

NANYANG TECHNOLOGICAL UNIVERSITY

SCHOOL OF HUMANITIES AND SOCIAL SCIENCES



**An Etymological Study of Singapore Sign Language:
The Influence of American Sign Language on
Singapore Sign Language**

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An Etymological Study of Singapore Sign Language: The Influence of American Sign Language on Singapore Sign Language

Lee Naomi Elizabeth

Abstract

Though there is no officially recognized national sign language in Singapore, Singapore Sign Language (SgSL) is recognized by the local deaf community. It has influences from Shanghainese Sign Language (SSL) and American Sign Language (ASL), and is continually developing with locally generated signs. This study aims to give an insight into the influence of ASL on SgSL, which serves as a first look into the etymology of SgSL. 14 participants were recruited in this study; 3 participants were given a Swadesh list for sign languages consisting of 100 words, which they were asked to sign in SgSL. The videos of ASL signs for the same words were obtained online and presented alongside the SgSL signs to the other 11 participants, who gave judgments about the similarities of each pair of signs. The signs were also transcribed using the *Hamburg Sign Language Notation System*, or HamNoSys, and further analyzed based on handedness and four traditional phonological parameters – handshape, location, movement and orientation. This was done by calculating the Levenshtein distances between each pair of transcriptions. The similarity of the signs was then determined after consideration of the participants’ judgments and the analysis of phonological parameters, and it was found that the signs were similar to a great extent, which suggests that SgSL is heavily influenced by ASL.

1 Introduction

Learning about the etymology of a language may help one to better understand it (Awad, 2006), and also aid in the learning of words and concepts (Pierson, 1989). In this case, the etymology of Singapore Sign Language is the area of interest that I would like to explore. Singapore Sign Language (SgSL) has its roots in Shanghainese Sign Language (SSL), American Sign Language (ASL), and Signed Exact English (SEE) (Phua, 2004).

To understand the influences of SgSL, one would have to look into the history of the language. According to Phua (2003), Mr. Peng Tsu Ying, who was educated in the Hong Kong School for the Deaf and the Shanghai Chung Wah School for the Deaf, first introduced a formal sign system in Singapore in 1951, and the first school for the deaf was established in 1954. In 1963, the Singapore School for the Deaf consisted of two sections – the oral section and signing section. The former was taught with English as the medium of instruction, while the latter was taught Chinese with Shanghainese Sign Language as the medium of instruction. Mr Peng's student, Mr. Lim Chin Heng, then introduced ASL to Singapore in 1975 after he graduated from an American university for the deaf. The Singapore School for the Deaf later adopted and implemented the philosophy of Total Communication (TC) in 1977, where the oral section of the school used signs and the signing section used oral communication. At this point, the classes were conducted in ASL. The next year, the school decided to use Signed Exact English as the official medium of instruction, and the Chinese section using Shanghainese Sign Language ceased operation in 1983. Today, SgSL is a mix of these sources of influence, and includes locally developed signs.

Currently, very little research has been done on the etymology of SgSL, and there is a lack of documentation of the language. This study aims to provide a brief look into the influences of SgSL by comparing core lexical items in SgSL and ASL. The primary goal of this study is to provide a quantitative perspective of the etymology of SgSL. On top of this, the videos collected in this study can be used in the future both as a lexicon and as a Swadesh list for SgSL, thus contributing to the proper documentation and increased social recognition of the language, which are limited at the time of this study.

There have been previous studies done on the history of other sign languages and their influences. Woodward (1976) did a study on the historical relationship between American Sign Language (ASL) and French Sign Language (FSL), and found that FSL tended to have the older form compared to ASL in many instances when there were relationships of historical change between the two languages. In this study, the FSL data that Woodward collected was in the form of still photos, and he compared

the changes in FSL and ASL in terms of fluidity and variation of handshapes, locations and movements. However, as the FSL data collected was in the form of still photos, the analysis of the variations in movements of the signs may not have been accurate. A study was also done on the history of Hong Kong sign language in 1993 (Woodward, 1993), and it was found that Hong Kong Sign Language (HKSL) had a close relationship with Shanghai Sign Language (SSL), but was not influenced solely by SSL. The results of this study were reinforced in a recent study by Sze et al. (2013).

Woodward made use of a modified Swadesh list (see Section 2.2 for more details), which he developed specifically for the use of comparing sign languages, and obtained both HKSL and SSL signs for all words on the list. He then asked participants to determine if the signs were similar. Sze et al. relied on written materials in the form of publications by the government, news agencies, and the Deaf school, and also interviews with the Deaf community regarding sign language use. There is a limitation in Woodward's sole reliance on the judgment of the participants to obtain results regarding the similarity of the signs – judgments always involve an element of subjectivity and thus may compromise the reliability of the results obtained. For example, a participant may think of HKSL as a completely different language from SSL, and would thus give the opinion that the signs are not similar, even if they show similarities. Sze's study, on the other hand, was largely qualitative and served to reinforce Woodward's finds in the 1993 study. A combination of all the methods mentioned above – comparison based on phonological parameters, quantitative and qualitative means – would give a more comprehensive picture of the similarities between different sign languages.

2 Methodology

Although there have not been any studies on the relationship between SgSL and other sign languages, there has been extensive research done on other sign languages. Thus, the methodology used in this study is based largely on methods used in past research to determine the relationship between sign languages – many of the comparative studies on sign languages involved the use of a modified Swadesh list as a basis of comparison and determination of the degree of relation between different sign languages (Johnston, 2003; McKee & Kennedy, 2000; Wang, 2006). As SgSL is a relatively under-described language at this point and there is limited data available, lexicostatistics is an appropriate method to employ as it enables one to establish the relationship between languages without having to compare a large number of lexical items (Woodward, 2011).

2.1 Participants

14 participants were selected to take part in this study. They were recruited with the help of Ms. Low Jarn May, chairperson of the linguistics sub committee at *The Singapore Association for the Deaf* (SADeaf), and Jessica Mak, sign language development officer at SADeaf. 5 of the participants were female, and 9 were male. They were separated into 5 age groups – 18 to 30 (I), 31 to 40 (II), 41 to 50 (III), 51 to 60 (IV), and 61 & above (V), with 3 participants each in groups I to IV, and 2 in group V.

