHQ2 are dubious, and at most play a secondary role in marking WHQ2 due to the following three factors: a) spread of the brow movement over the whole sentence occurs in only a weak majority (about 51%) of sentences, b) brow movements, i.e brow raise plus brow lowering fall mainly over the final sign in about one third of the WHQ2, while in WHQ2 brow movement over the whole sentence is the dominant marker. Since question words are often located finally, NMM fall mainly over question words; however, when question words are otherwise located, the NMM are normally spread over more than one sign. Therefore, NMMs, represented by either brow raise or brow lowering or both, play a secondary role, if any, in marking content questions.

6. Discussion

In the investigation of manual markers in Section 4, both WH signs in content questions and particles in polar questions have been explored. There are two basic WH signs: WHAT, which can be denoted by any WH sign except the one denoting quantity, which is realized by HOWMANY. Both signs make up the compounding series specifying the content that is requested respectively. The syntactic distribution of WH varies with sentence-final as the preferred position.

As far as the particles are concerned, these basically consist of three types: YES, A-NOT-A signs and negators. YES is a particle that may originate from question tag. A-NOT-A signs form a continuum, one extreme being a direct borrowing from spoken Chinese and the other extreme is a grammaticalized simple sign like GOOD-BAD. This construction seems still to be productive in shaping new forms of particles while negators can also function as manual markers in polar questions with certain limitations.

As for NMMs in interrogatives, these falls into two types: mouthing and intonational NMMs. Mouthing is mainly bound with the particles and WH signs function at the morphological level marking interrogatives. Their function cannot, however, be ignored and has been little covered as yet in the research. Intonational NMMs refer mainly to the movement of eyes, brows and head. From the investigation explored in detail in Section 5.2.1, brow movement is found to be the primary NMMs in interrogatives. In Section 5.2.2, it is postulated that brow raise is the most important of all the NMMs, being the sole marker in polar questions without manual markers. Brow movement in interrogatives with manual markers plays an optional role in that its spread is less regular in WHQ2 than in WHQ1.

Table 5 shows the distribution of markings across various types of interrogative. If we set up a measurement to label the weight of various markings across the question types, to be more specific, - = non-marking, + = weak major marking, ++ = absolute major marking; +++ = sole dominant marking). As we can see, brow movement, as intonational NMM and manual markers, including WH signs and particles, is basically complementarily distributed in interrogative marking. For example, brow movement is the sole marker where the manual marker is absent, is less important where there are lexicalized manuals, i.e. particles, and least important where there are strong manuals markers like WH signs.

Table 5 the distribution of marking mechanisms among various type of interrogatives

| Marking types | Polar questions | WH questions |
|---------------|-----------------|--------------|
|---------------|-----------------|--------------|

| | | Q1 | Q2 | WHQ1 | WHQ2 |
|---------|---------------|-----|-----|------|------|
| Manuals | WH signs | - | - | - | +++ |
| | Particles | - | +++ | - | - |
| NMMs | mouthing | - | ++ | - | ++ |
| | brow movement | +++ | ++ | +++ | + |

6.1 CSL interrogative construction across sign languages

A statistically-driven attempt to deal with naturalistic data regarding CSL interrogative construction enables a finer analysis of the marking mechanism of CSL interrogatives. I have found it follows the basic paradigm: manuals are mainly applied to mark WH questions, and non-manuals are used as the dominant marker in polar questions, from a statistical perspective. However, as shown in Table 5, one salient characteristic in CSL is that manual markers are adopted in marking one third of polar questions; wherever manual markers increase, there is a relevant decrease from NMMs as exemplified by the cases in Q2 and WHQ1, which appear atypical for interrogatives in that Q2 is mainly marked by manuals and WHQ1 by NMMs. As we have demonstrated above, there is a system of particles in CSL for marking polar questions, each of which seems to be active and productive, for example, the A-NOT-A particles form a continuum among borrowed and fully grammaticalized items. It seems that particles can be derived from gesture (palm-up), written form (QM in ASL), or borrowed directly from spoken languages like MA in TSL and KA in JSL, as shown in Table 6. Interestingly, almost all types of forms also appear in CSL.

