NANYANG TECHNOLOGICAL UNIVERSITY

SCHOOL OF HUMANITIES AND SOCIAL SCIENCES

Investigation of Classifiers in Singapore Sign Language through Narratives: A Pilot Study

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Declaration of Authorship

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No part of this Final Year Project has been or is being concurrently submitted for any other qualification at any other university.

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ABSTRACT

Several sign language corpora such as the British Sign Language corpus have been set up over the years, providing a platform for extensive research to be done on classifiers. Yet little is known about the Singaporean variety as the Singapore Sign Language (SgSL) Corpus Project only kick-started recently. Focusing on video recordings of 12 SgSL users from varied sociolinguistic backgrounds, this study describes in detail the usage of prototypical classifiers in SgSL in terms of handshape-orientation combinations and structural patterns of occurrences. In addition, it explains why variance in classifier handshapes and morphemic functions occur. Entity classifiers were the most commonly produced classifier type, and together with Instrumental classifiers, the handshapes of the most commonly used classifiers in these two categories were found to be similar to those used in American Sign Language and Hong Kong Sign Language. Handling and Shape and Size Specifier classifiers were also found to be multi-morphemic and grammaticized in SgSL, suggesting that the most commonly used classifiers from each classifier type are highly lexicalized in SgSL, allowing them to remain stable and highly productive. This pilot study on classifiers thus serves to provide an avenue for future research, while highlighting issues of variation in SgSL.

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1 INTRODUCTION

How does one address a lexical item which has verb-like properties but seems to represent a whole set of entities and provide descriptions on the features of that particular group all at once? ‘Depicting signs’, ‘polycomponential signs’, ‘polymorphemic signs’ – these are just some of the names used by researchers investigating the grammatical construction of classifiers in sign languages (Cormier, 2014). Despite being a well-researched topic, there are still many issues about the nature of classifiers that remain unsettled. For example, while Supalla (1982) emphasizes that individual classifiers are made up of several morphemes, Liddell argues that there are some features in classifiers that have too limited productivity to regard them as morphemes (Liddell, 2003, p.216). Furthermore, although an extensive amount of effort has been spent on categorizing classifiers into different classifier types, the definition of these categories still vary among researchers, making it hard to determine the linguistic context in which each classifier type occurs.

The term ‘classifier’ was coined by Frishberg (1975) when he attributed the double index handshapes () used for the word ‘meet’ in American Sign Language (ASL) to “classifiers for human beings” (pp. 715). Although Frishberg claims that “many of these classifiers are productive and analyzable” (1975, pp. 715), there is a need to investigate the use of classifiers in languages beyond ASL, as different classification systems do exist across sign languages, be it in handshape, classifier type, or the environment in which these tokens occur. One such language is the native variety used in Singapore, Singapore Sign Language (henceforth SgSL). It is unique in that its linguistic makeup is greatly influenced by a variety of sign language systems, but at the same time, this diversity in influences also causes the issue of variance in the signs produced. While its American counterpart has been well-researched on, the grammatical constructions in SgSL have been barely investigated on, much less on the usage of classifiers. Hence, this research project is a pilot study aiming to discover more about classifiers used in SgSL, and to shed new light on the types of classifiers available in the local variety, as well as their functions.

2 LITERATURE REVIEW

This section reviews previous research with reference to studies on classifiers, the Singapore context, and the use of narratives in corpus studies.

2.1 Classifiers

2.1.1 Classifiers in the spoken language

Early studies on sign language classifiers were very much influenced by studies on spoken language classifiers, and it has been established is research that the latter consists of different classifier systems (Zwitserlood, 2012, p.175). The closest system to the one used in sign languages would be the verbal classification system, where verbal classifiers are bound morphemes affixed to verbs and associated with verb arguments (Zwitserlood, 2012, p.176). Classifiers in sign language exhibit similar properties in that they behave like affixes (Supalla, 1982, p.24), and are linked to referents. Another similarity lies in variability where spoken languages allow a noun to be categorized under more than one classifier, and sign languages allow an entity to be categorized under various classifiers as well (Zwitserlood, 2012, p.178). However, there are differences too, whereby classifiers in spoken languages can occur on nouns and determiners on top of verbs, but classifiers in sign language are restricted to acting on the verbs only (Zwitserlood, 2012, p.178). In addition, the hand configurations in sign language allow all entities to be classified, whereas not all nouns are classified in spoken languages (Zwitserlood, 2012, p.179).

2.1.2 Definition of classifiers in sign language

Applied in various sign languages, manual features make up four out of the five sign parameters with handshape, orientation, movement, and place of articulation; the fifth parameter belongs to non-manual features such as facial expressions (Johnston & Schembri, 2007a, p.117). Like phonemes in spoken languages, the parameters are the smallest formational units in sign, and hence are combined to form a single meaningful unit in some signs (Johnston & Schembri, 2007, p.118). However, researchers suggest that they can also be individually meaningful in certain signs, such as in classifiers where each parameter performs a different function (Johnston & Schembri, 2007a, p.118). According to Brentari (2010, p.287), classifiers found in sign languages are multi-morphemically constructed with a verbal root (actualized by the movement of the sign) and affixes involving other manual features such as handshape, orientation and place of articulation. This means that in sign language classifiers, the whole handshape and other different manual features associated with

the handshape all carry meaning and contain different types of information pertaining to a particular class of referents (Brentari, 2010). For example, by changing the 1-handshape and upright orientation in CL(1-UPRIGHT):PERSON-MOVES-TOWARDS to a b-handshape and vertical orientation, we get a different classifier CL(B-VERT):VEHICLE-PASSES-BY representing a different entity of different shape and size and a different path of movement, indicating that the two parameters, handshape and orientation, carry different meanings on their own (Johnston & Schembri, 2007a, p.117). Thus in cases where classifier signs resemble lexical or verbal signs, they can be differentiated based on the functions of their parameters; the latter usually requires the parameters to be combined into one meaningful unit, rather than have meaningful units assigned to each parameter (Johnston & Schembri, 2007a, p.118). Since classifiers do not make use of non-manual features, for the purpose of data analysis in this study, classifiers would be examined based on manual features, and identified as signs that:

(i) contain two or more parameters with different meanings/functions AND
(ii) represent a class of referents (e.g. people, vehicles, instruments), AND
(iii) - describe the shape and size of a referent, OR
- demonstrate how the referent moves or how it is handled, AND/OR
- convey how the referent relates to other referents

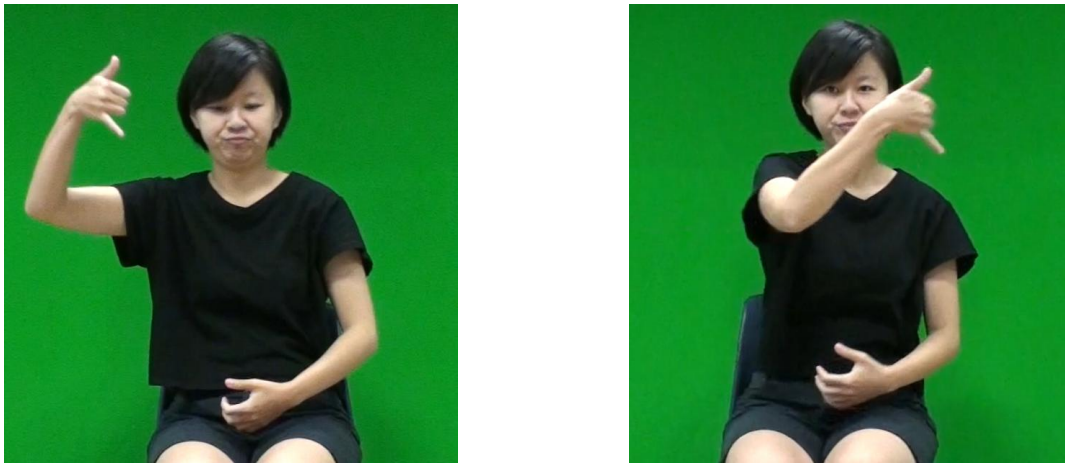
Classifiers also have other properties such as being arbitrary and language-specific, such that the same referent can be represented by different handshapes in different sign languages, and even if the same handshape is used across different sign languages, it could represent different entities and mean different things (Brentari, 2010, p.252). While signs made by two hands usually contribute to the making of one lexical sign, classifier signs allow the handshapes made by both hands to represent two different entities (Brentari, 2010, p.269). Unlike non-classifier signs which tend to become symmetrical over time when made with two hands, classifier signs do not become symmetrical if one handshape contains meaning independent of the other (Frishberg, 1975). Furthermore, variations in handshape and orientation can also help to distinguish primary and secondary roles between the two different classifier handshapes (Brentari, 2010, p.271).

2.1.3 Classifier types in American Sign Language

Since American Sign Language is one of the most documented sign language systems to date, this paper will refer to classification terms adapted from ASL. Also, in line with the

definition given above, the classifier types further explained below would be accompanied by movement types such as location, path, manner of motion, and tracing of size and shape of object. To signify location of objects, a stamping movement is used for each classifier (Leeson & Saeed, 2012, p.91). Path movement tends to show the general movement of an object from one location to another (for e.g. a classifier moving from right to left), whereas manner movement specifies the movement of the object (for e.g. the speed of movement of a classifier). Lastly, the tracing of an object is usually an iconic description of the object, i.e. the outline of its size and shape (Leeson & Saeed, 2012, p.91).

(i) Entity classifiers (ECLs)



Starting position *Ending position*

Figure 1: Participant C describes Sylvester (an entity) swinging across a building with CL(Y-LATERAL):ANIMAL-MOVES in Clip 6

Handshapes under this category represent an entity as a whole, and can be iconic or abstract in nature (Brentari, 2010, p.298). ECLs have a variety of finger combinations, contributing to both marked handshapes (such as  representing an airplane) and unmarked handshapes (such as  representing a person). The combination of fingers selected to form the handshape do not represent the shape and size of a specific referent (Brentari, 2010, p.298), that is, a change in one finger would change the meaning of the handshape and represent a different object altogether. ECLs are usually used together with movements that represent location in space, orientation, path and manner (Liddell & Johnson, 1987).

(ii) Instrumental classifiers (ICLs)

Classifiers under this category also represent whole objects, but are more iconic as compared to ECLs and more representative of physical attributes portrayed by the tools described (Brentari, 2010, p.298). This means that fingers selected to form handshapes can be altered to represent changes in size and shape of the object; for example,  can be used to represent a thin brush, while  can be used to represent a thicker brush (Brentari, 2010, p.298). ICLs are mostly used together with path and manner movements, as well as orientation movements.

Starting position

Ending position

Figure 2: Participant E describes how an antenna (an instrument) is being used to electrocute someone with CL(X-VERT):ANTENNA in Clip 6

(iii) Shape and size specifier classifiers (SASSCLs)

Unlike the previous two categories, SASSCLs do not represent whole entities; instead, they outline the shape and size of referents, and are thus used together with tracing movements (Liddell & Johnson, 1987). As such, they can be used to represent the perimeter, depth and width, and surface of an object. The types of handshapes used in this category are more restricted as compared to those in ECLs and ICLs.

Starting position

Ending position

Figure 3: Participant C describes the shape and size of a wire with CL(9-VERT):LONG-THIN-OBJECT in Clip 6

(iv) Handling classifiers (HCLs)

While the previous three categories describe or represent an entity, HCLs are used instead to describe the shape of the hand manipulating the object (Brentari, 2010, p.300). Here, changes in fingers selected to form handshapes would thus indicate a difference in size of objects being handled (Brentari, 2010, p.301). Handshapes used in this category are also more gestural in nature as compared to the other three categories (Slobin, Hoiting, Kuntze, Lindert, Weinberg, Pyers, Anothony, Biederman & Thumann, 2003) as they often mimic the way objects are handled, such as using  to pick up an apple. Hence, HCLs are often used together with manner and path movements.

Starting position

Ending position

Figure 4: Participant C using CL(S-LATERAL) to re-enact the way Sylvester held on to a rope when he swung across the building

2.2 The Singapore context

2.2.1 Background of Singapore Sign Language and its current status

Unlike ASL which boasts a long history of documentation, SgSL is still in its early stages of documentation as the SgSL Corpus Building Project only kick-started recently. Following Ang, Low, Mak, Kratochvil and Wang's study (2015), SgSL stems from Shanghai Sign Language (SSL) which was first introduced by Mr Peng Tsu Ying in 1952, following which the development of SgSL during the 1950s resembled that of Hong Kong Sign Language (Sze, Lo, Lo & Chu, 2013). It was only in 1977 that SgSL started to be influenced by other sign language systems; the enactment of the Bilingual Education of policy in Singapore required all children to be taught English and this caused deaf educators to turn towards ASL and thereby adopt Signed Exact English (SEE2) as the language of instruction (Ang et al., 2015). With the implementation of the latter, SSL was phased out of the curriculum, giving rise to a lingua franca, now known as SgSL, reflecting elements from SSL, ASL, manually coded English, as well as unique Singaporean lexical innovations coined over the years (Ang et al., 2015). Due to this multilingual influence, current research shows that many concepts can be expressed by two or more synonymous signs, with ASL-derived signs being more widely used by the younger generation, and SSL-derived signs still being used by the older Chinese-educated generation (Ang et al., 2015). With this variation in linguistic repertoire across generations of signers in Singapore, the linguistic makeup of SgSL remains a much debated topic within the local Deaf community, thus emphasizing the need to officially build a corpus for SgSL in order to understand the language more. While the SgSL Corpus Building Project is currently underway, there is still a lot more work to be done in terms of data collection and analysis of grammatical constructions.

2.2.2 The need to document SgSL

As of 2007, only 3,000 deaf SgSL users in Singapore were reported (Lewis, Simons & Fennig, 2016), even though there may be as many as 360,000 people in Singapore with hearing loss (Low, 2005). This indicates that the language status of SgSL is not very stable in the community, especially with the increasing number of deaf youths below the age of 19 entering mainstream schools in recent years (The Singapore Association for the Deaf, 2015). Although positive attitudes towards SgSL have been reported (The Singapore Association for the Deaf, 2016), the language is still in its developing stage, and there is a lack of consensus on what SgSL really is, as discussed in the section earlier. Given that language use in deaf communities is heterogeneous in that native signers may not even agree on conventionally

used signs (Johnston & Schembri, 2007b, p.146), there is a pressing need to document the language and create a corpus so that an extensive variety of signs can be collated and analyzed. Building a corpus not only enables researchers to verify and decipher grammatical patterns and discourse structures of the local variety (Johnston & Schembri, 2007b, p.148), it also helps SgSL to be recognized as the native sign language of Singapore, and the deaf community in Singapore to be further recognized as a linguistic minority. Investigative studies focusing on the structure of SgSL would thus contribute to the corpus in terms of data collection and analysis, enabling language teaching materials on SgSL and deaf educators' training materials to be developed.