2.2 Procedure

There were two parts to the study. In the first part, three participants (1 each from groups I, II, and IV) were given a list of 100 words from the Swadesh list, and were asked to sign each word on the list in SgSL. The original Swadesh list, which was developed by Morris Swadesh, is a list of basic concepts that enables one to quantify the relationship between languages, and is used widely for the purpose of historical-comparative linguistics. Swadesh developed several versions of the list. The original list started off as a list of 225 words (Swadesh, 1950). He made several revisions before publishing his final 100-word list in 1971 (Swadesh et al., 1972). The words in the list were picked by Swadesh for their universal, culturally independent

availability in many languages.

The list used in this study was modified by James Woodward specifically for the purpose of studying sign languages (Woodward, 1993). The modified list was adapted so as to reduce the overestimation of the relationship between sign languages due to a large number of indexic signs in the original list. As a result, the modified Swadesh list contains fewer body parts and personal pronouns. Some nouns on the list were presented with clipart images obtained by the author through the search engine Bing, using a filter that only allowed images in the public domain and are free to used to be shown. The clipart images are used so as to maintain neutrality and prevent any cultural issues that may arise if pictures of local objects are used (Padden, 2015). The list that was presented to the participants can be found in the Appendix A. The participants signed each word on the list and pressed a bell after each word to signal the end of a sign, and this was recorded in video format. As the facial expression of the signer is a crucial part of the signs, it was not possible to record data in a manner that participants remained anonymous. Thus, the participants were asked for permission for the data to be released under a creative commons attributive license (CC BY)¹, with the goal of making a releasable dictionary for the community, which would make SgSL more accessible to the general public and increase social recognition of the language.

In the second part, the remaining 11 participants were shown videos in pairs – the SgSL signs recorded in the first part of the study were cut into short clips (each containing one sign) and merged with videos of a signer signing the same word in ASL. In other words, one pair of videos would contain the SgSL sign for a particular word, and the ASL sign for that same word. Since 3 participants were recorded in the first part, there were some repetitions of signs used for each word. The repeated signs were left out in the second part of the study. The videos of the ASL signs were obtained from online ASL dictionaries, Spreadthesign and Handspeak. When the signs differed on both sites, other online dictionaries, ASLPro.com and Signing Savvy were used to determine which sign would be used – in general, the sign that was given on most sites was chosen. For most words, only one ASL sign was chosen.

¹ <https://creativecommons.org/licenses/by/4.0/legalcode>

However, for some words where two of the ASL signs seemed similar to the SgSL signs given, both ASL signs were chosen and each was presented with the similar SgSL sign – an example is given in Figure 2.1. This was done in order to prevent any underestimation of the relationship between ASL and SgSL.

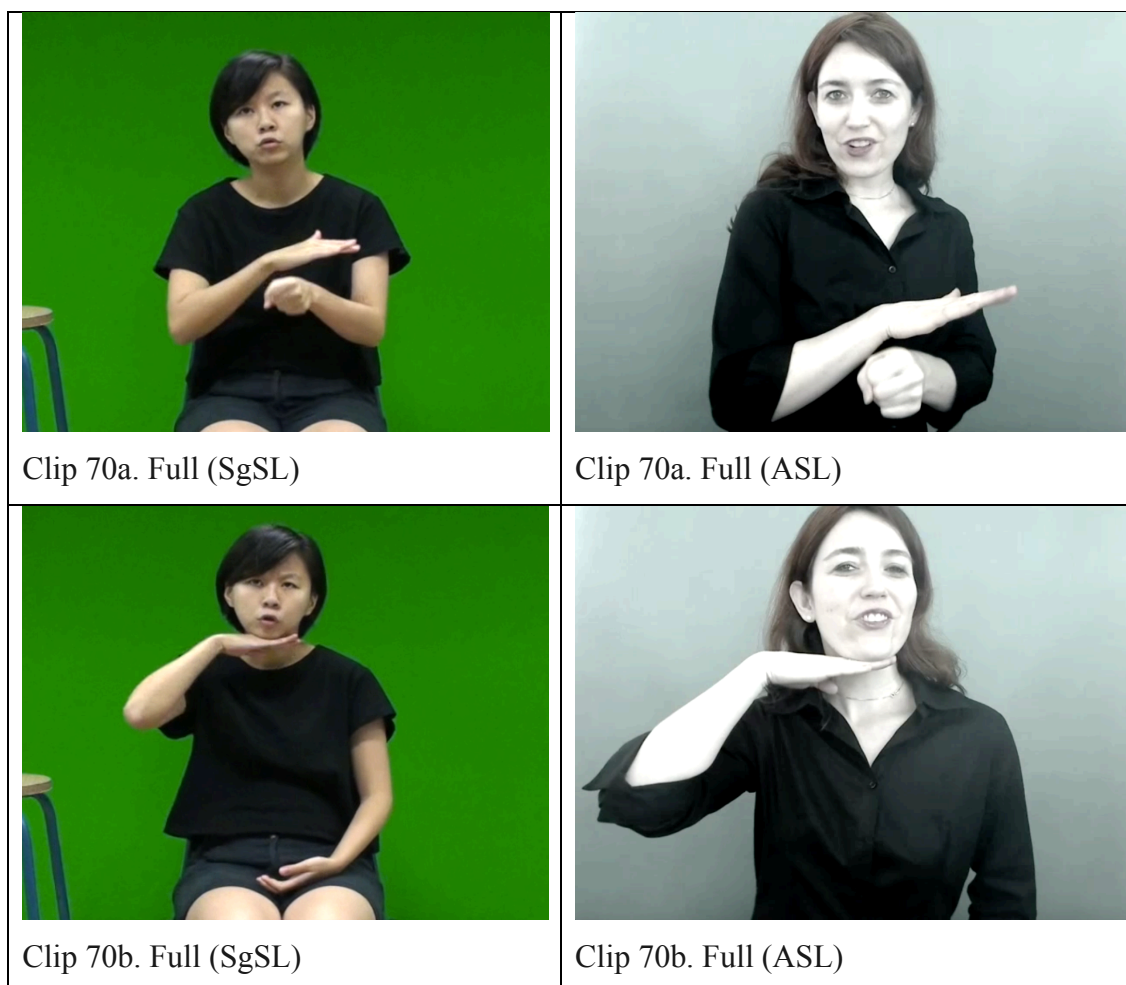


Figure 2.1: Variations of signs in SgSL & ASL for 'full'