Table 6 Particles Distribution Across the Sign Languages other than CSL

| Codes of the particles | Sign languages | References |
|------------------------|----------------|--|
| PALM UP | NGT, NZSL, FSL | Coerts(1992); McKee and Wallingford(2011), Savolainen (2006) |
| A-NOT-A | HKSL, TSL | Tang (2006), Chen(2012) |
| YES-NO | LSE | Zeshan (2004) |
| QM | ASL | Fischer (2006) |
| Borrowed particle | JSL, TSL | Zeshan(2006), Morgan(2006) |

Tang (2006) reported that two basic WH signs are WH1 and WH5, identical to WHAT and HOWMANY in CSL both in form and function , also A-NOT-A particles. CSL in this paper shows more variety in particles, including YES, other forms of A-NO-A particles, like GOOD-BAD, which can appear only in sentence-final position, while both sentence-initial and final seem to be possible in CSL. On the other hand, regarding the function of NMMs in interrogatives, HKSL and CSL are quite similar. It is not surprising to find similarity between HKSL and CSL in that they are generically related (Sze et al 2013). I suspect that some differences between CSL and HKSL in interrogative marking may arise from different approaches; Tang (2006) based her discussion on elicited data while the methodology adopted in this paper enables us to observe more detail in a descriptive way.

6.2 Implications from typological perspective

According to Zeshan 2013, it seems that we can divide sign languages into two types: particle-poor and particle-rich sign languages. Most Western sign languages belong to the former while some East Asian sign languages belong to the latter, including CSL which is a typical particle-rich sign language. When there exists a variety of particles in a particular sign language, these can replace NMMs in marking the polar questions. There are two basic mechanisms for marking interrogatives in sign languages: manual and non-manual markings. We have also noted in this paper how NMMs compete with manual markers in interrogative marking to form a complementary distribution; such a mechanism is also in accord with the principles of general linguistics.

Closer observation based on the naturalistic data discloses that there is no significant interaction between question words (WH words and particles) and NMMs. NMMs are optional for marking WH questions as long as WH words are present. In addition, mouthing should be considered as part of NMMs functioning, like tone in spoken languages, playing an optional role in CSL by accompanying question words.

Influence of the spoken language has been proposed to account for the emergence of particle-rich languages. In the context of our discussion of Mandarin Chinese, we find the paradigms and mechanisms of manual markers (WH words and particles) in CSL is very similar to the WH words and particles in spoken Mandarin Chinese. It is probable that the CSL construction of interrogative marking is heavily influenced by spoken Chinese. However, there are some unique forms, which cannot be explained simply by language

contact, for example, the VV construction used as particles, see Example (9)-(11) and the doubling of A-NOT-A particles in CSL, see example (6), all of which are not found in Mandarin Chinese. I postulate that internal reconstruction triggered by language contact is the main driving motivation shaping current CSL interrogative markings. First and foremost, CSL is susceptible to the question particles and similar constructions evidenced in surrounding spoken Chinese. As we can see, CSL mouthings of relevant spoken particles are prevalent due to their ease of perception and production; many question particles are monosyllabic and of the open-mouth type in spoken Chinese. Some particle forms, see Figure 4, have found their way into CSL by borrowing and then being reconstructed, or through the process of grammaticalization. Other forms, like negators, are also ‘infected’ with particle-like functions in that their syntactic distribution is sentence final, and often overlaps with question particles. On the other hand, it is quite possible that some Western sign languages, surrounded by particle-poor spoken languages, draw upon gesture or written form (like palm-up and QM) for the manual marking of polar questions.

7. Conclusion

Natural language does not always follow the rules very strictly, unlike written languages. The small corpus I have built up based on naturalistic data shows rich phenomena similar to the interrogative construction in CSL. In this paper, I have explored in-detail the manual and non-manual marking system of CSL interrogatives and their complementary distribution across the various types of interrogatives. Their interaction within one type of interrogative is not significant. Mouthings, however, as special NMMs, could be construed as the tone of the manual markers. This paper suggests further research on the interrogative construction of sign languages from the typological approach and presupposes a wider and more general investigation of many sign languages based on large-scale naturalistic data. A case in point, we do not know much about the sign languages which are surrounded by particle-rich spoken language communities except for Chinese, Cantonese to see if they behave like CSL or not. Moreover, sign language is an interactive language depending on real time and face-to-face context. There are many factors that will find their ways into the form of the sign language, including socio-cultural and historical effects (Lucas et, al. 2001). More research should be conducted from socio-linguistic perspective in order to identify and analyze different factors in the variation and change of sign languages.

To sum up, a) corpus-based research on interrogatives is called for; b) it is speculated that manual and non-manual markers are complementarily distributed in interrogatives in sign language. c) manual markers, to be more specific particles, can be the dominant marker in polar question, d) The isomorphism between CSL and Chinese, both of which are monosyllabic, with no-WH movement, and morphologically-poor, renders CSL a particle-rich language.

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