2.3 Use of narratives to elicit gestures and signs

In order to elicit specific grammatical constructions from languages, some corpus projects have used a variety of elicitation tasks, such as video stimuli comprising of animation movie clips (Orfanidou, Woll & Morgan, 2015). With the intention to bring forth representations of motions together with a subset of referent types, such video stimuli was found to be very effective and useful in eliciting classifiers in sign languages (Orfanidou et al., 2015). It was noted that sign language studies widely employed narratives as elicitation methods, one of which was the use of an episode called "Canary Row" from the Warner Brothers' *Tweety and Sylvester* cartoon series (Orfanidou et al., 2015). This methodology originated from gesture studies (McNeill, 1992) and has since been used for sign language research. Other than video stimuli, written stimuli has also been used to elicit narratives, such as "The Hare and the Tortoise", an Aesop fable used in the Auslan corpus project (Orfanidou et al., 2015). While the current SgSL Corpus Building Project has dabbled with written stimuli, video stimuli would be used for this study instead, in consideration of participants who might be illiterate.

2.4 Research issues

Given that Singapore Sign Language (SgSL) is greatly influenced by Shanghai Sign Language, American Sign Language (ASL), Signed Exact English (SEE2), and locally developed signs, this study aims to find out if like its American counterpart, SgSL uses classifiers too through elicitation of such signs via video stimuli. If so, it would be interesting to find out if there are also any differences in categories and functions in the classifiers used, since SgSL has been recognized by the local deaf community to be a reflection of Singapore's diverse linguistic culture. Hence, following the review of the literature above, the research issues for this project may be specified as follows:

(i) To find out if classifiers are used in Singapore Sign Language;
(ii) To identify handshape categories of classifiers used in Singapore Sign Language;
(iii) To investigate structural patterns of classifier occurrence in Singapore Sign Language.

Although there has been extensive research done on the usage of classifiers in other sign languages such as ASL and Hong Kong Sign Language, little or no research has been done on the usage of classifiers in SgSL. Research found pertaining to SgSL focused mainly on the derivation of the language, but little has been done to investigate the structure of the language. While there has been an effort to build up the SgSL corpus, no present work has been done on the area of classifiers: this project is a pioneer. Findings on this research study could therefore contribute to the existing SgSL Corpus Project, and offer insights on the characteristics of classifiers used in SgSL.

3 METHODOLOGY

This section of the paper describes the methodology used to collect and codify data relevant to the field of classifiers, of which were retrieved from signs made by Deaf bilinguals.

3.1 Profiles of people involved in the study

3.1.1 Participants

PARTICIPANT	AGE GROUP	GENDER	DEGREE OF DEAFNESS	VARIETIES[1] OF SIGN LANGUAGE KNOWN
A	18-30 years old	Male	Both ears profound[2]	SgSL, PSE, SEE2, ASL
B	18-30 years old	Male	Both ears profound	SgSL, SEE2, ASL
C	18-30 years old	Female	Left: moderate Right: profound	SgSL, PSE, SEE2, ASL
D	31-40 years old	Male	Both ears profound	SgSL, SEE2, SSL
E	31-40 years old	Female	Left: mild Right: severe	SgSL, PSE, SEE2
F	31-40 years old	Female	Both ears profound	SgSL, SEE2, SSL
G	41-50 years old	Male	Left: severe to profound Right: profound	SgSL, PSE, SEE2, ASL
H	41-50 years old	Male	Both ears profound	SgSL, PSE, SEE2, ASL
I	41-50 years old	Female	Left: severe Right: profound	SgSL, PSE, SEE2, ASL, SSL
J	51 years and above	Male	Both ears profound	SgSL, PSE, SEE2, ASL, SSL
K	51 years and above	Male	Left: severe to profound Right: profound	SgSL, PSE, SEE2, SSL
L	51 years and above	Male	Both ears profound	SgSL, ASL, SSL
X1[3]	51 years and above	Male	Both ears profound	SgSL, SSL
X2	51 years and above	Female	Both ears profound	SgSL

Table 1: Profiles of participants

In order to capture the widest range of signs available in the Singapore Deaf community at present, the participants recruited for this study included Deaf people from various age groups, genders, signing communities, and family backgrounds. All participants were recruited through personal contacts and the help of the Singapore Association for the Deaf (SADeaf); recruitment was done via word of mouth to ensure that participants' profiles matched the criteria of this study – deaf and uses SgSL. A total of 14 participants were

[1] SgSL: Singapore Sign Language; PSE: Pidgin Signed English; SEE2: Signed Exact English; ASL: American Sign Language; SSL: Shanghai Sign Language

[2] Severity of degree of deafness: mild < moderate < severe < profound (The Singapore Association for the Deaf, 2016)

[3] Both participants X1 and X2 were not included in the data analysis (discussed in Section 4)

recruited, all of whom are bimodal bilinguals. This means that they are proficient in sign language, and can understand instructions in a written language as well. The categorization of participants is shown in Table 1.

3.1.2 Researcher and deaf facilitators

In order to partake in a study that involves judgment on sign language, one must first be acquainted with some sign language knowledge. The researcher has attended classes on SEE2 (up to Beginners' Level 3) and SgSL, undergone basic training for sign language interpreting, and has a 1.5 year experience of tutoring a profound deaf student via sign language. She is able to communicate effectively with members of the Deaf community, and has deaf friends whom she uses sign language with. Therefore, her knowledge on sign language is proficient enough to make credible judgments on SgSL for the purpose of this study.

To ensure that information was transmitted as accurately as possible to the deaf participants, the researcher sought help from 2 deaf facilitators during the conduction of the experiment. One has linguistic training and is a native SgSL user, while the other is a native Malaysian Sign Language user, bilingual in SgSL.

3.2 Procedure

3.2.1 Acquiring consent

As the data collected from this study would eventually be shared online for the purpose of research, the signers filmed in this study will be identified and their input may be looked at by responsible individuals from relevant research fields. Therefore, permission was asked from participants to release the data under a Creative Commons Attribution License (CC BY) prior to filming, as only those who agreed will be filmed. The license allows the data collected to be shared and adapted for any purpose, as long as it is given proper attribution[4] (Creative Commons Corporation, 2014). Deaf facilitators were asked to explain in sign language to participants who were unsure of any technical terms in the license, so that they fully understood how the data would be used.

3.2.2 The main study

The participants were shown 7 separate video clips from *The Canary Row*, an episode of the cartoon *Tweety Bird and Sylvester*. Each clip narrates a different scenario of Sylvester attempting to capture Tweety bird, of which lasts between 24 and 66 seconds. 1 clip was used

[4] The full license can be found in Appendix E

for a pre-test[5] to ensure that participants understood what was required from the task, while the other 6 clips were used in the actual study. The cartoon episode was broken down into several parts so that the participant could retrieve as much information as possible from his/her memory. This ensured a detailed visual description as participants were required to narrate what they saw in SgSL after viewing each clip.

Participants were given instructions to narrate the scenarios according to what they saw in detail to the moderator of the session, and that the description process would be videotaped as data for building the corpus. There was no mention of the experiment being related to the usage of classifiers to avoid priming, but the process was filmed for this purpose. A confederate (the moderator) was used in this situation to encourage the participant to reenact the scenarios more accurately in a storytelling manner, which could possibly illicit more classifier signs subconsciously.

The Canary Row was chosen because this particular episode has been commonly used in studies to illicit co-speech gestures, such as in Mcneill's (1992). Also, it has been shown in other studies that the use of stimuli, in this case the video clips, ascertained the presence of classifiers in collected data (Pfau, Steinbach & Woll, 2012, p.180), with classifiers occurring at a higher rate in narratives than in casual speech (Morford & Macfarlane, 2003), hence a stimuli was used in this study. Given that this stimulus has already been used in many studies, this would also thus be convenient and useful for cross-linguistic comparison.

Lastly, an interview[6] was conducted to understand more about the participants' linguistic history and social background. Information attained from the interviews will be contributed to the Meta data of the corpus.

[5] The clip taken for the pre-test was not analyzed in this study
[6] The interview questions can be found in Appendix B

3.2.3 Setup of study

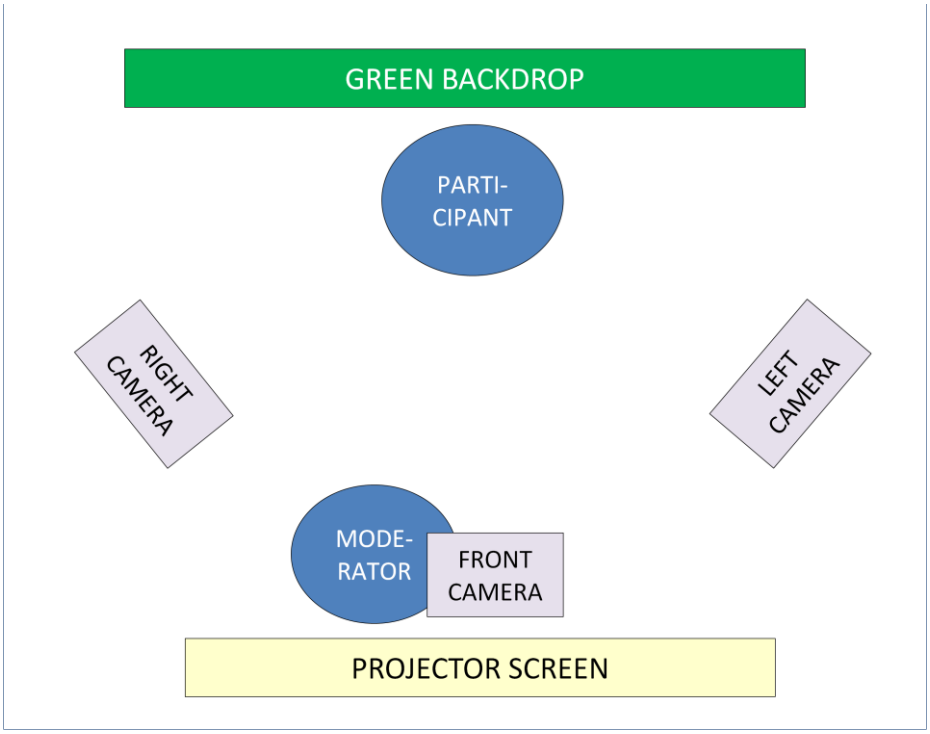


Figure 5: Aerial view of recording setup (picture not drawn to scale)

The video recordings were done in a well-lit enclosed room measuring at least 5m by 5m, with ceiling height of at least 3m, in order to capture the full signing window of participants. The recording location was at SADeaf, a place familiar to the participants so that they would be comfortable enough to produce natural signing. During a recording session, the participant was seated on a chair in front of a green-colored backdrop. Three HD cameras were set up: one provided a frontal view of the participant, while the other two captured the participant's signing from the sides at an angle. All three cameras were mounted on tripod stands, and elicitation material shown to the participant was presented on a projector screen in front of the participant and behind the frontal camera so as not to interfere with the view of the frontal camera. The moderator was seated next to the frontal camera so that the participant was facing towards the front when narrating the stories.

3.3 Data coding

3.3.1 Annotation with tiers

Only the front recordings were used for coding; the other angles were used as references when signs were not clear from the front. The frontal recordings were tagged and glossed using the software ELAN (version 4.9.1), which allows annotations to be done on multiple

tiers and be precisely time-aligned with corresponding video sources (MPI/LAT Technical Group, 2009). Following the conventions used for the Auslan corpus which is also built based on a digital video archive, the basic level of annotation was adopted, involving translation of video data into written English, segmentation and tokenization of individual sign units, and thereafter glossing of these units (Johnston, 2013, p.12). This method of documentation was chosen as it serves to "append linguistically relevant information to units of language" (Johnston, 2010, p.112).

The first tier is the free translation tier, labeled as 'FreeTransl' in the annotations. This tier consists of 'chunks' of coherent units of translated text time-aligned to simple or complex clauses that appear in the video data (Johnston, 2013, p.12). The second and third tiers are glossing tiers for each hand, labeled as 'RH-IDgloss' and 'LH-IDgloss' respectively. It is necessary to separate the tiers for each hand as signers can articulate different signs on each hand at the same time, or sustain the handshape on one hand for a longer period of time than the other. Here, ID glossing refers to the assignment of a unique identifying gloss to each sign type, so that tokens under the same type can be uniquely and consistently identified (Johnston, 2013, p.13). The last tier serves the purpose of this study by identifying the types of classifiers produced in a video clip. It is labeled as 'ClassifierType'. A typical annotation for a clause would thus look something like this (retrieved from Participant C, Clip 1):

FreeTransl	The cat sees something with its binoculars.		
RH-IDgloss	CAT	BINOCULARS	CL(2-HORI):ANIMAL-SEES-SOMETHING
LH-IDgloss	CAT	BINOCULARS	CL(2-HORI):ANIMAL-SEES-SOMETHING
ClassifierType			ENTITY

3.3.2 Glossing of signs

Each tag in a tier begins when the hand leaves its position from rest or when the handshape begins to change from the previous sign, and ends when the hand returns to rest position or right before it changes to the next handshape. Figures 6 and 7 illustrate the start and end of a tag accordingly.