Participants were first shown the sign for each word in SgSL, followed by the sign in ASL. They were then asked to determine whether the signs have the same meaning, and whether they looked the same or not. Their responses were recorded on a response sheet (See Appendix B). The participants were presented with a total of 213 pairs of signs, containing 213 SgSL signs and 104 ASL signs. The NeighborNet algorithm was used to construct a phylogenetic network so as to analyze the extent of agreement among the judgments made by the 10 participants. NeighborNet is a distance-based model used for analysis of data, and it is one of the methods used in quantitative comparative linguistics. This method constructs split networks by taking

distance matrices as input and agglomerating clusters (Bryant & Moulton, 2003). The phylogenetic network was generated using SplitsTree4, a program used to infer phylogenetic networks from data in the form of sequence alignments, distance matrices or sets of trees (Huson & Bryant, 2006).

Due to the subjective nature of judgments given by the participants, the signs were further compared based on handedness and four traditional phonological parameters – handshape, location, movement and orientation. In 1960, William Stokoe introduced three phonological parameters, or *cheremes* (derived from Greek *cheir* – hand), for the analysis of signs in sign languages (Stokoe, 1960). These parameters were *tabula*, *designator* and *signation*, which he shortened to *tab*, *dez*, and *sig*, which refer to location, handshape and movement respectively. At the time, he used this system to examine ASL signs. He made a clear distinction between finger-spelled English words and signs due to their structural differences, and argued that signs should be analyzed in an aspectual manner instead of being segmented in time order, unlike words in the English language. Robbin Battison later added a fourth parameter, orientation or *ori*, to Stokoe’s system in 1973 (Wilbur, 1980). This parameter refers to the orientation of the palm. These four parameters form the bases of phonological comparisons of signs today.

In order to compare the signs based on the four phonological parameters, they were transcribed by the author using the *Hamburg Sign Language Notation System*, or HamNoSys. It is a phonetic transcription system that is influenced by the Stokoe notation system, and it enables one to transcribe sign languages in detail, thus allowing the comparison of signs through the 4 phonological parameters. HamNoSys is an alphabetic system with approximately 210 characters in its symbol inventory (Hanke, 2009). This transcription system is widely used in research (Miller, 2001), and was chosen due to the level of detail that it is able to capture, as well as the ability to be stored on computers. This would be greatly beneficial in the creation of an online corpus for SgSL. The general structure of HamNoSys is shown in Figure 2.2 below:

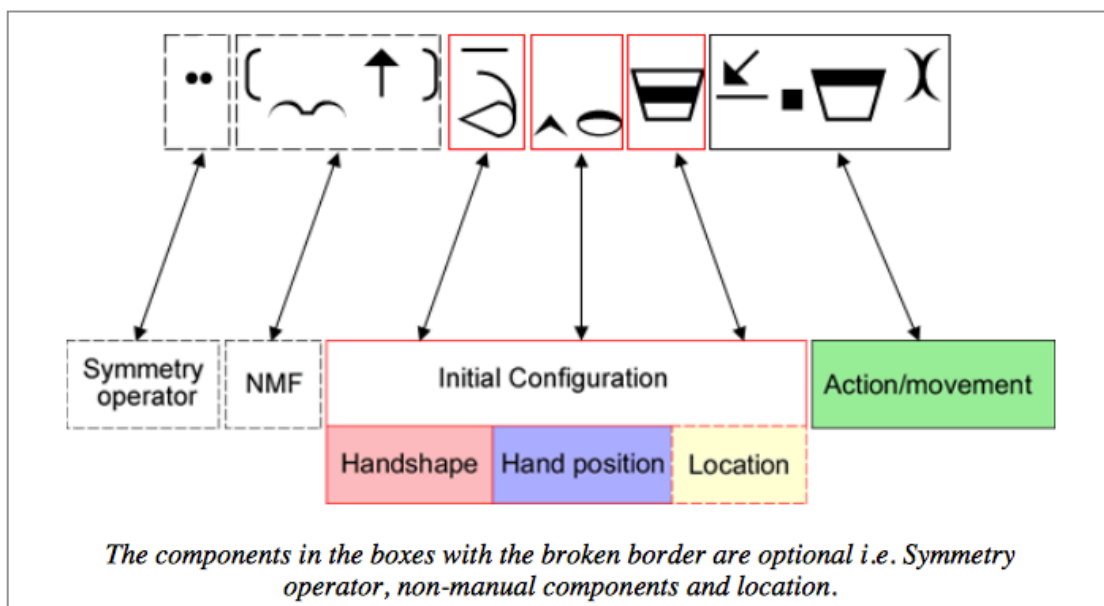


Figure 2.2: General Structure of HamNoSys (Smith, 2013, p.4)

As seen in Figure 2.2, the main components of HamNoSys transcriptions include the four phonological parameters that we want to use in the comparison of the sign pairs – handshape, hand position (orientation), location, and movement. Thus, HamNoSys was chosen as the transcription system for this study. An example of a transcription can be found in Figure 2.3 below.