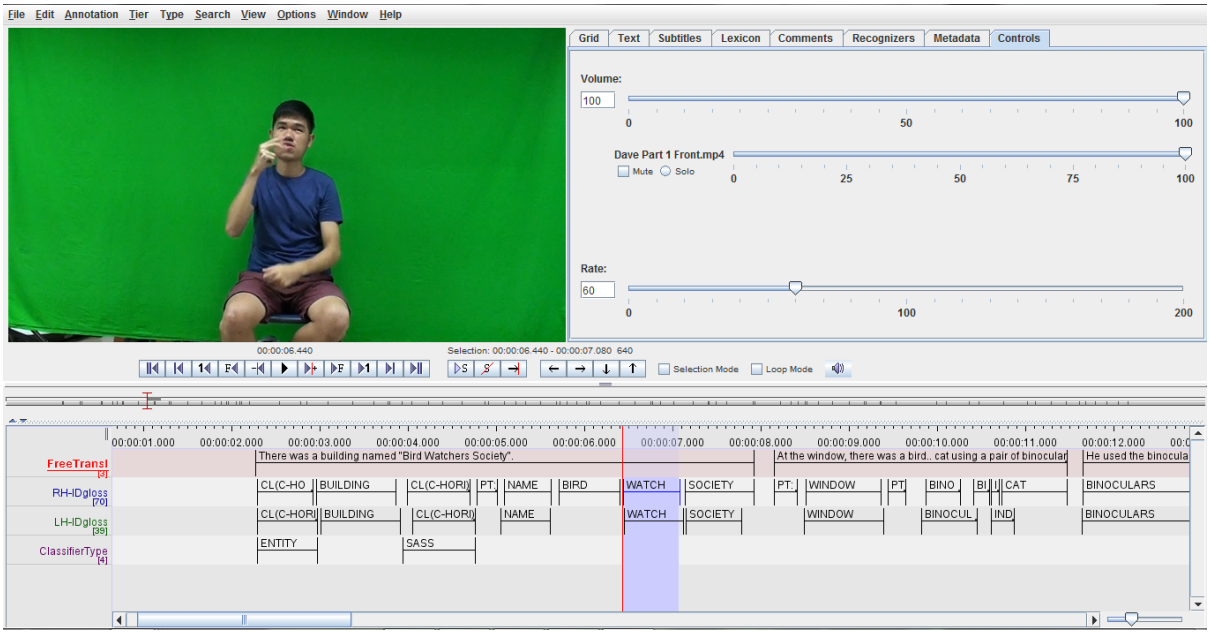


Figure 6: Starting position of the tag for 'WATCH'

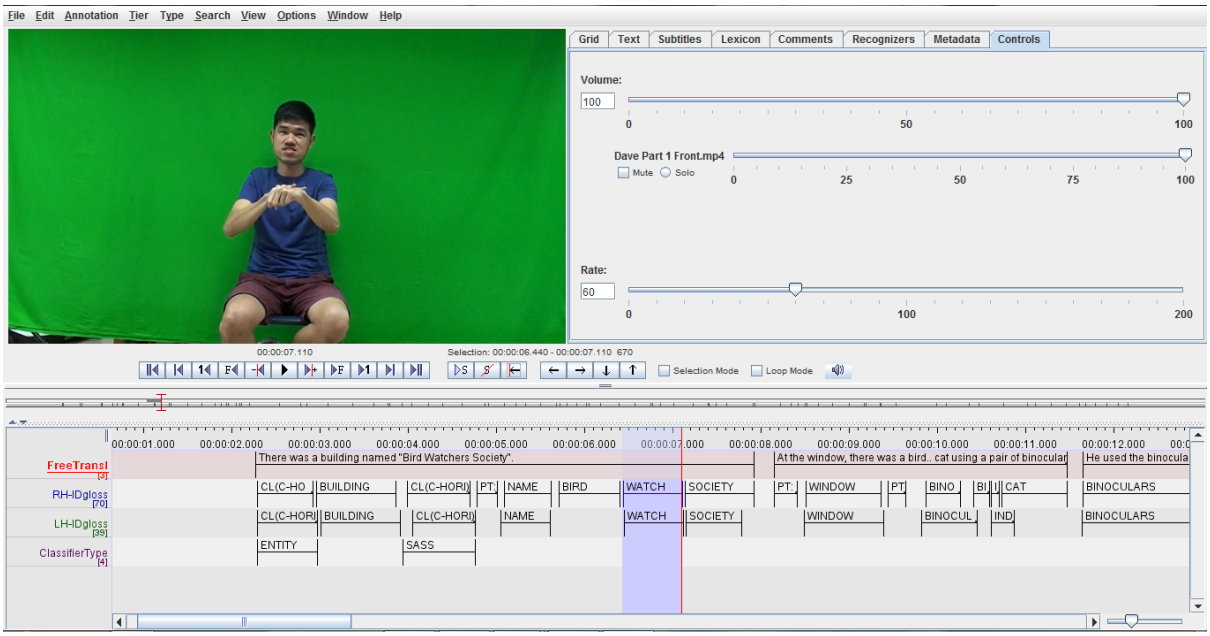


Figure 7: Ending position of the tag for 'WATCH'

Following sign language glossing conventions, the tags for manual features were tagged in uppercase English text, and signs that required more than one word to represent its meaning accurately were separated by hyphenation (Johnston, 2013, p.16), e.g. 'FLAP-WINGS'. For classifier signs, the format of the gloss would be 'CL(HANDSHAPE-ORIENTATION):DETAILS', for e.g. 'CL(Y-LATERAL):ANIMAL-MOVES'. For the purpose of this study, the handshapes used would follow the manual alphabet used in ASL

and SEE2, while the orientations were split into 5 separate types according to the following guidelines:

ORIENTATION	EXAMPLE	GLOSS	MEANING
Horizontal		1-HORI	Sign brought down, palm parallel to the floor
Vertical		1-VERT	Sign in original upright position
Lateral		1-LATERAL	Sign brought down and twisted towards the side
Up		1-UP	Palm of sign faces upwards towards the ceiling
Down		1-DOWN	Sign brought down by 180 degrees

Table 2: Orientation guidelines for classifier glossing

3.3.3 Meta data

Sociolinguistic information retrieved from interview responses were translated into text and tabulated in an excel file. This information would be added into the Meta data and linked to the video data of the corpus after this project for observation of signing trends produced across sign communities in Singapore.

4 DATA ANALYSIS

In this section of the study, the results of participants from all 4 age groups are reported and analyzed. It gives an overview of the trends of classifier usage in SgSL, discusses in detail the usage of most commonly produced classifiers, and explains why variance in classifiers occurs. Although a total of 14 participants were recorded, only 12 participants and their signs produced were taken into account; 1 participant failed to comprehend the task entirely and summarized the narrative instead of explaining it in detail, hence compromising the signs produced, while another participant used Shanghai Sign Language to narrate instead of SgSL which is the focus of this study. It was also noticed that participants tended to replicate the type of classifiers used over time, hence not all data recorded were analyzed. The following analysis is thus based on three video clips (1, 4 and 6) which were chosen according to the content of the narratives – points taken into consideration included the amount and type of interaction among characters, and whether the scenes elicited more actions. Overall, 4 hours, 32 minutes and 42 seconds of video data was recorded with 3 cameras, spread over 14 participants. These videos are Open Data under the Creative Commons Attribution License (CC BY), and will be used to start the SgSL Corpus.

4.1 Overview of classifier usage in SgSL

4.1.1 Variations of handshapes and orientations

In the 2191 seconds (36 min 31s) of video data analyzed, a total of 1104 classifiers were produced, comprising 65 different combinations from 26 handshapes and 5 orientations (see Table 3). While this list is not exhaustive, the number of combinations available for classifiers in the local deaf community already gives us a hint on how this lexical set is not yet standardized amongst SgSL users. As such, it is common to find variations of handshape-orientation combinations for the same concept in SgSL, and such variations are allowed and deemed acceptable by SgSL users, as long as the signs have semantic relevance with respect to other signs produced.

HANDSHAPES			ORIENTATION				
			HORIZONTAL	VERTICAL	LATERAL	UP	DOWN
ALPHABETS	A		✓		✓		
	B		✓	✓	✓		
	C		✓	✓			
	SMALLC			✓			
	F				✓		
	G			✓			
	CLOSEDG		✓	✓			
	I			✓	✓		✓
	L			✓			
	O		✓	✓			
	FLATO		✓	✓		✓	✓
	S		✓	✓	✓	✓	✓
	T		✓	✓			
	U		✓				
	X			✓			
	Y			✓	✓	✓	
NUMBERS	1		✓	✓	✓	✓	✓
	2		✓				✓
	BENT2		✓	✓		✓	
	3				✓		
	4			✓			
	5		✓	✓	✓	✓	
	CLOSED5		✓	✓	✓	✓	
	CLAW5		✓	✓	✓	✓	
	BENT5			✓	✓		✓
	9		✓	✓	✓	✓	

Table 3: Combinations of handshapes and orientations produced for all classifiers

Based on Table 3, the probability of a handshape having alternative orientations in the representation of a single classifier is high, as 18 out of 26 handshapes had more than 1 possible handshape-orientation combination. The inconsistency in handshape-orientation combinations suggests that most classifiers used in SgSL are non-lexicalized, requiring contextual support for the explanation of such signs, since there are so many alternative representations for the same concept. One such variation occurred for the category of vehicle, where participants used different handshapes and orientations. The signs below were taken from Clip 6, where participants were describing the arrival of a tram.

Figure 8: Front and angled views of Participant E describing the arrival of a tram

RH-IDgloss	FS:TRAM
LH-IDgloss	CL(CLOSED5-HORI):VEHICLE-MOVES

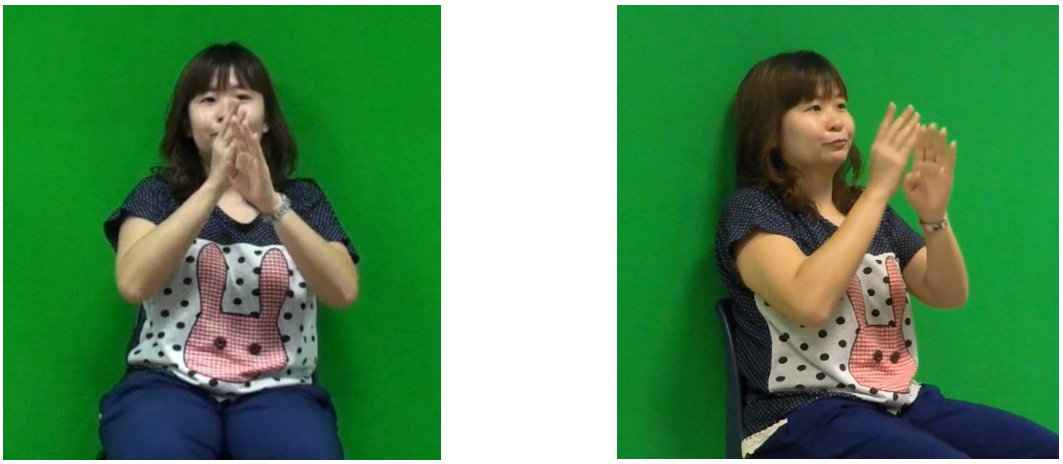


Figure 9: Front and angled views of Participant F describing the arrival of a tram

RH-IDgloss	CL(4-VERT):LONG-VEHICLE TRAIN
LH-IDgloss	CL(4-VERT):LONG-VEHICLE TRAIN

While Participant E chose to fingerspell the word ‘tram’ to specify the classifier sign she introduced after, Participant F produced a lexical sign with a similar concept after using the classifier sign. It is noted that both participants clarified the meanings of the classifiers, suggesting that the classifiers in the figures are both non-lexicalized.

One possible reason for the existence of so many possible handshape-orientation combinations is that the occurrences of non-lexicalized signs are sparser and less reproducible across participants as compared to lexicalized signs. This entails that non-lexicalized signs are produced based on individual preferences that are not likely to be known by others, whereas lexicalized signs are more commonly used for the same concept across participants, given that people associate handshapes of such signs with particular categories of referents. This agrees with Brentari’s (2010, p.260) observation that classifier signs do become lexicalized items that are stable over time, where one representation cannot be substituted freely for another, indicating that signers do practice a one-to-one mapping of classifier sign to category as certain signs become more conventionalized within a signing community. In contrast, non-lexicalized signs tend to be more iconic[7] as they are created based on the signer’s visual impression of the object or concept at that point in time. This is so, according to Johnston and Ferrara’s (2012, p.239) argument that non-lexical signs consist of gestural components that are determined by iconic mappings of the elements in the mental space to the spatial arrangements of the signer’s hands. However, Liddell also argues that the relationship between form and meaning may not always be direct, giving rise to classifier signs that are not straightforward visual representations of the referents being addressed (Brentari, 2010, p.260), and thus explaining the variations in non-lexicalized classifier signs, like in Figures 8 and 9. This phenomenon can be seen appearing across all classifier types used in SgSL, as seen in the next few sections.

[7] Iconicity is defined as the similarity of relationship between form and meaning (Ponterotto, 2000, p.747)

4.1.2 Distribution of classifier types in SgSL

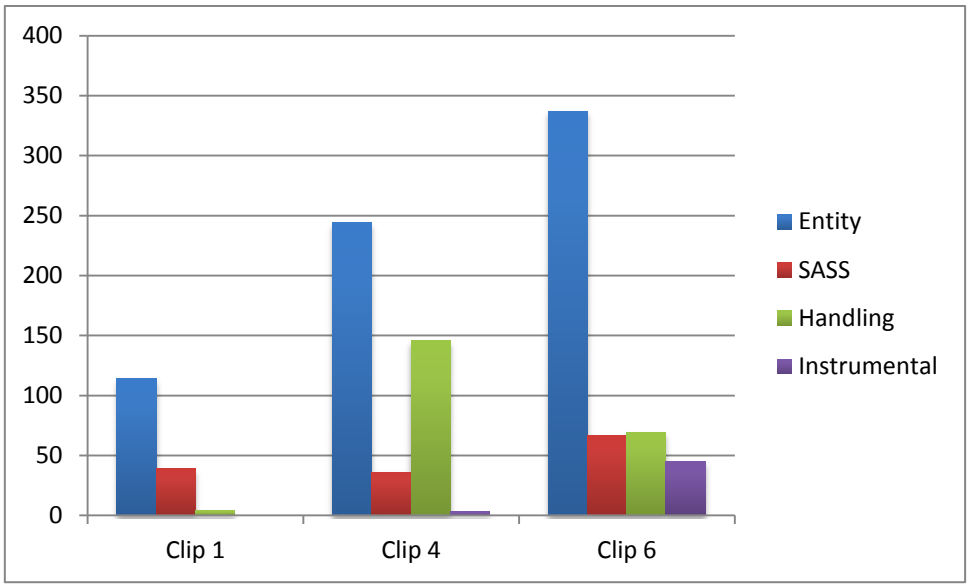


Figure 10: Distribution of classifier types according to video clips

Out of the 4 classifier types, Entity classifiers (ECLs) were the most commonly used across all 3 video clips, making up 63.0% of the total number of classifiers produced. This comes as no surprise since the narratives used revolved around the chasing escapades of the two main characters, Tweety and Sylvester. The ECLs produced thus mostly represented humanized animals and objects that were involved in their chase, such as the setting (e.g. buildings) and tools Sylvester used in order to get to Tweety. However, the high usage of ECLs may not be attributed solely to the topic of elicitation material, as this pattern is also noticed in ASL where ECLs have been found to be highly produced amongst other classifier types (Williford, 2008). Aronoff, Meir, Padden and Sandler (2003) suggest that the high occurrence of ECLs could be linked to them behaving more like lexical signs, as they have evolved to include abstract forms in ASL, therefore covering a wider scope of representations.

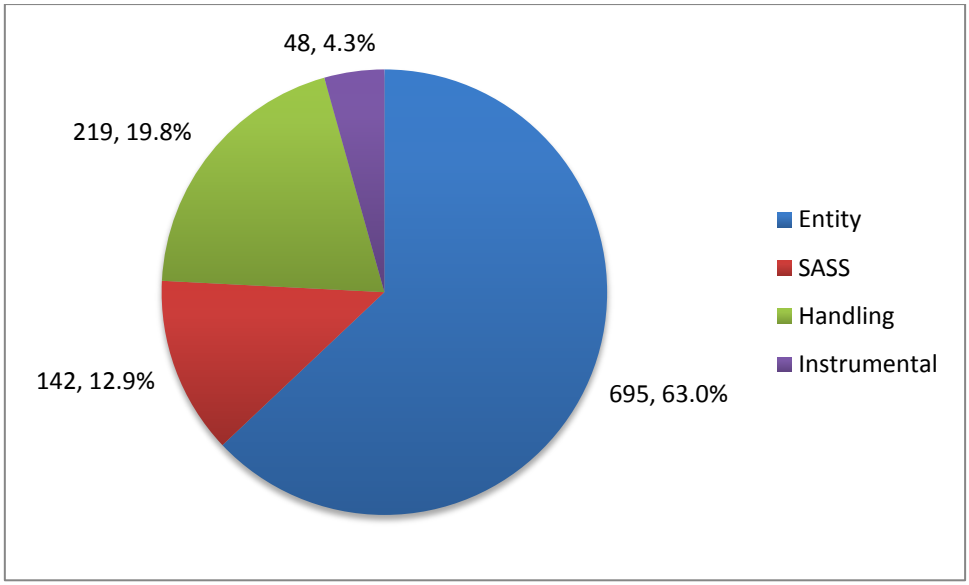


Figure 11: Total distribution of classifier types

While Shape and Size Specifier classifiers (SASSCLs) had a relatively low occurrence rate at 12.9%, the frequency of occurrence remained fairly stable across all 3 clips. The highest number of occurrence appeared in Clip 6, possibly because that particular clip was a combination of two scenarios, both of which required more descriptive explanations in order to locate referents in space. Figure 12 depicts the first scenario where participants used SASSCLs to set up the location of the two buildings and describe the tool (rope) Sylvester used to travel across the buildings. The climax of the second scenario can be seen in Figure 13 where participants used SASSCLs to describe the tram lines and how Sylvester travelled across them.

Figure 12: Sylvester getting ready to swing from one building to another

Figure 13: Sylvester crossing from one building to another via the tram lines

In general, the SASSCLs used had an adjectival quality attached to them, and were used to describe characteristics of a referent, such as length and thickness, rather than the referent itself. This agrees with Schembri's (2003, p. 21) observation that it is usually the salient properties of a referent that determines the SASS handshape used to describe it. In addition, the SASSCLs produced in the data collected were often used in situations where more description was required to provide a fuller visual representation on top of what other classifier types (mainly ECLs) can depict. The lower occurrence of SASSCLs as compared to ECLs can thus be explained by the fact that they are usually only required when other classifier types are unable to paint an adequate description of scenarios.

In comparison to SASSCLs, there was a slightly higher occurrence of Handling classifiers (HCLs) at 19.8%, particularly for Clip 4. This could be due to the extensive number of times the main character of the narrative deals with an object in its hand (as shown in Figures 14 and 15, leading to an increase in the number of HCLs produced for this particular clip. Another reason could be that since HCLs differ from other classifiers in that they depict agents manipulating objects instead of referring to the objects themselves, it is less likely that other classifier types could be used in place of HCLs.

Figure 14: Sylvester holds up a cup for Granny to drop a coin in

Figure 15: Sylvester lifts up the table cloth and other materials in search of Tweety

The least occurring classifier type belonged to the category of Instrumental classifiers (ICLs), occurring at a low rate of 4.3%. In fact, no ICLs were produced by any participant for Clip 1, and only 3 were produced for Clip 4. It is interesting to note that the three participants who produced the ICLs for Clip 4, Participants I, J and K, belonged to the older age groups (41 to 50 years old and 51 years and above). It is however too early to say that age group affects the distribution of signs produced here. Nevertheless, one possible reason for the low occurrence

of ICLs is that where ICLs could have been used, participants chose to use HCLs or replace the situation with appropriate gestures instead. This is particularly prominent in Clip 4, where Granny uses an umbrella to hit Sylvester on the head. An ICL could have been used to represent the umbrella, as shown by Participant K in Figure 16, but many participants chose to use HCLs to depict the way someone holds an umbrella or a gesture to indicate that Sylvester was hit on the head, as demonstrated by Participant B in Figure 17. This is consistent with the observation that users of most sign languages are allowed to use more than one classifier to depict a referent, depending on the aspect or characteristic of the referent that the user wishes to focus on (Zwitserlood, 2012, p.163). Thus this also suggests that when faced with the need to represent instruments in sign, SgSL users would prefer to focus more on how the tool is handled rather than depict the tool itself.

Figure 16: Participant K uses an ICL to represent an umbrella

RH-IDgloss CL(1-VERT):HITTING-TOOL

Figure 17: Participant B uses a gesture to represent Sylvester being hit

RH-IDgloss G:GOT-HIT-ON-THE-HEAD

4.2 Common and prototypical classifiers

While some classifier signs have been studied earlier on, this section of the study focuses on one to two more commonly used classifiers from each classifier type, shedding light on how prototypical classifiers and their variants are used in different contexts.

4.2.1 Entity classifiers (ECLs)

HANDSHAPES	PARTICIPANTS												TOTAL
	18-30 years old			31-40 years old			41-50 years old			51 years old and above			
	A	B	C	D	E	F	G	H	I	J	K	L	
A-LATERAL 					1				2	1	5	5	**14**
B-LATERAL 	2			1			2					9	**14**
C-HORI 		2	1	3	1	1	5	3	4		1		**21**
Y-LATERAL 	3	8	4		36	6	5	10	7	8	5	15	**107**
1-HORI 	1	3	1	4			8	4	4	4	8	6	**43**
1-VERT 	1	1	6	2		3	5	2	5	13	1	1	**40**
2-HORI 	5	4	8	10	5	21	9	3	6	6	8	1	**86**
2-DOWN 	20	8	5	23		26	25	11	7	3	6	14	**148**
CLOSED5-HORI 	7	1	1	9	7	8	6	7	2	5	4	9	**66**
CLOSED5-VERT 	5		2	1	1	7	1	2	1	3	1		**24**
CLOSED5-LATERAL 		4		9		2		2		1	1		**19**
CLOSED5-UP 	1		2			1	1				1	8	**14**

Table 4: Distribution of top 12 most commonly used ECLs across all 3 video clips

Out of the total 695 ECLs produced from 43 different handshape-orientation combinations[8], it can be seen in Table 4 that the 2-DOWN handshape-orientation combination is the most commonly used ECL at 148 (21.3%), followed by Y-LATERAL occurring at 107 (15.4%). Both classifier signs were used by most, if not all participants. It is interesting to note that these 2 ECLs depict human beings or humanized objects, suggesting that the most established ECLs in SgSL are those that can relate to human properties. This behaviour can also be found in most sign languages such as ASL and Auslan where there is a separate classifier form for animate and legged entities, which include humans and animals (Zwitserlood, 2012, p. 163). It is also noted that languages tend to create more lexical items for human activities than for objects (Brentari, 2010, p.260), thus suggesting that it is highly possible that these 2 classifiers have been lexicalized in SgSL.

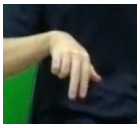
[8] Refer to Appendix A for distribution breakdown of all classifier types for individual video clips

(i) 2-DOWN ()

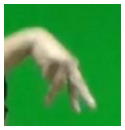
General meaning: a two-legged entity standing in an upright position

Basic gloss: CL(2-DOWN):HUMAN-DETAILS or CL(2-DOWN):ANIMAL-DETAILS

Handshape: 2-handshape with fingertips pointing downwards; the index and middle fingers are usually straight with the rest of the fingers kept, but slight limpness in the fingers and slight featuring of other fingers are also accepted.


Participant A


Participant C


Participant D


Participant F

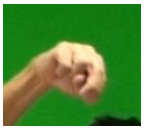

Participant G

Figure 18: Variants of CL(2-DOWN) retrieved from Clip 6

Orientation: The area where the knuckle is protruding is thought to be the front of the referent, and the fingers function as the legs. While the referent is usually upright, occasions where it is slightly tilted due to limit stretch of the wrist as portrayed by Participant C in Figure 18 can be accepted. The sign can face any direction and be placed in any location in space, even on top of another sign. To indicate a referent falling, participants sometimes change the orientation of the sign to portray the referent in a lying position (end position), as shown by Participant D in Figure 19.


Participant C


Participant D


Participant G

Figure 19: Different orientations of CL(2-DOWN) retrieved from Clip 6

Movement:

a) To indicate a referent's location in space, this classifier sign can be held stationary in space or used with a stamping movement.
b) To indicate a referent moving from one location in space to another, this classifier can be used together with a path movement and/or a manner movement (for e.g. wriggling of fingers to depict walking). It was also noticed that some participants bounced the sign across space to signify the referent moving, regardless of manner of movement, possibly because it was more economic to do so. This has also been noticed in other sign languages, such as Danish Sign Language, where the bouncing movement is used in a linear path (Brentari, 2010, p.261).

Environment: There were variations in the environment in which the classifier occurred across all participants, depending on the context of the situation being described.

a) When the referent is first being introduced (Participant G, Clip 4):
   FreeTransl The cat had its arms akimbo as it paced up and down the street.
   RH-IDgloss PT:PRO CAT G:ARMS-AKIMBO
   CL(2-DOWN):ANIMAL-PACES-UP-AND-DOWN
   LH-IDgloss G:ARMS-AKIMBO
b) When the referent is alone (Participant F, Clip 6):
   FreeTransl The cat walked on the tram line.
   RH-IDgloss CL(9-VERT):LONG-THIN-OBJECT CL(2-DOWN):ANIMAL-WALKS
   LH-IDgloss CL(9-VERT):LONG-THIN-OBJECT
   CL(CLOSED5-HORI):FLAT-HORIZONTAL-SURFACE
c) When the referent is described with other entities (Participant G, Clip 4):
   FreeTransl The monkey walked towards the cat.
   RH-IDgloss CAT CL(2-DOWN):ANIMAL-WALKS MONKEY
   CL(2-DOWN):ANIMAL-WALKS
   LH-IDgloss CL(1-DOWN):ANIMAL-LOCATION

From the above examples, it can be seen that CL(2-DOWN) is usually produced after the referent has been made known, except when there are no other referents around where the classifier can be used on its own to depict the referent, the action it is portraying and its location in space. This suggests that the sign has been lexicalized in SgSL as it is clear to the

users what the sign represents even without referring to it prior to its usage, like in example b above.

Prototype:

Figure 20: Prototypical usage of CL(2-DOWN) by Participant G in Clip 4

FreeTransl	The cat walked.
LH-IDgloss	PT:PRO CAT CL(2-DOWN):ANIMAL-WALKS

Similar to most sign languages, the 2-DOWN classifier in SgSL is used to portray legged entities, including animals (Zwitserlood, 2012, p.163). While there is a variant BENT2-HORI () that is usually used for animals (Zwitserlood, 2012, p.163), it is not that prominent in SgSL, or at least in the data collected despite the characters being animals. In the rare occasion that it is used, it depicts a referent sitting on another object instead.

(ii) Y-LATERAL ()

General meaning: an upright entity standing in position

Basic gloss: CL(Y-LATERAL):HUMAN-DETAILS or

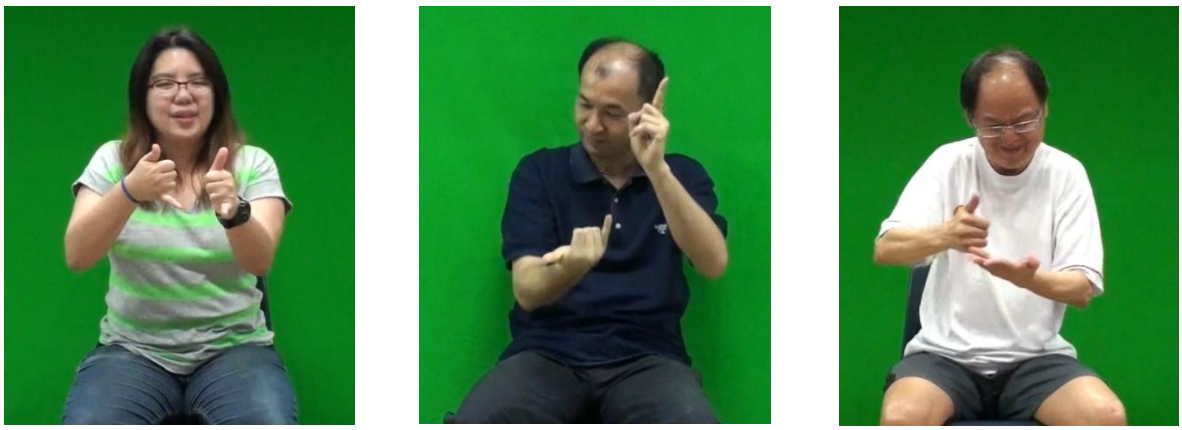
CL(Y-LATERAL):ANIMAL-DETAILS

Handshape: Y-handshape with thumb pointing upwards and pinky pointing downwards; the thumb and pinky are usually straight with the rest of the fingers kept, but slight limpness in the fingers and slight featuring of other fingers are also accepted.

Participant B Participant E Participant H Participant I

Figure 21: Variants of CL(Y-LATERAL) retrieved from Clip 6

Orientation: The back of the thumb (behind the nail) is thought to be the front of the referent, with the thumb representing the head and the pinky representing the legs. While the referent is usually upright, with the palm facing towards the signer's body, occasions where it is tilted outwards to signal change in direction as portrayed by Participant B in Figure 21 can be accepted. Similar to CL(2-DOWN), the sign can face any direction and be placed in any location in space. It can be placed on top or below another sign, but this is usually less seen. To indicate a referent falling, participants sometimes change the orientation of the sign to portray the referent in a lying position (end position), as shown by Participant H in Figure 22.