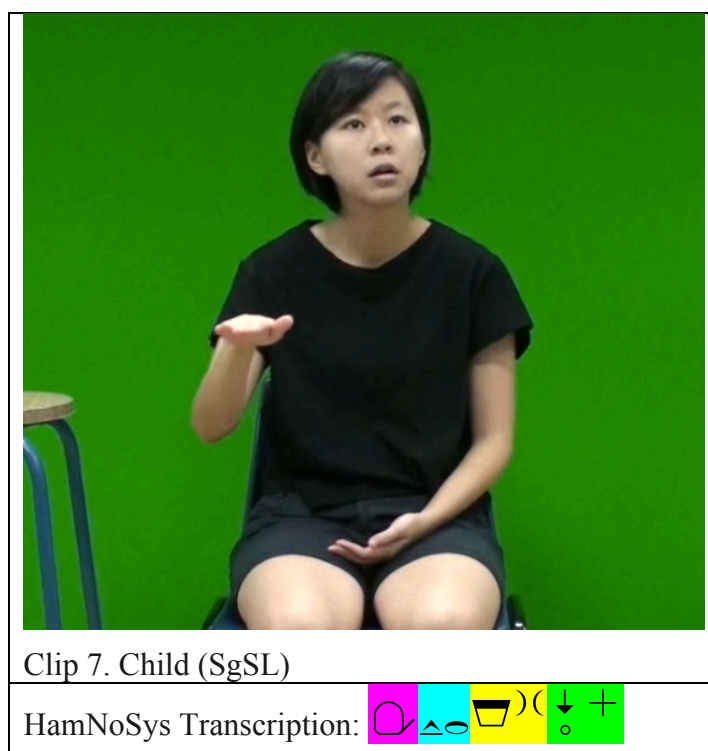


Figure 2.3: HamNoSys Transcription for 'Child'

The transcription in Figure 2.3 can be read as:

handshape - flathand, fingers nonspread except thumb

orientation - fingers pointing straight ahead, away from the body, palm facing down

location - at shoulder line, close to body without contact

movement - small movement downwards, repeated once

The transcriptions of the SgSL signs were then compared to those of the ASL signs to find the differences. In order to compare the signs quantitatively, the Levenshtein distance between each pair of signs was computed. The Levenshtein distance, named after Vladimir Levenshtein, is a string metric that allows one to measure the difference between 2 sequences (Levenshtein, 1966). Simply put, it is the minimum number of insertions, deletions and substitutions that are required to change one word to the other. For example, the Levenshtein distance between “Friend” and “French” is 3, as the minimum number of edits that is required to change “Friend” to “French” is 3, as seen below:

1. Friend → Frend (Deletion of “i”)
2. Frend → Frenc (Substitution of “c” for “d”)
3. Frenc → French (Insertion of “h”)

The Levenshtein distances for each pair of signs were calculated by the author using the implementation in the Natural Language toolkit `nlk.metrics.edit_distance` (Bird et al., 2009). Similarity scores were also calculated using the following formula: $\text{Similarity} = (1 - \text{Distance}/(\text{length of longest sign}))$, with 1 meaning that the signs are exactly the same, and 0 meaning that they are completely different. The Levenshtein distance and similarity scores, along with the HamNoSys transcriptions, can be found in the Appendix C. The similarity of the signs was then determined based on both the judgment of participants and the further comparisons in the phonological parameters.

3 Results

3.1 Judgment Task

During the study, it was found that one of the participants from group V (aged 61 and above) could not understand the instructions written in English. Even though the instructions were translated into Chinese, it seemed that he still had difficulty understanding the task. Therefore, his responses will not be included in the results. A total of 10 participants' responses (2130 judgments) were collected. 846 of these options indicated that the signs looked the same and have the same meaning, while 1049 of them indicated that the signs looked different but have the same meaning. 56 of the options indicated that the signs have different meanings but looked the same, while 137 reflected that the signs have different meanings and looked different. For signs that the participants could not identify, there were 42 responses. The overall results are summarized in Figure 3.1.

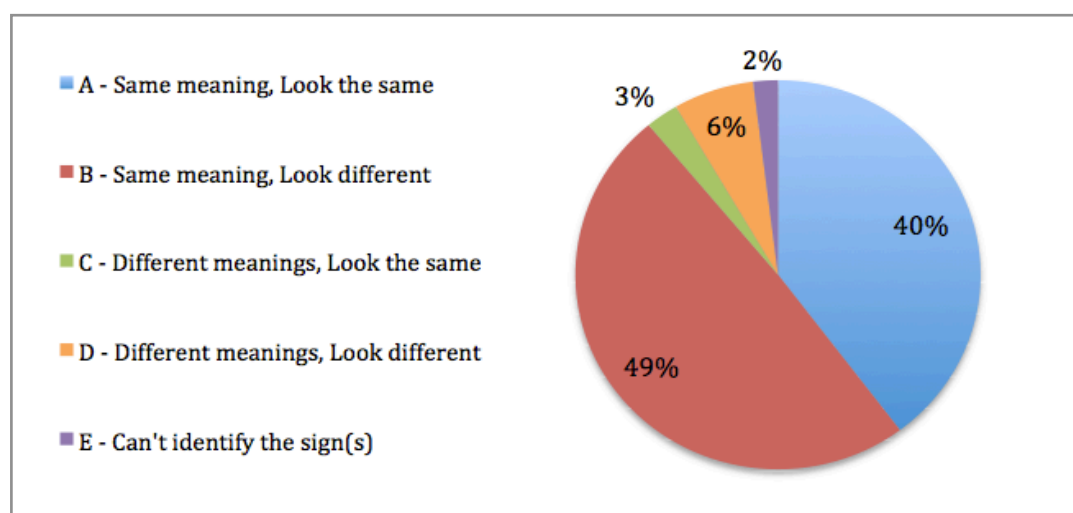


Figure 3.1: Overall Responses

A total of 77 out of 213 sign pairs were deemed to have the same meaning and looks by majority of participants (60% or more), while 121 out of 213 sign pairs were stated to have the same meaning but looked different. Although the majority of the overall responses indicated that the signs have the same meaning but looked different, the results indicated that 72 out of the 100 words on the list had at least one SgSL sign that the majority (60% or more) of the participants thought looks and means the same as the ASL sign.

Looking at the average frequency of responses in terms of age groups, it seems that there are no significant differences among the different groups – Figure 3.2 shows the average frequency of each option chosen by the five different age groups, where A – Same meaning, look the same, B – Same meaning, look different, C – Different meanings, look the same, D – Different meanings, look different, and E – I can't identify the sign(s). Generally, all five groups chose option B more than they chose option A, and majority of the options chosen were either A or B, with significantly lower frequencies for options C, D, and E. The only obvious difference in the frequency of the options chosen was in option B, where age group V had a relatively higher frequency of choosing option B than the rest of the groups. However, it should be kept in mind that the responses for group V came from one participant only, due to the exclusion of the responses from the other group V participant who could not understand the instructions given. Thus, the numbers for this group should not be taken as a good representation of responses of a whole group of participants.

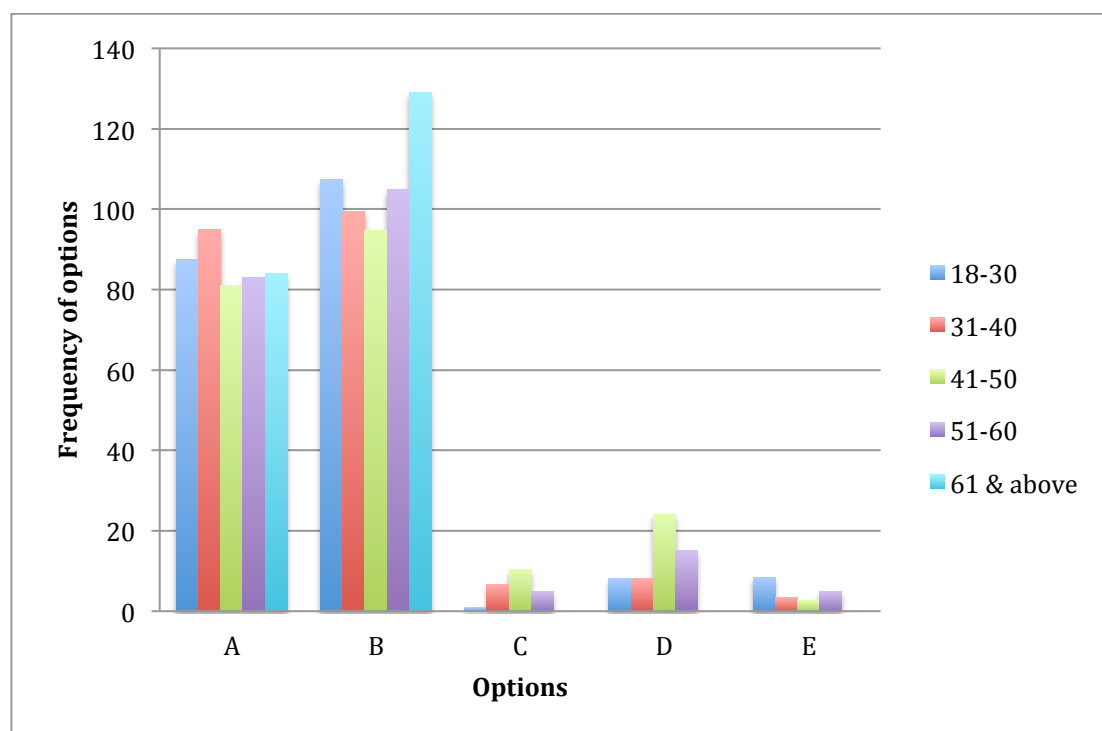


Figure 3.2: Average Frequency of Options Chosen (by Age Group)

As seen from Figure 3.2, no significant trends or differences were observed across the different age groups. However, the frequency of responses given by some individuals differed greatly from that of the rest, as seen in Figure 3.3, where each line represents the frequency of options chosen by one participant. Generally, most of

the participants chose option B most frequently, followed by option A, D, E, and finally C. This means that most participants thought that most of the signs in the sign pairs had the same meaning, and more of these signs looked different than the same. Only the responses given by participants 4 and 5 did not follow this trend – they chose option A more than they did option B. These two participants were from groups IV and III respectively. Table 3a shows the participants in each age group.

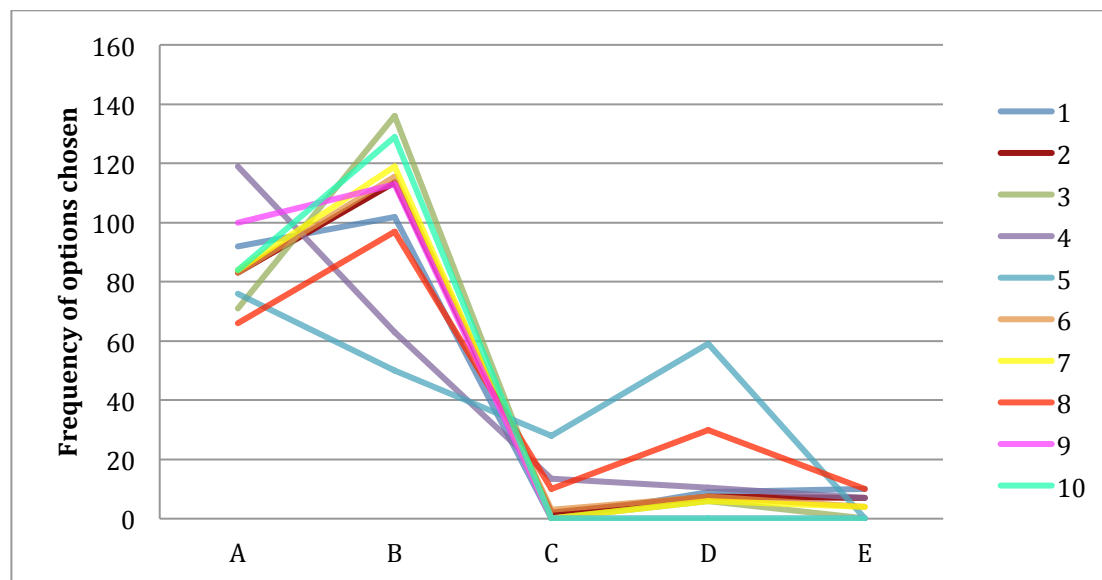


Figure 3.3: Frequency of Options Chosen (Individual)

Age Group	I	II	III	IV	V
Participant No.	1, 8	2, 10	3, 5, 9	4, 7	6

Table 3a: Participants in each age group

A phylogenetic network was also constructed using SplitsTree4 (Huson & Bryant, 2006) to determine the extent of agreement in the participants' judgments of similarities of the sign pairs. Phylogenetic networks are graphs that are used to visualize relationships between nucleotide sequences, genes, chromosomes, genomes or species (Huson et al., 2010). However, in this case, it is used to visualize the relationship among the participants' responses. As seen in Figure 3.4, the responses of participants 3, 4 and 10 differed greatly from the rest of the participants. This means that these participants disagreed with the judgments given by the other participants. The phylogenetic network also suggests that participant 3 disagreed most with the other participants, followed by participant 10 and participant 4. Since they were all from different age groups, it seems that the differences in judgments is not a result of differences in age.