Participant E Participant H Participant L

Figure 22: Different orientations of CL(Y-LATERAL) retrieved from Clip 6

Movement:

a) To indicate a referent's location in space, this classifier sign can be held stationary in space or used with a stamping movement.
b) To indicate a referent moving from one location in space to another, this classifier can be used together with a path movement. Unlike CL(2-DOWN), it is less likely to be paired with manner movements. In the rare occasion that it does, manner is portrayed by wriggling of the thumb up and down to portray the referent doing a vertical climb, and by shaking the entire sign from side to side to portray a dizzy or shocked referent. Possibly due to the immobility of the pinky, it was noticed that participants sometimes

tended to switch from CL(Y-LATERAL) to CL(2-DOWN) when they wanted to portray movement of the legs. This pattern however, was not consistent, as the two signs were mostly seen used interchangeably (more explained below).

Environment: There were variations in the environment in which the classifier occurred across all participants, depending on the purpose of usage.

a) To portray the referent travelling across space (Participant B, Clip 6):

FreeTransl	The cat swung across using a rope, but hit the wall instead.
RH-IDgloss	CL(9-LATERAL):SOMETHING-THIN CL(S-LATERAL):HOLDING-SOMETHING-THIN CL(Y-LATERAL):ANIMAL-MOVES-AND-HITS-WALL
LH-IDgloss	CL(9-LATERAL):SOMETHING-THIN CL(S-LATERAL):HOLDING-SOMETHING-THIN CL(5-VERT):FLAT-VERTICAL-SURFACE

b) When CL(2-DOWN) is preferred (Participant L, Clip 6):

FreeTransl	The cat stood on the tram line and walked across it.
RH-IDgloss	CL(Y-LATERAL):ANIMAL-LOCATION CL(2-DOWN):ANIMAL-LOCATION CL(CLOSEDG-VERT):LONG-THIN-OBJECT CL(2-DOWN):ANIMAL-WALKS
LH-IDgloss	CL(1-HORI):-THIN-OBJECT CL(CLOSEDG-VERT):LONG-THIN-OBJECT CL(1-HORI):-THIN-OBJECT

c) When the referent is described with other entities (Participant B, Clip 6):

FreeTransl	The tram chased after the cat.
RH-IDgloss	CL(BENT5-LATERAL):VEHICLE-MOVES FS:TRAM CAT CL(CLOSED5-LATERAL):TRAM-MOVES
LH-IDgloss	CL(Y-LATERAL):ANIMAL-MOVES PT:DET CL(Y-LATERAL):ANIMAL-MOVES

From the above examples, it can be seen that when used with other classifier signs, the user tends to clarify the entity that CL(Y-LATERAL) was used on, which is similar to the usage of CL(2-DOWN). The classifier can also be used on its own to depict the referent, the action it is portraying and its location in space. Example b shows how CL(2-DOWN) is preferred when movement of the legs have to be shown, and the switch is made without the need to clarify who the second classifier is referring to. This suggests that both ECLs can be used interchangeably in SgSL, and is an interesting phenomenon as it is unlike that of Danish Sign Language which has three types of classifiers representing human referents, each describing

different aspects of movements and strictly cannot be substituted by another (Engberg-Pederson, 1993).

Prototype:

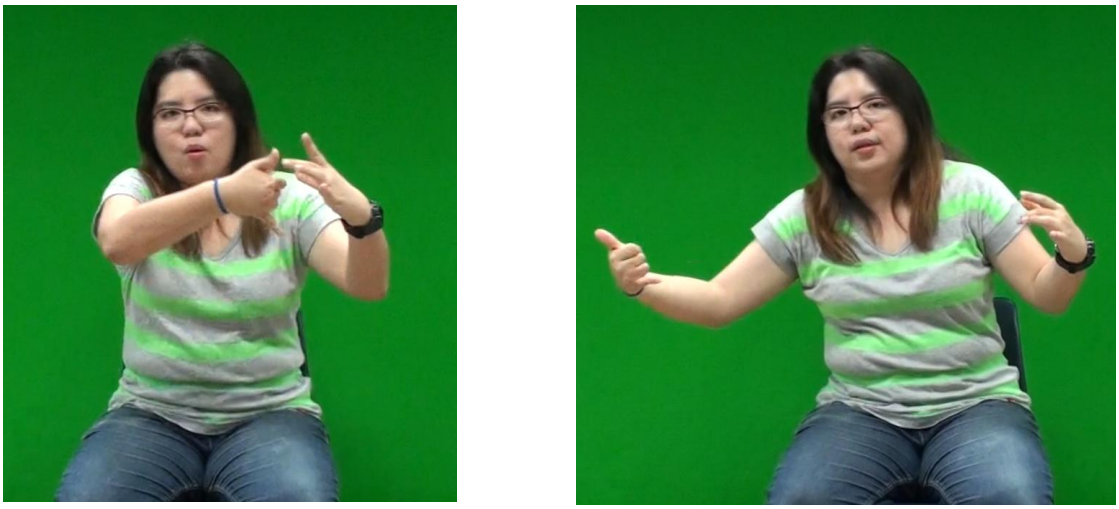


Figure 23: Prototypical usage of CL(Y-LATERAL) by Participant E in Clip 1

FreeTransl	But the cat got hit and flew across.
RH-IDgloss	BUT CAT CL(Y-LATERAL):ANIMAL-FLIES
LH-IDgloss	BUT G:HIT

Originating from SSL, the CL(Y-LATERAL) sign is typically used as a person classifier (Brentari, 2010, p.253). It was used for animals in this case, possibly because the characters in the story seemed humanized. Nevertheless, it is interesting how this classifier is still being used despite the phasing out of SSL in the 1970s and the increasing influence of ASL on SgSL. Referring to Table 4, half of the participants actually used as many Y-LATERAL ECLs as 2-DOWN ECLs. The co-existence of two classifiers with similar functions possibly suggests that the grammatical components in SgSL are taking a longer time to change as compared to lexical items. This is in line with Cabrera's (1998, p.224) argument that while languages increase their lexicon pool, they do not necessarily lose their morphology and syntax.

4.2.2 Instrumental classifiers (ICLs)

HANDSHAPES	PARTICIPANTS												TOTAL
	18-30 years old			31-40 years old			41-50 years old			51 years old and above			
	A	B	C	D	E	F	G	H	I	J	K	L	
G-VERT 			1										**1**
O-VERT 												1	**1**
X-VERT 				1	4				3	2	4		**14**
1-VERT 	2			4			9		3	2	3		**23**
1-UP 						1							**1**
BENT2-UP 						8							**8**

Table 5: Distribution of ICLs across all 3 video clips

A total of 48 ICLs were produced from 6 handshape-orientation combinations. The 1-VERT combination was the most commonly used, accounting for 47.9% of total ICLs produced. It is closely followed by the X-VERT combination, which stands at 29.2%. CL(1-VERT) was used by half of the participants, and used across two video clips[9], as compared to CL(X-VERT) which was used exclusively in Clip 6 to describe an antenna. One possible reason for the exclusive use of CL(X-VERT) in Clip 6 is that the handshape is highly iconic in the way it imitates the shape of the antenna on top of a tram, but cannot be easily reproduced elsewhere to represent something else. In contrast, CL(1-VERT) is more generic in its handshape, and can be used in different classifier types such as Entity classifiers and Shape and Size Specifier classifiers to represent a number of different entities. High usage of CL(1-VERT) is also seen in Dutch Sign Language where it represents thin and long entities (Zwitserlood, 2012, p.169), very much like how it is used in SgSL as well, as explained below.

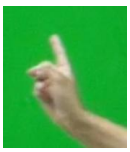
[9] Refer to Appendix A for breakdown of classifiers used per individual clip

(iii) 1-VERT ()

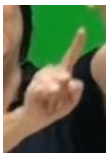
General meaning: a thin and long entity used as an instrument or tool

Basic gloss: CL(1-VERT):INSTRUMENT-DETAILS

Handshape: 1-handshape with index finger pointing upwards; the index is usually straight with the rest of the fingers kept, but loosely kept fingers are also accepted.


Participant D


Participant G


Participant I

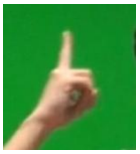

Participant K

Figure 24: Variants of CL(1-VERT) retrieved from Clip 6

Orientation: Where the palm is facing is thought to be the front of the referent, with the index representing the main body of the referent. The referent is usually upright, depending on how it is used. If the object being described does not have a front face, for e.g. a cylindrical object, then it does not matter which direction the handshape faces, as seen in the examples below. Its location in space is determined by how it is used, and since a tool is usually required to interact with another entity to show how it is being used, it can also be placed on top or below another sign.


Participant D


Participant I


Participant K

Figure 25: Different orientations of CL(1-VERT) retrieved from Clip 6

Movement:

a) To indicate a referent's location in space, this classifier sign can be held stationary in space or used with a stamping movement.
b) To indicate a referent moving from one location in space to another, this classifier can be used together with path and manner movements. Unlike Entity classifiers (ECLs), ICLs are usually paired more with manner movements, as the focus should be on how they are used. Possible manner movements include striking (CL(1-VERT) was being used to represent an umbrella in Clip 4), and bouncing/poking (it was later used in Clip 6 as an antenna).

Environment: Variations occurred according to context and what the classifier sign represented.

a) When the instrument was part of another entity (Participant G, Clip 6):

   FreeTransl The tram had an antenna on top of it and if the cat touched the antenna, it would get an electric shock.

   RH-IDgloss CL(CLAW5-VERT):VEHICLE CL(1-VERT):ANTENNA IF CL(2-DOWN)ANIMAL-STANDS CL(1-VERT):ANTENNA CL(2-DOWN):ANIMAL-STANDS HAVE ELECTRIC

   LH-IDgloss CL(CLOSED5-HORI):FLAT-HORIZONTAL-PLANE HAVE ELECTRIC

b) To show how an instrument contacts a referent (Participant K, Clip 4):

   FreeTransl The cat got hit on the head and felt dizzy.

   RH-IDgloss CL(A-LATERAL):HOLDING-HITTING-TOOL CL(1-VERT):HITTING-TOOL CL(1-VERT):ANIMAL-DIZZY

From the above examples, it can be seen that the order in which the classifier occurs is quite consistent, i.e. it appears after an indication of who is wielding the tool, and before the referent who will receive the impact of the tool. In other words, the ICL has the task of indicating how the tool is being used by an agent on a recipient, suggesting that ICLs used in SgSL are iconic in their portrayal of movement. The environment in which they occur in also suggests that ICLs rely on the description of agent-classifier and classifier-recipient relationships, be it location or the way it is handled, to establish and make sense of the tool it is trying to portray. This is in line with Zwitserlood's (2012, p.169) observation that what sets ICLs aside from ECLs is that they do not move independently as they are subject to

manipulation, and their appearance in a grammatical construct entails a purpose, meaning they do not simply exist in a space.

Prototype:

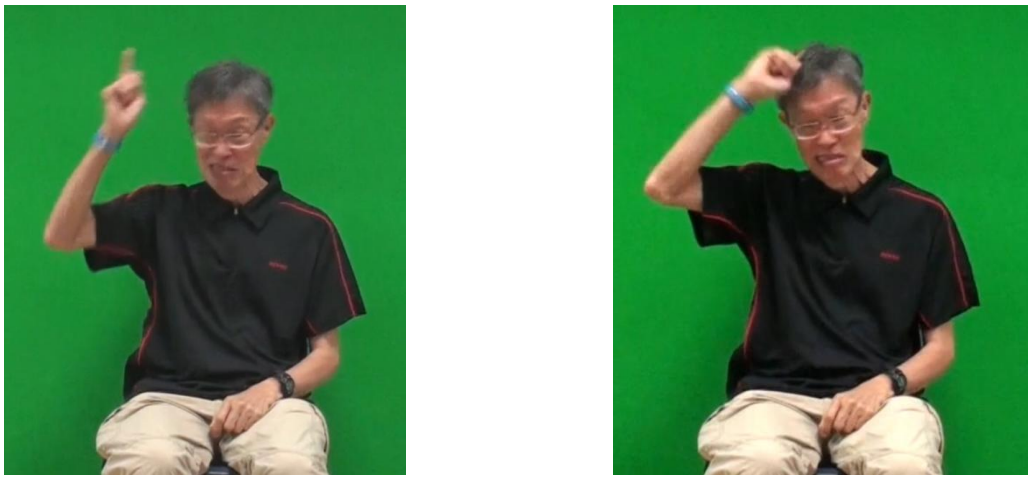


Figure 26: Prototypical usage of CL(1-VERT) by Participant J in Clip 4

FreeTransl	The cat got hit on the head and felt dizzy.
RH-IDgloss	CL(A-LATERAL)HOLDING-HITTING-TOOL CL(1-VERT):HITTING-TOOL CL(Y-LATERAL):ANIMAL-DIZZY

As discussed earlier, a prototypical ICL is established based on the relationship it has with both its agent and recipient, often showing the effect it has on the latter. Given that the entities that CL(1-VERT) represents can differ greatly in appearance (antenna versus umbrella), one possible reason could be that this particular handshape has been lexicalized by the local deaf community to mean anything that fits the description ‘long and thin’, and that lexicalized items need not be entirely iconic in shape. Another possible reason could be that signers usually use a more restricted set of classifiers in actual sign production than what exists in that language, causing other non-prototypical signs to be less productive (Craig, 1986; Schick, 1990).

4.2.3 Shape and size specifier classifiers (SASSCLs)

HANDSHAPES	PARTICIPANTS												TOTAL
	18-30 years old			31-40 years old			41-50 years old			51 years old and above			
	A	B	C	D	E	F	G	H	I	J	K	L	
S-LATERAL 		1	2	1	1	2	7		1				**15**
1-HORI 	1		2	3					4	3		1	**14**
1-VERT 		1				2	4				1	1	**9**
CLOSED5-LATERAL 			4	14		2	1		2	1			**24**
9-HORI 					2	1	3	1					**7**
9-VERT 			5	1		4					1	2	**13**

Table 6: Distribution of top 6 most commonly used SASSCLs across all 3 video clips

142 SASSCLs were produced from 35 different handshape-orientation combinations, most of which had sparse distributions. The most commonly used combination was CL(CLOSED5-LATERAL) which accounted for 16.9% of total SASSCLs produced. However, it is noted that out of the 24 classifier occurrences, 14 of them were produced by the same participant, indicating an unequal distribution of usage across all participants for this combination. If this anomaly were to be removed, the occurrence of this classifier is actually not that high. In contrast, the 1-handshape and the 9-handshape are seen to have more productive distribution across participants, accounting for 16.2% and 14.1% respectively. Here, it should be noted that for SASSCLs, since they mostly describe the outline of a referent, the orientation of the classifiers are less meaningful as compared to the handshapes. Rather, it is the movement of the classifiers (e.g. tracing an outline) that would be more important in understanding the attributes of a referent. In fact, Schembri, Jones and Burnham (2005, p.272) have noted that Auslan users do have a restricted categorical set of handshapes for SASSCLs, reinforcing the idea that SASSCLs are recognized first and foremost by their handshape, regardless of other morphemic components. As the 1-handshape has already been discussed earlier on, this section will focus on the 9-handshape instead.