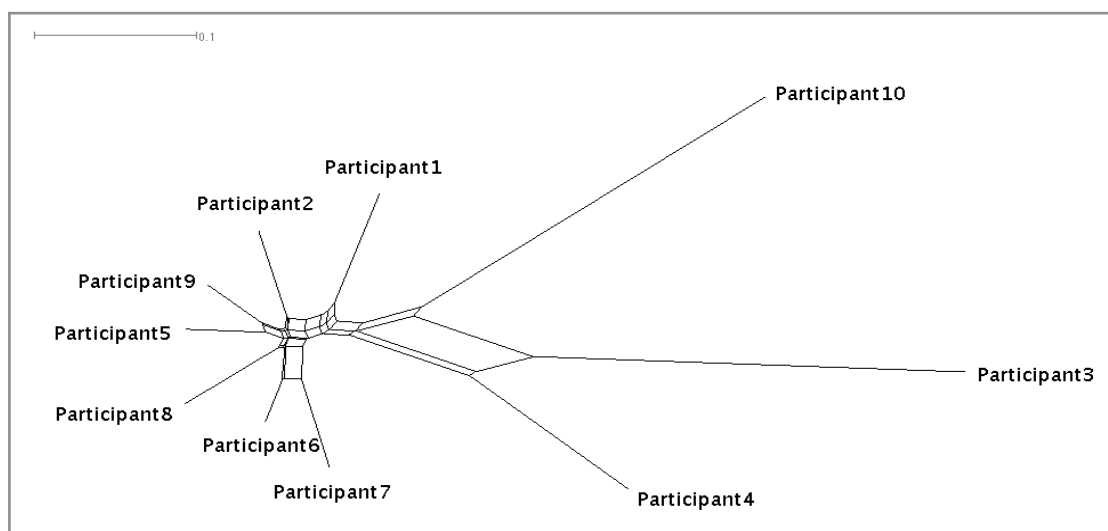


Figure 3.4: *Phylogenetic Network of Responses Collected*

3.2 Comparison of Phonological Parameters

Similarity scores of the sign pairs were calculated from the HamNoSys transcriptions (as discussed in Section 2.2). Sign pairs with similarity scores of more than 0.65 were considered to be similar, while those with scores of 0.65 or lower were considered to be different. The value of 0.65 was chosen as it meant that signs with minor differences in handshape, orientation and location would not be considered as different signs. Overall, 74 out of the 213 signs were similar according to the similarity scores. Figure 3.5 shows the percentage of similarity of the sign pairs.

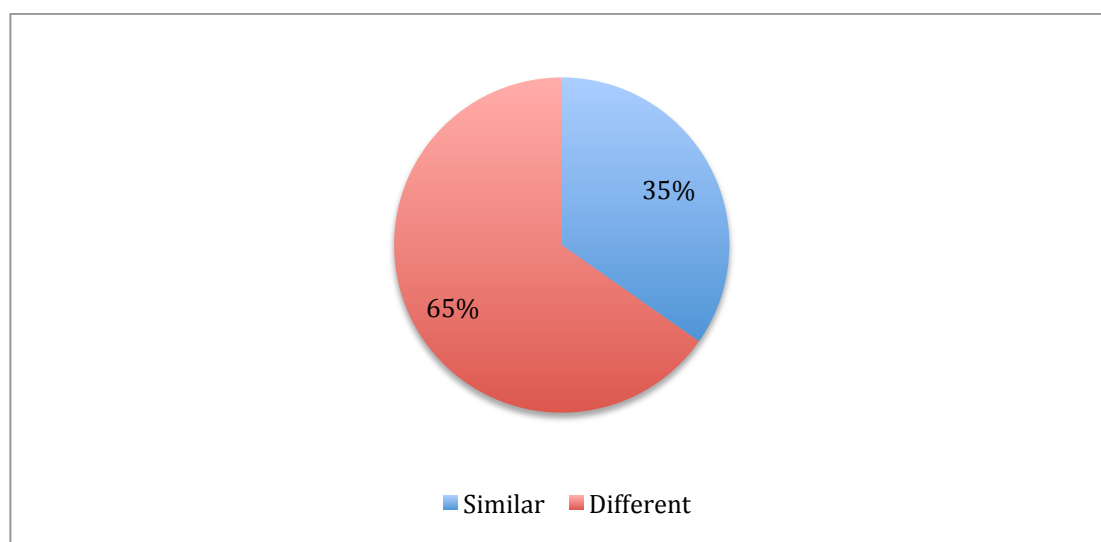


Figure 3.5: *Similarity of Sign Pairs Based on Levenshtein Distances*

64 out of the 100 words on the list had at least one SgSL sign that was similar to the ASL sign.

3.3 Overall Results

Looking at the numbers from both the judgment task and the phonological comparisons of the sign pairs, it is clear that the majority of the sign pairs were different. However, they also show that majority of the words on the list had at least one SgSL sign that was similar to the corresponding ASL sign. As seen in Figure 3.6, the participants who took part in the judgment task thought that more of the words on the list had at least one similar sign pair than what is suggested by the analysis of the HamNoSys transcriptions.

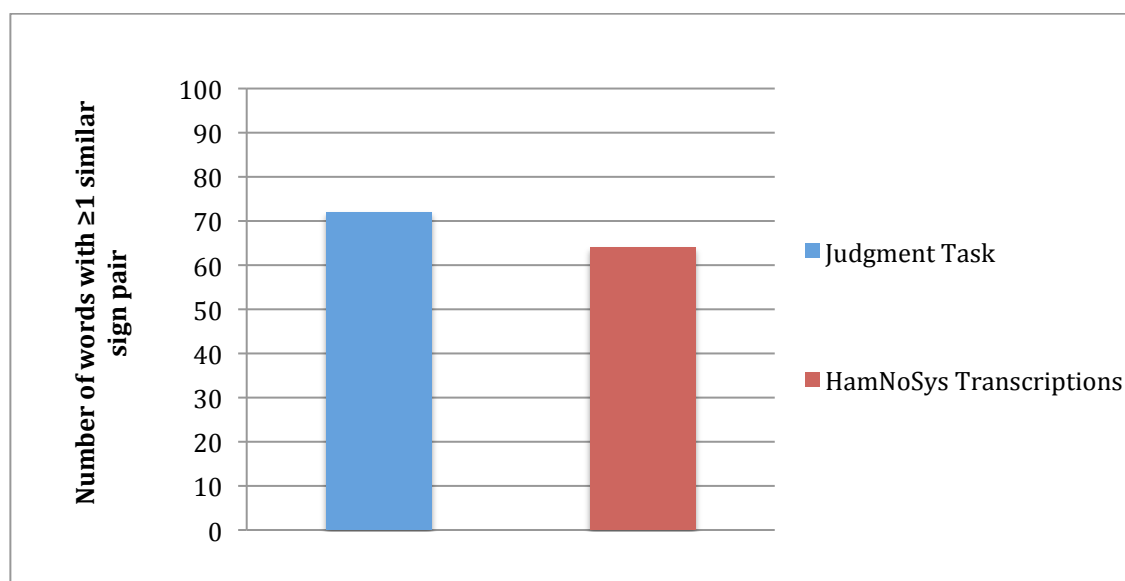


Figure 3.6: Number of words with ≥ 1 similar sign pair

The overall responses from the judgement task suggest that the participants thought there were more sign pairs that were similar than the transcriptions indicate.

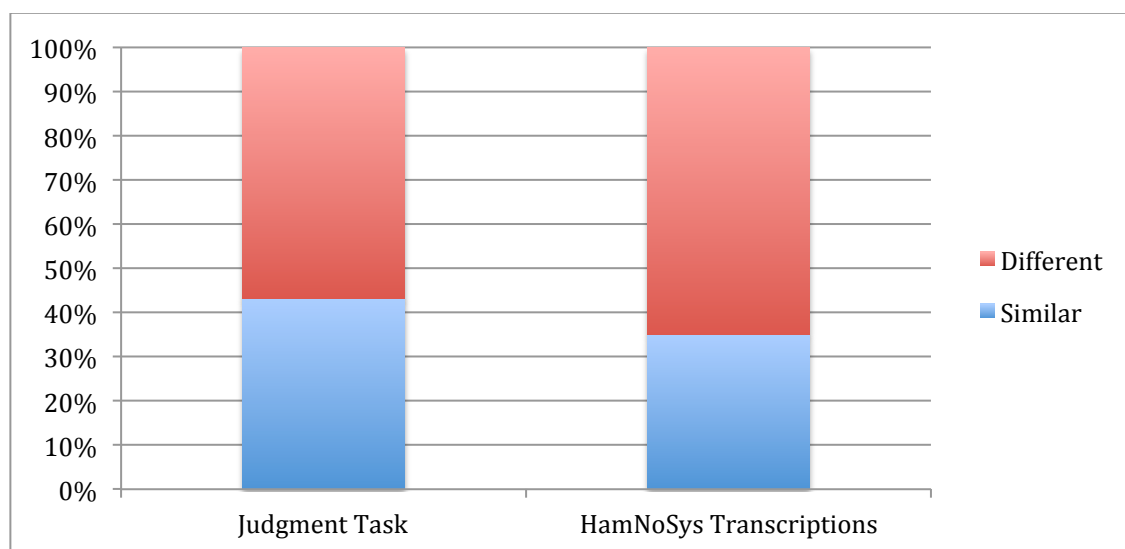


Figure 3.7: Similarity of Sign Pairs (Judgment Task vs. HamNoSys Transcriptions)





When the words on the list were split into subgroups, such as nouns, verbs, adjectives, colors, etc. (see Table 3b), the ‘colors’ group showed the most interesting results – All 10 participants unanimously stated that there was at least one SgSL sign that looked the same and had the same meaning for all five colors on the list. The HamNoSys transcriptions also indicated that there was at least one pair of signs for each color that was similar. There were no clear trends in the other groups.

Nouns			Verbs	Adjectives		Adverbs
Animal	Person	<u>Animals</u>	Count	Bad	<u>Colors</u>	How
Blood	Rain	Bird	Die	Dirty	Black	Not
Child	River	Dog	Hunt	Dry	Red	What
Day	Rope	Fish	Kill	Dull	White	When
Dust	Salt	Louse	Laugh	Good	Yellow	Where
Earth	Sea	Snake	Lie	Heavy	Green	Who
Egg	Snow	Worm	Live	Long		
Grease	Star	Cat	Play	Narrow		Conjunctions
Feather	Stone	Pig	Sing	New		Because
Fire	Sun		Sit	Old		If
Flower	Tail	<u>Kinship Terms</u>	Stand	Other		
Grass	Tree	Father	Vomit	Correct		Prepositions
Ice	Water	Husband	Dance	Sharp		With
Leaf	Wind	Mother	Work	Short		
Man	Woman	Wife		Smooth		Predeterminers
Meat	Wood	Brother		Thin		All
Mountain	Year	Sister		Warm		
Name	Moon			Wet		
Night				Wide		
				Full		

Table 3b: Swadesh list split into subgroups

For sign pairs where the responses from the participants were greatly diverse or split between two choices, there did not seem to be any apparent trends – the similarity scores of these sign pairs ranged from 0.05 to 0.93. They also did not belong to any particular subgroup.