(iv) 9-HORI ()/9-VERT ()

General meaning: a long and thing object, or a small round/cylindrical object

Basic gloss: CL(9-HORI):DETAILS-OBJECT or CL(9-VERT):DETAILS-OBJECT

Handshape: 9-handshape with the thumb and index touching each other and last three fingers extended; the thumb and index can create a pointy edge or a circle, and the extended fingers are usually straight, but slight limpness or curling in the fingers are also accepted. The pointy edge is usually used for describing thin objects, while the circle is used to describe round or cylindrical objects. This suggests that different parts of one handshape can be used to describe different characteristics of an object for SASSCLs in SgSL. According to Supalla (1978), one reason could be because each part of the hand functions as a separate morpheme to classify different geometric properties of a referent.


Participant C


Participant F


Participant G

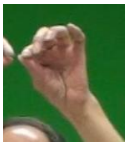

Participant L

Figure 27: Variants of CL(9-HORI) and CL(9-VERT) retrieved from Clips 4 and 6

Orientation: As mentioned earlier, the orientation of the handshape is not as important in SASSCLs so the sign can face any direction, of which would largely depend on location and features of the referent described. Both hands usually replicate the same handshape and are used simultaneously when outlining the shape of the referent. There are three ways in which the tip created by the index and thumb can be oriented: 1) the tips from both hands face each other; 2) the tips both face the same direction; and 3) the tips face opposite direction with the circles created by the tips overlapping each (usually applies to round descriptions). The morphemic function can be said to be internalized by users of SgSL as it is portrayed by Participant G in his usage of the same handshape to describe different properties of different referents (a pipe in Clip 4 and a wire in Clip 6, shown in Figure 28).

Participant F (Clip 6) Participant J (Clip 4) Participant J (Clip 6)

Figure 28: Different orientations of CL(9-HORI/VERT) retrieved from Clips 4 and 6

Movement:

a) To describe a referent's shape, the classifier is used with a tracing movement to outline its perimeters. It starts with both hands in one place and then one hand would move away from the other, or both would move away from each other in opposite directions. This behaviour is also seen in other sign languages where the movement of tracing SASSCLs are highly restricted to hands moving away from each other; movement in the other direction would instead portray the coming together of 2 entities (Craig, 1986, p.189).
b) The size of the referent being described would be determined by the extent through which the handshapes move through space via a path movement.

Environment: There is not much variation in the environment in which the SASSCL occurs, regardless of the entity it is describing.

a) To portray a long and thin object (Participant F, Clip 6):

FreeTransl The cat walked on the tram line.

RH-IDgloss CL(9-VERT):LONG-THIN-OBJECT CL(2-DOWN):ANIMAL-WALKS CL(9-VERT):LONG-THIN-OBJECT CL(2-DOWN):ANIMAL-WALKS

LH-IDgloss CL(9-VERT):LONG-THIN-OBJECT CL(CLOSED5-HORI):FLAT-HORIZONTAL-SURFACE CL(9-VERT):LONG-THIN-OBJECT

b) To portray a cylindrical object/object with round openings (Participant G, Clip 4):

FreeTransl The cat walked over and climbed up the pipe.

RH-IDgloss CL(2-DOWN):ANIMAL-WALKS CL(9-HORI):LONG-CYLINDRICAL-OBJECT G:CLIMBING

LH-IDgloss CL (9-HORI):LONG-CYLINDRICAL-OBJECT G:CLIMBING

From the above examples, it can be seen that the grammatical usage of the SASSCL is fairly consistent. In fact, it does not require other specifications, and functions like a subject in the SgSL word order of Subject-Object-Verb. The classifier thus can be used on its own to depict the referent, on top of providing the properties of the referent. Earlier on, it was suggested that SASSCLs were used only when Entity classifiers (ECLs) could not provide enough visual-geometric information of the referent. Based on the environment it occurs in, the pattern seems to suggest that in cases where ECLs do not suffice in SgSL, SASSCLs would be used in replacement instead. This behaviour is very much like how adjectives, on top of modifying nouns, can sometimes also be used as nouns in spoken languages, for e.g. the rich, the intelligent etc. (Gromisch, 2013).

Prototype:

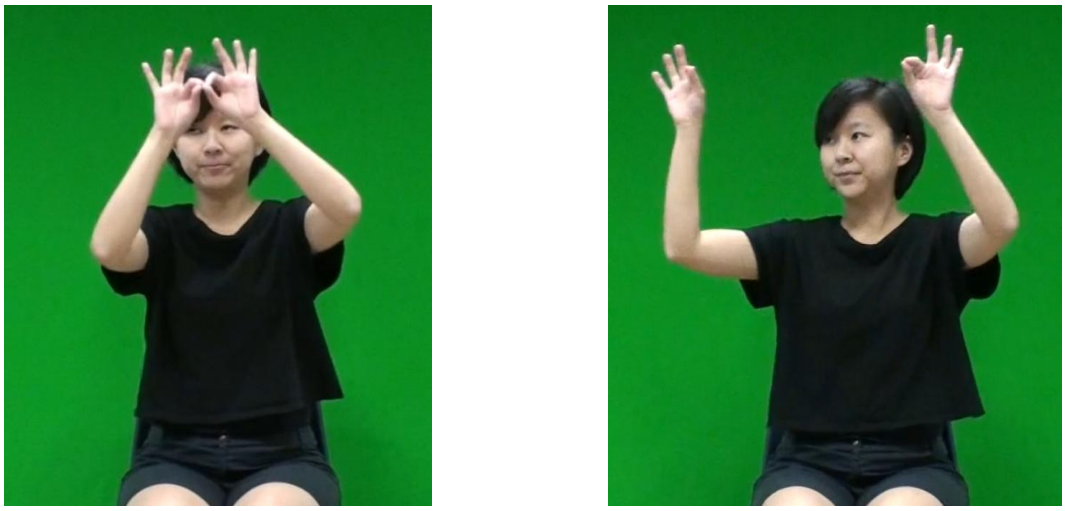


Figure 29: Prototypical usage of CL(9-VERT) by Participant C in Clip 6

FreeTransl The cat walked on the tram line.

RH-IDgloss CL(9-VERT):LONG-THIN-OBJECT CL(2-DOWN):ANIMAL-WALKS

LH-IDgloss CL(9-VERT):LONG-THIN-OBJECT

As seen from above, tracing SASSCLs, such as CL(9-HORI/VERT), allow property descriptions of referents to be more multi-dimensional as they are not restricted by orientation. It is to be noted that for SASSCLs, the purpose is not for the handshape to be iconic to the referent, but for the properties of the referent to be highlighted when the handshape is used together with a movement, such as tracing. The multi-morphemic design and grammaticalization of the CL(9-HORI/VERT) in SgSL suggests that it seems to obey

features of well-formedness that are noticed in lexical signs, thus enabling it to be a stable sign in the community. The reason for such behaviour can be found in Kendon's (1998) explanation that sign languages undergo the process of not only creating a visual representation that is symbolic to a particular concept, but also the process of transforming these representations into expressions recognized and shared by the local community (p.162-163).

4.2.4 Handling classifiers (HCLs)

HANDSHAPES	PARTICIPANTS												TOTAL
	18-30 years old			31-40 years old			41-50 years old			51 years old and above			
	A	B	C	D	E	F	G	H	I	J	K	L	
A-HORI 			1	3		3	2	1	1	4	1	3	**19**
A-LATERAL 		2	3	1	3	3		1	2	2	5	3	**25**
CLOSEDG-HORI 		3				2		5		3	2	6	**21**
S-HORI 	1		3		2	2	2		1	2			**13**
S-LATERAL 	5	2	4	3	6	8	2	4	5	1		1	**41**
T-HORI 	1	1		1	2		3		4	1		1	**14**
CLAW5-HORI 		2	2		4	2	1		3	2	1		**17**
9-HORI 	3		1	3	1		3				2		**13**

Table 7: Distribution of top 8 most commonly used HCLs across all 3 video clips

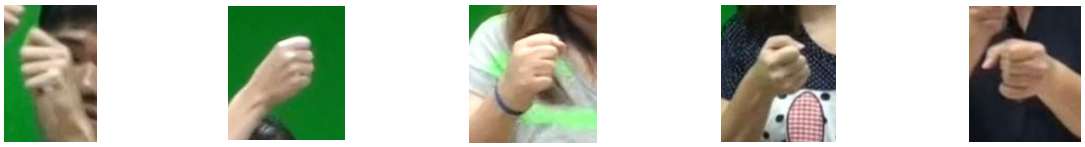
Out of the 219 HCLs produced from a total of 24 handshape-orientation combinations, S-LATERAL was the most common combination accounting for 18.7% of all HCLs produced. HCLs contained the second least number of combinations out of all 4 classifier types, of which consisted of 10 handshapes matched with different orientations. The relatively small number of handshapes produced could be attributed to the limited number of ways one can hold an object. This thus suggests that HCLs are more iconic as they tend to directly portray the actual action of how an object is held. Perniss, Pfau and Steinbach (2008, p.10) also agree that HCLs are less arbitrary as compared to ECLs, thus having fewer variations in possible handshapes.

(v) S-LATERAL ()

General meaning: holding in the hand(s) a long and thin object that is vertically upright

Basic gloss: CL(S-LATERAL):HOLDING-DETAILS-OBJECT

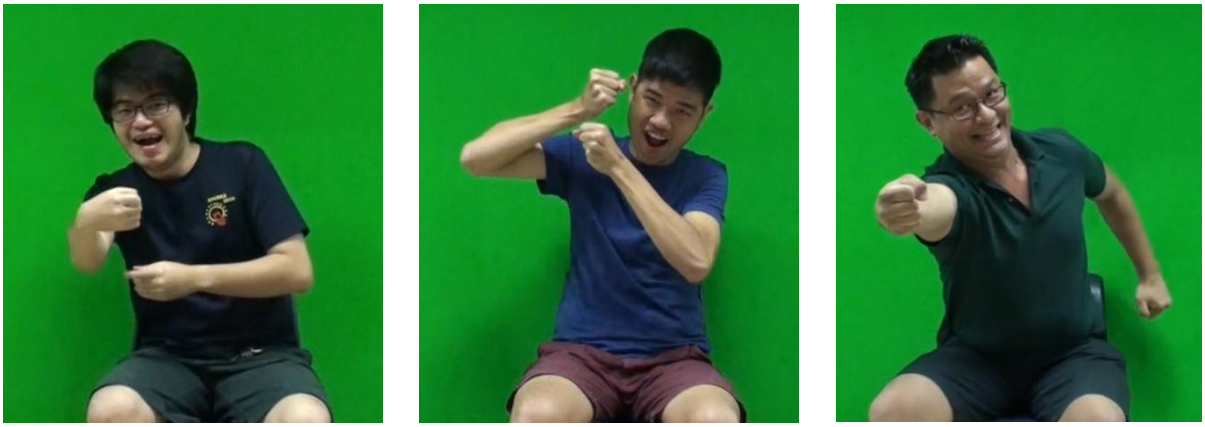
Handshape: S-handshape with all fingers clenched into a tight fist; when in clenched position, the thumb usually does not go past the first joint of the fingers (right after the nails) as it would be considered as an O-handshape () instead. Also, tucking in of the thumb below the fingernails would make it look like an E-handshape (), while sticking out of the thumb would allude to the A-handshape ().



Participant B Participant C Participant E Participant F Participant I

Figure 30: Variants of CL(S-LATERAL) retrieved from Clip 6

Orientation: The direction in which the palm is facing should be towards the side. In certain cases, the wrist can be snapped so that it faces inwards, towards the body of the signer, as produced by Participant A in Figure 31. The sign can be pulled close to the body, or away from the body with the entire arm outstretched. It can also be replicated on the other hand, depending on the entity described. For this particular orientation, if the participant is holding on to one entity, the second hand with the same sign would normally be vertically in line with the first; having two CL(S-LATERAL)s side by side or in different locations in space would imply that both hands are either holding onto separate entities or different parts of the same entity.



Participant A (Clip 4) Participant B (Clip 6) Participant D (Clip 4)

Figure 31: Different orientations of CL(9-HORI/VERT) retrieved from Clips 4 and 6

Movement:

a) To indicate how an object is being handled by an entity or the signer himself, the handshape is usually accompanied by a manner movement. There are also instances where both hands feature the handling property, but only the dominant hand is accompanied by the manner movement while the weak hand stays stationary to mark the location of the object in space.

b) To indicate how an object is transported across space, a path movement is used together with the handshape. Both path and manner can be used in combination with the handshape, suggesting that each movement type can be thought of as morphemic components of the sign. This behaviour is also seen in spoken languages such as Spanish, where some of its manner of motion verbs can project both process and path, like in *volar* 'fly' and *corer* 'run' (Fabregras, 2007, p.185-186).

Environment: The environments seem to differ according to how the manner movements of the classifiers were portrayed.

a) When both hands are used but portray different manner (Participant I, Clip 6):

FreeTransl	As the bird drove the tram, the cat received an electric shock every time it came into contact with the tram's antenna.
RH-IDgloss	CL(S-LATERAL):ROTATING-THIN-OBJECT CL(1-VERT)):ANTENNA G:SHOCK ELECTRIC
LH-IDgloss	CL(S-LATERAL):HOLDING-THIN-OBJECT CL(Y-LATERAL):ANIMAL-JUMPS G:SHOCK ELECTRIC

b) When both hands are used in the same manner (Participant C, Clip 6):

FreeTransl	The cat wanted to use a rope to swing over and catch the bird.
RH-IDgloss	ROPE CL(S-LATERAL):HOLDING-THIN-OBJECT WANT CL(Y-LATERAL):ANIMAL-MOVES CATCH BIRD
LH-IDgloss	ROPE CL(S-LATERAL):HOLDING-THIN-OBJECT WANT CATCH

It is noticed that when one HCL is stationary in space while the other HCL projects manner, participants tended not to introduce the object handled. This seems to imply that the stationary hand functions like an ECL in that it can stand alone to represent a referent without the need for specifications. In contrast, when two hands functioning as HCLs are used in the same manner, the object being handled requires specification prior to the occurrence of the HCL. One possible reason could be that HCLs, like SASSCLs, have a limited number of handshape-orientation combinations, causing them to generically represent a class of objects instead of particular types of subjects (Craig, 1986, p.189). While CL(S-LATERAL) is quite productive among SgSL users, it is also used to refer to many items that fall into the same category of 'thin and upright'. Thus special reference to the object being handled has to be made first to specify what exactly it is.

Prototype:

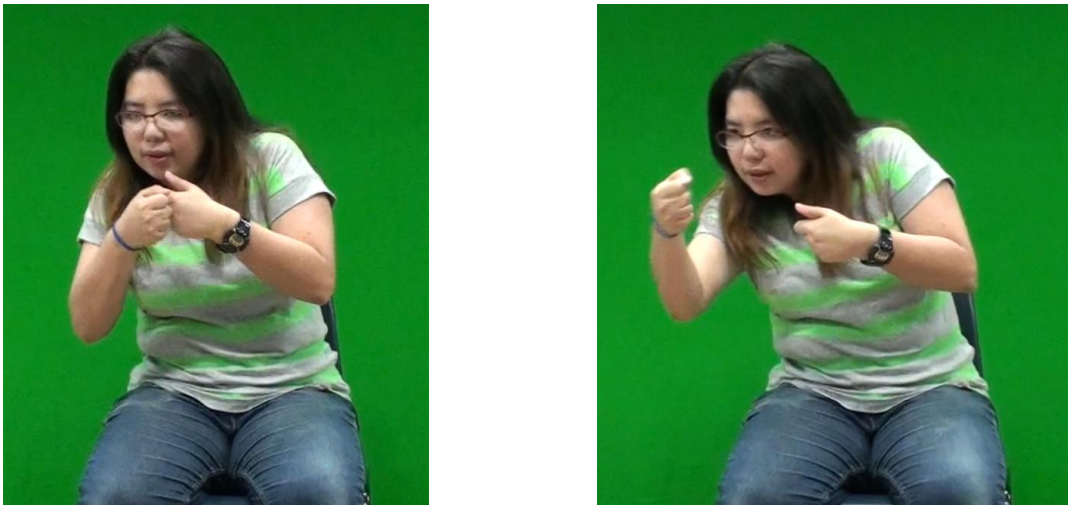


Figure 32: Prototypical usage of CL(S-LATERAL) by Participant E in Clip 4

FreeTransl	The cat held out a banana to tempt the monkey.
RH-IDgloss	BANANA CL(S-LATERAL):HOLDING-UPRIGHT-OBJECT MONKEY
LH-IDgloss	BANANA G:PSST MONKEY

It is interesting to note how the HCL itself is quite complex as to how it contains a number of morphemic parts, some of which are absent in other classifier types. According to Craig

(1986, p.196), each morphemic-component of a HCL is able to portray “a different aspect in the visual-tactile mode”. From the prototypical example itself, we can break down CL(S-LATERAL) into several meaningful components: the handshape indicates the thinness of the object handled, while the orientation indicates that the object handled is upright or in the vertical plane, and lastly, the path and manner movements show how the object is transported across space.

5 CONCLUSIONS

The preliminary examination of a small corpus of Singapore Sign Language (SgSL) has proven that classifiers are used in SgSL. In addition, the handshapes identified in the most commonly used classifiers in SgSL, especially from the Entity and Instrumental classifier types, are similar to those used in other sign languages such as American Sign Language (ASL) and Hong Kong Sign Language. While there may be slight variations in the environment that the classifiers occur, the most commonly used classifiers from each classifier type are highly lexicalized in the local variety. In particular, the multi-morphemic design and grammaticization of Handling and Shape and Size Specifier classifiers indicate that they obey features of well-formedness which are usually noticed in lexical signs, thus allowing them to remain stable and highly productive in SgSL. This study also acknowledges that there are many variants of handshapes produced for the same referent or concept, but distribution for such variations is usually sparse. This agrees with past studies which found that variations do occur on various levels due to the many parameters found in sign languages (Brentari, 1998; Perniss, Pfau & Steinbach, 2008). Overall, this study is the first description of classifiers in SgSL, and has served to provide a platform for further research, while highlighting issues of variation in SgSL. In addition, on top of researching on classifiers, this study has also contributed a substantial body of useful data for future research.

5.1 Limitations

The 12 participants whose data were analyzed in this study were all regarded as SgSL users based on self-reporting. However, as discussed in the literature review, the linguistic makeup of SgSL is a much debated topic within the local Deaf community as there is still no official standardization of the language. This means that the proficiency level of SgSL for each participant cannot be controlled for, and can only be based on their personal judgment. Nevertheless, all signers displayed ability in using a natural sign variety and had no problems communicating with the deaf facilitators.

In addition, due to the nature of this project[10], only the researcher herself was allowed to tag and gloss the signs produced, without moderation from another annotator. Despite her proficiency in sign language, the researcher is not a natural signer, and may have different perceptions on classification methods as compared to a Deaf. Thus it would have been good

[10] Linguistics and Multilingual Studies Final Year Project guidelines do not allow help in data gathering and annotation, although having multiple annotations is the best practice.

to have had at least one more annotator going through the same data to prevent researcher's biasness. Also, due to the scale of the project, this study is only able to document and analyze in detail a subset of all classifiers available in SgSL. More research needs to be done on a larger scale to gather information on the extent of classifiers used in SgSL. Nonetheless, this study has provided a good starting point on the analysis of classifier usage in SgSL.

5.2 Future research

Research on SgSL can contribute greatly to the ongoing SgSL Corpus Building Project and more follow-up work will be done after this project to build up the interface of the corpus and link up all recorded video data with the Meta data collected. As all signs produced in this study were elicited via a stimulus, more studies need to be conducted across different linguistic contexts before a definitive description of SgSL classifiers can be come up with.

Furthermore, the current study concentrates on the usage of classifiers in SgSL, focusing primarily on the types and functions of commonly used classifiers. Further research looking into the influence of ASL and Shanghai Sign Language on local classifiers would help in better understanding the current variance occurring in SgSL classifiers. Another area of interest is the investigation of factors that influence classifier usage, such as education background, degree of deafness etc. By identifying what motivates the development of classifiers in SgSL, this would be particularly useful in understanding how SgSL is structured differently from other sign languages, and provide explanation on why certain features are unique to the local variety.

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APPENDIX A: Data tabulation for each video clip

Distribution of classifiers for Clip 1

CL TYPE	HANDSHAPES	PARTICIPANTS												TOTAL
		18-30 years old			31-40 years old			41-50 years old			51 years old and above			
		A	B	C	D	E	F	G	H	I	J	K	L	
ENTITY	A-LATERAL 									2		2	2	**6**
	B-LATERAL 	2												**2**
	C-HORI 		1							1				**2**
	C-VERT 				1									**1**
	SMALLC-VERT 					1								**1**
	L-VERT 					1								**1**
	O-VERT 	1												**1**
	U-HORI 												2	**2**
	Y-VERT 								1					**1**
	Y-LATERAL 		1			5	4	2	3	1	1			**17**
	1-HORI 	1			1			1		1		2		**6**
	1-VERT 			1										**1**
	1-DOWN 	2					3							**5**
	2-HORI 	1	1	3	4	2	9	6	2	2	2	3	1	**36**
	2-DOWN 	2		1	3			1	1					**8**
	3-LATERAL 					1								**1**
	5-UP 											1		**1**
	CLOSED5-HORI 	1				1	1			1		1	2	**7**
	CLOSED5-VERT 								2					**2**
	CLOSED5-LATERAL 				4		2							**6**
	CLOSED5-UP 			1			1	1						**3**
	CLAW5- 									1				**1**

	HORI												
	BENT5-VERT 			1				1			1		**3**
SASS	B-HORI 				1	1							**2**
	B-VERT 							1					**1**
	B-LATERAL 					1	1						**2**
	C-HORI 		1										**1**
	SMALLC-VERT 			2	1	1							**4**
	S-LATERAL 							7					**7**
	1-HORI 	1										1	**2**
	1-VERT 						1						**1**
	1-DOWN 							1					**1**
	5-LATERAL 									1		1	**2**
	CLOSED5-LATERAL 			2	11			1		1	1		**16**
HAND LING	S-VERT 			2									**2**
	T-HORI 									1			**1**
	CLAW5-UP 				1								**1**
TOTAL		**11**	**4**	**13**	**27**	**14**	**22**	**20**	**11**	**12**	**4**	**11**	**8**	**157**

Distribution of classifiers for Clip 4

CL TYPE	HANDSHAPES	PARTICIPANTS												TOTAL
		18-30 years old			31-40 years old			41-50 years old			51 years old and above			
		A	B	C	D	E	F	G	H	I	J	K	L	
ENTITY	A-LATERAL 					1					1	2	3	**7**
	C-HORI 		1	1	2	1	1	5	3	3		1		**18**
	C-VERT 										1			**1**
	FLATO-HORI 									1		2		**3**
	FLATO-UP 								3			1	1	**5**
	T-VERT 										1			**1**
	Y-VERT 												1	**1**
	Y-LATERAL 	3		1		13	2	3	5	1	2	4	12	**46**
	1-HORI 									1	1		1	**3**
	1-VERT 	1	1	4	2		2	5		5	9	1	1	**31**
	1-DOWN 		1					2						**3**
	2-HORI 	1		3	3	2	5	3	1	3	2	4		**27**
	2-DOWN 	7	4	1	10		10	10	4	4	1	1		**52**
	BENT2-HORI 					1		2		1				**4**
	BENT2-VERT 					1	1							**2**
	5-HORI 				1				1					**2**
	5-VERT 						1							**1**
	5-UP 								2					**2**
	CLOSED5-HORI 				1						1		1	**3**
	CLOSED5-VERT 	1					3				2			**6**
	CLOSED5-LATERAL 				2				1		1			**4**
	CLOSED5-UP 	1		1								1	7	**10**
	CLAW5-HORI 							1		1	1			**3**

	CLAW5-VERT						2							**2**
	CLAW5-LATERAL									1			1	**2**
	CLAW5-UP									1				**1**
	BENT5-VERT									1				**1**
	BENT5-LATERAL										1			**1**
	BENT5-DOWN			1										**1**
	9-HORI							1						**1**
S A S S	A-LATERAL					1								**1**
	C-HORI			1		1		1					1	**4**
	CLOSEDG-VERT				1									**1**
	O-VERT							1						**1**
	S-LATERAL			1	2	1	1	1			1			**7**
	1-HORI										1			**1**
	CLOSED5-HORI					1								**1**
	CLOSED5-VERT				1									**1**
	CLOSED5-LATERAL				2	1		2						**5**
	CLOSED5-UP								1					**1**
	CLAW5-HORI				1						1			**2**
	CLAW5-VERT					2								**2**
	CLAW5-LATERAL									1				**1**
	BENT5-LATERAL					1	1		1				1	**4**
	9-HORI								3	1				**4**
	A-HORI				1	3		3	2	1	1	4	1	3	**19**
	A-LATERAL			2	3	1	3	3		1	1	2	5	3	**24**
	C-HORI			2	1			2		1					**6**
	CLOSEDG-			1				1		3			2		**7**

HANDLING	HORI														
	CLOSEDG-VERT							1							**1**
	O-HORI						1		4	3					**8**
	O-VERT									1	1				**2**
	FLATO-HORI											1		1	3	**5**
	FLATO-VERT										2	1			1	**4**
	FLATO-DOWN											1				**1**
	S-HORI		1		2		2	2	2		1	2			**12**
	S-LATERAL		4		1	1	2	1		2	2	1		1	**15**
	S-DOWN					2									**2**
	T-HORI		1	1		1	2		3		3	1		1	**13**
	T-VERT													1	**1**
	BENT2-HORI							1							**1**
	CLAW5-HORI			2	2		4	2	1		3	2	1		**17**
	CLAW5-VERT												1		**1**
	CLAW5-LATERAL		1										1		**2**
	CLAW5-UP			1											**1**
	9-HORI				1	1			2						**4**
INSTRUMENTAL	1-VERT										1	1	1		**3**
TOTAL			**21**	**17**	**30**	**37**	**35**	**50**	**55**	**32**	**38**	**40**	**31**	**43**	**429**

Distribution of classifiers for Clip 6

CL TYPE	HANDSHAPES	PARTICIPANTS												TOTAL
		18-30 years old			31-40 years old			41-50 years old			51 years old and above			
		A	B	C	D	E	F	G	H	I	J	K	L	
ENTITY	A-LATERAL 											1		**1**
	B-HORI 	1												**1**
	B-VERT 										3	3		**6**
	B-LATERAL 				1			2					9	**12**
	C-HORI 				1									**1**
	C-VERT 									1				**1**
	CLOSEDG-VERT 		1			1								**2**
	L-VERT 					2								**2**
	O-VERT 							3					1	**4**
	S-LATERAL 	1												**1**
	Y-VERT 											1		**1**
	Y-LATERAL 		7	3		18			2	5	5	1	3	**44**
	Y-UP 					1			1					**2**
	1-HORI 		3	1	3			7	4	2	3	6	5	**34**
	1-VERT 			1			1		2		4			**8**
	1-UP 											1		**1**
	1-DOWN 		1									1		**2**
	2-HORI 	3	3	2	3	1	7			1	2	1		**23**
	2-DOWN 	11	4	3	10		16	14	6	3	2	5	14	**88**
	3-LATERAL 			2										**2**
	5-HORI 	4									2	2		**8**
	5-VERT 		1	1										**2**
	5-LATERAL 		1											**1**
	CLOSED5-HORI 	6	1	1	8	6	7	6	7	1	4	3	6	**56**

	CLOSED5-VERT		4			2	1	1	4	1			1	1						**16**
	CLOSED5-LATERAL				4		3					1				1				**9**
	CLOSED5-UP																		1	**1**
	CLAW5-HORI									3										**3**
	CLAW5-VERT									1										**1**
	BENT5-LATERAL				2											2				**4**
S A S S	A-LATERAL						1													**1**
	C-HORI															1				**1**
	C-VERT					1														**1**
	SMALLC-VERT											2								**2**
	F-LATERAL								1											**1**
	G-VERT						1													**1**
	CLOSEDG-HORI											1								**1**
	CLOSEDG-VERT				1	1						2							1	**5**
	I-VERT				1															**1**
	I-LATERAL				2															**2**
	I-DOWN				1															**1**
	S-LATERAL								1											**1**
	1-HORI					2	3					3			3					**11**
	1-VERT				1				1	4						1	1			**8**
	1-LATERAL				3							1								**4**
	1-DOWN		1																	**1**
	4-VERT								1											**1**
	5-HORI											1								**1**
	5-LATERAL					1														**1**
	CLOSED5-VERT					1														**1**

	CLOSED5-LATERAL 				2					1				**3**
	9-HORI 					2	1							**3**
	9-VERT 			5	1		4					1	2	**13**
	9-LATERAL 		1											**1**
	9-UP 							1						**1**
HANDLING	A-LATERAL 									1				**1**
	C-HORI 	1					2							**3**
	CLOSEDG-HORI 		2				1		2		3		6	**14**
	CLOSEDG-VERT 		1				2	2		2				**7**
	S-HORI 			1										**1**
	S-VERT 	1	2	1							2			**6**
	S-LATERAL 	1	2	3	2	4	7	2	2	3				**26**
	S-UP 			1										**1**
	9-HORI 	3			2	1		1				2		**9**
	9-VERT 					1								**1**
INSTRUMENTAL	G-VERT 			1										**1**
	O-VERT 												1	**1**
	X-VERT 				1	4				3	2	4		**14**
	1-VERT 	2			4			9		2	1	2		**20**
	1-UP 						1							**1**
	BENT2-UP 						8							**8**
TOTAL		**39**	**45**	**34**	**47**	**42**	**65**	**56**	**27**	**36**	**37**	**40**	**50**	**518**

APPENDIX B: Interview questions for Meta data

1. Were you born deaf? If not, at which age did you turn deaf?
2. What is the degree of your hearing loss? Mild/Moderate/Severe/Profound
3. Did you grow up in a deaf family? Other than you, is there any other member in the family who is also deaf?
4. Is sign language your first language? If not, when did you pick it up? And how did you learn sign language?
5. How long have you been using sign language?
6. Which variety(s) of sign language do you use? Singapore Sign Language/Pidgin Sign/Signed Exact English II/Shanghai Sign Language/American Sign Language
7. What other languages do you know?
8. Please provide us with your name, contact number and email address so that we can contact you to clarify about the data if need be.

APPENDIX C: Sample of ELAN annotation

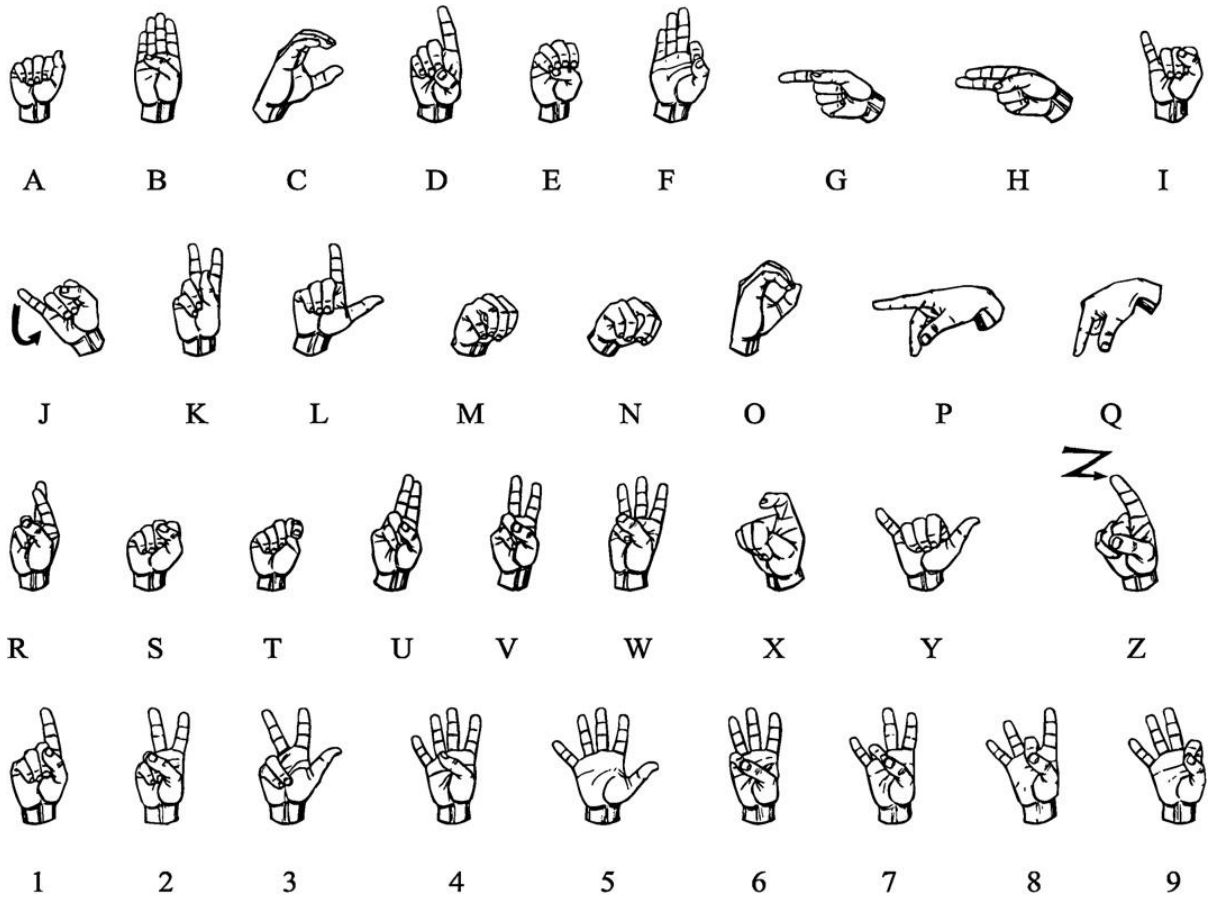
The following was extracted from an ELAN file (Participant B, Clip 1):

TIER	TIME START	TIME END	ANNOTATION
FreeTransl	00:02.3	00:07.9	There was a building named "Bird Watchers Society".
RH-IDgloss	00:02.3	00:02.9	CL(C-HORI):BUILDING-LOCATION
LH-IDgloss	00:02.3	00:03.0	CL(C-HORI):BUILDING-LOCATION
ClassifierType	00:02.3	00:03.0	ENTITY
RH-IDgloss	00:03.0	00:03.9	BUILDING
LH-IDgloss	00:03.0	00:03.9	BUILDING
ClassifierType	00:03.9	00:04.8	SASS
RH-IDgloss	00:04.0	00:04.7	CL(C-HORI):BUILDING-SIZE
LH-IDgloss	00:04.0	00:04.8	CL(C-HORI):BUILDING-SIZE
RH-IDgloss	00:04.8	00:05.0	PT:LOC
LH-IDgloss	00:05.1	00:05.6	NAME
RH-IDgloss	00:05.1	00:05.6	NAME
RH-IDgloss	00:05.7	00:06.4	BIRD
RH-IDgloss	00:06.4	00:07.1	WATCH
LH-IDgloss	00:06.4	00:07.1	WATCH
RH-IDgloss	00:07.1	00:07.9	SOCIETY
LH-IDgloss	00:07.1	00:07.8	SOCIETY
FreeTransl	00:08.1	00:11.5	At the window, there was a bird.. cat using a pair of binoculars.
RH-IDgloss	00:08.2	00:08.4	PT:LOC
LH-IDgloss	00:08.5	00:09.4	WINDOW
RH-IDgloss	00:08.5	00:09.4	WINDOW
RH-IDgloss	00:09.4	00:09.6	PT:PRO
LH-IDgloss	00:09.8	00:10.5	BINOCULARS(FALSE-START)
RH-IDgloss	00:09.9	00:10.3	BINOCULARS(FALSE-START)
RH-IDgloss	00:10.4	00:10.6	BIRD(FALSE-START)
RH-IDgloss	00:10.6	00:10.7	INDECIPHERABLE
LH-IDgloss	00:10.6	00:10.9	INDECIPHERABLE
RH-IDgloss	00:10.7	00:11.5	CAT
LH-IDgloss	00:11.6	00:13.3	BINOCULARS
RH-IDgloss	00:11.7	00:13.3	BINOCULARS
FreeTransl	00:11.7	00:15.2	He used the binoculars to stare out of the building.
RH-IDgloss	00:13.3	00:14.1	STARE
LH-IDgloss	00:13.3	00:14.1	STARE
RH-IDgloss	00:14.2	00:15.2	BINOCULARS
LH-IDgloss	00:14.2	00:15.2	BINOCULARS
RH-IDgloss	00:15.5	00:16.1	PT:LOC
FreeTransl	00:15.5	00:20.3	There was another building across named "Broken Arms".
RH-IDgloss	00:16.6	00:17.0	ANOTHER
LH-IDgloss	00:17.0	00:18.0	BUILDING
RH-IDgloss	00:17.0	00:17.8	BUILDING
RH-IDgloss	00:17.9	00:18.1	PT:LOC
LH-IDgloss	00:18.2	00:18.8	NAME

RH-IDgloss	00:18.2	00:18.8	NAME
RH-IDgloss	00:19.0	00:19.5	BREAK
LH-IDgloss	00:19.1	00:19.4	BREAK
RH-IDgloss	00:19.5	00:20.3	ARM
RH-IDgloss	00:20.4	00:21.2	PT:PRO
FreeTransl	00:20.4	00:25.7	He took up his binoculars and saw another bird cage.
RH-IDgloss	00:21.4	00:22.3	BINOCULARS
LH-IDgloss	00:21.4	00:22.6	BINOCULARS
RH-IDgloss	00:22.5	00:23.0	SEE
RH-IDgloss	00:23.1	00:23.4	ANOTHER
RH-IDgloss	00:23.5	00:23.8	PT:DET
RH-IDgloss	00:23.9	00:24.7	BIRD
LH-IDgloss	00:24.8	00:25.7	CAGE
RH-IDgloss	00:24.9	00:25.3	CAGE
RH-IDgloss	00:25.4	00:25.7	PT:PRO
RH-IDgloss	00:25.8	00:26.2	BIRD
FreeTransl	00:25.8	00:27.3	The bird was also using a pair of binoculars.
RH-IDgloss	00:26.3	00:26.6	ALSO
LH-IDgloss	00:26.4	00:26.7	ALSO
RH-IDgloss	00:26.8	00:27.3	BINOCULARS
LH-IDgloss	00:26.8	00:27.3	BINOCULARS
FreeTransl	00:27.7	00:31.7	It was when they were looking at the same direction then did the bird realize.
LH-IDgloss	00:27.7	00:28.2	WHEN
RH-IDgloss	00:27.7	00:28.1	WHEN
RH-IDgloss	00:28.2	00:29.1	CL(2-HORI):ANIMAL-SEES-SOMETHING
LH-IDgloss	00:28.2	00:29.1	CL(2-HORI):ANIMAL-SEES-SOMETHING
ClassifierType	00:28.2	00:29.1	ENTITY
LH-IDgloss	00:29.2	00:29.5	THEN
RH-IDgloss	00:29.3	00:29.6	THEN
RH-IDgloss	00:29.6	00:30.0	BIRD
RH-IDgloss	00:30.0	00:30.7	REALIZE
RH-IDgloss	00:30.9	00:31.7	BINOCULARS
LH-IDgloss	00:30.9	00:31.7	BINOCULARS
FreeTransl	00:31.8	00:35.6	Then the cat smirked to himself.
RH-IDgloss	00:31.8	00:32.2	THEN
LH-IDgloss	00:31.9	00:32.1	THEN
RH-IDgloss	00:32.2	00:32.5	PT:DET
RH-IDgloss	00:32.5	00:33.2	CAT
RH-IDgloss	00:33.3	00:34.8	BINOCULARS
LH-IDgloss	00:33.4	00:34.8	BINOCULARS
RH-IDgloss	00:34.9	00:35.6	G:UP-TO-NO-GOOD
LH-IDgloss	00:34.9	00:35.6	G:UP-TO-NO-GOOD
RH-IDgloss	00:35.7	00:35.9	WANT
LH-IDgloss	00:35.7	00:35.9	WANT
FreeTransl	00:35.7	00:36.6	He wanted to get out.
RH-IDgloss	00:35.9	00:36.3	OUT
LH-IDgloss	00:35.9	00:36.3	OUT

LH-IDgloss	00:36.3	00:36.5	OUT
RH-IDgloss	00:36.3	00:36.6	OUT
FreeTransl	00:36.9	00:40.8	He ran over to that building over there.
RH-IDgloss	00:36.9	00:37.1	CL(BENT2-DOWN):ANIMAL-MOVES
RH-IDgloss	00:37.3	00:38.0	G:RUNNING
LH-IDgloss	00:37.3	00:38.0	G:RUNNING
RH-IDgloss	00:38.2	00:38.6	PT:LOC
RH-IDgloss	00:39.0	00:39.2	THAT
LH-IDgloss	00:39.0	00:39.3	THAT
RH-IDgloss	00:39.4	00:40.2	BUILDING
LH-IDgloss	00:39.5	00:40.2	BUILDING
RH-IDgloss	00:40.3	00:40.8	PT:LOC
FreeTransl	00:42.1	00:44.5	But he got kicked out.
RH-IDgloss	00:42.1	00:42.6	BUT
LH-IDgloss	00:42.1	00:42.6	BUT
RH-IDgloss	00:42.6	00:43.0	PT:PRO
RH-IDgloss	00:43.7	00:44.0	KICK
LH-IDgloss	00:43.7	00:44.0	KICK
RH-IDgloss	00:44.1	00:44.5	OUT
LH-IDgloss	00:44.1	00:44.5	OUT
RH-IDgloss	00:44.7	00:46.2	CL(Y-LATERAL):ANIMAL-FLIES
ClassifierType	00:44.7	00:46.2	ENTITY
FreeTransl	00:44.7	00:48.4	He flew across and landed on a rubbish pile.
RH-IDgloss	00:46.4	00:46.6	PT:PRO
LH-IDgloss	00:46.7	00:47.0	ON
RH-IDgloss	00:46.8	00:47.0	ON
RH-IDgloss	00:47.1	00:48.1	RUBBISH
RH-IDgloss	00:48.2	00:48.4	PT:PRO
LH-IDgloss	00:48.6	00:49.7	G:GETS-HIT-ON-HEAD
RH-IDgloss	00:48.6	00:49.2	G:GETS-HIT-ON-HEAD
FreeTransl	00:48.6	00:50.4	He gets hit on the head by a can.
RH-IDgloss	00:49.5	00:49.8	PT:DET
RH-IDgloss	00:49.8	00:50.4	FS:CAN
FreeTransl	00:50.5	00:50.7	Oh well.
RH-IDgloss	00:50.5	00:50.7	G(5-UP):WELL
LH-IDgloss	00:50.5	00:50.7	G(5-UP):WELL
RH-IDgloss	00:50.8	00:51.3	FINISH
LH-IDgloss	00:50.8	00:51.3	FINISH
FreeTransl	00:50.9	00:51.4	The end.

APPENDIX D: ASL and SEE2 handshapes



(Shield & Meier, 2012, p.452)

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