In cases where the results of the judgment task and the analysis of the transcriptions disagreed on the similarity of the signs, it was discovered that sign pairs with clear differences in handshape or orientation only (e.g. $\bar{\square}$ vs. \downarrow , or < 0 vs. $\wedge \circ$) were considered by the participants to be different. Sign pairs with differences in movement were also deemed to be different, or the responses were split between 2 options in some cases. On the other hand, sign pairs with subtle differences in

handshape, location or orientation (e.g.  vs. ,  vs. , or $\wedge 0$ vs. $r \emptyset$) were taken to be the same by the participants. Table 3c shows the list of words where the results of the judgment task disagreed with the analysis of the transcriptions on the similarity of the sign pairs.

1c. All	33a. Narrow	78b. Egg
5c. Black	33b. Narrow	81c. Flower
6a. Blood	37. Old	84b. Leaf
9. Day	50b. Snow	87a. Rain
15a. Grease	51a. Stand	92. Stone
22b. Hunt	53d. Thin	93c. Sun
23. Husband	54a. Vomit	94b. Tail
24c. If	57a. Wet	97b. Worm
26b. Laugh	74a. Work	99a. Cat
27a. Lie	76a. Dog	100c. Pig
28. Live		

Table 3c: Sign Pairs where Judgment Task Results Differed from Transcription Analysis

4 Discussion

4.1 Findings

Since most of the concepts (64%-72%) on the list have at least one sign in SgSL that is similar to the ASL signs, but the majority of overall responses and the HamNoSys transcriptions indicate the sign pairs are different, this suggests that for most of the concepts, there is at least one sign that comes from ASL, but there are also many variants. Therefore, SgSL seems to be a developing language, or has vocabulary from multiple sources. However, to determine the extent of development of SgSL signs, further studies need to be done to investigate the influence of Shanghainese Sign Language on SgSL so as to ascertain the extent of influence that other sign languages have on SgSL, and thus the degree of development of this local sign language. Also, the fact that the participants felt there were more sign pairs that were similar than what the transcriptions indicated could be due to the fact that some signs that were initially borrowed from ASL have been modified by local signers, and they see the modified version of the sign as similar to the original ASL signs.

4.2 Participants

In future work, it would be interesting to test more participants of different ages. This may shed light on age-specific trends that were not found in this study. However, this was a challenge as it was difficult to recruit participants due to a lack of incentive. Elderly participants are especially difficult to recruit as they may not be literate, which would affect their ability to understand the task, and hence their responses. During the judgment task, it seemed that some of the participants had problems in evaluating the signs from one of the signers and this may have affected their responses. However, due to the small size of the community, this cannot be avoided. Interviews could be conducted in future studies to find out about the sociolinguistic backgrounds of the participants, which could provide explanations to individual differences in responses and anomalies in the data collected.

4.3 Procedure

Although HamNoSys is able to capture a great level of detail when one is transcribing signs using this system, the accuracy of the transcriptions is an issue – while there are some basic guides online on how to transcribe signs using HamNoSys (Hanke, 2009, Hanke, 2010, & Smith, 2013), there are no online resources for practicing HamNoSys transcription, and there is no way of checking whether a transcription is accurate. The large number of symbols means that there are many ways of transcribing a sign, and each person may transcribe a sign differently from others. The symbols for palm orientation may also be ambiguous in some cases. Figure 4.1 shows the symbols for palm orientation.

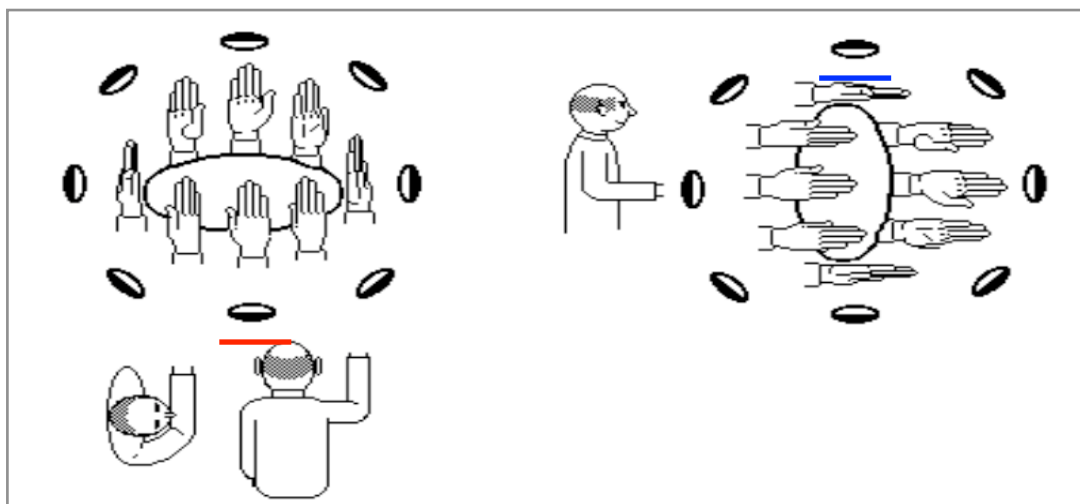


Figure 4.1: HamNoSys Symbols for Palm Orientation (Hanke, 2009)

If a sign involves a hand pointing upwards at an angle of 45 degrees, as seen in Figure 4.2, I could transcribe the palm orientation either as $\text{|\text{v}\text{O}}$ (like the symbol underlined in red in figure 4.1), or $\text{|\text{v}\text{O}}$ (as in the symbol underlined in blue). If one reads the transcription without watching the video of the sign, he would be confused about the palm orientation. If the HamNoSys transcriptions were to be used in building an open corpus, it would be best that multiple transcriptions are made by different individuals and they discuss it before agreeing on which transcription to use. For this study, as the transcriptions were done by the author alone, variation in transcriptions is not a significant issue.

In the first part of the study, 3 participants were asked to sign each word on the Swadesh list in SgSL. However, it is difficult to define which signs are SgSL signs. While I was trying to recruit participants from a church, I got a reply that they could not help me with the study as it involves SgSL and “SADeaf defines SgSL”. Does this then mean that only people at SADeaf sign in SgSL, while the others sign in a different language? Who decides if a sign is considered an SgSL sign, an ASL sign, or an SSL sign? In a language without any standard lexicon or corpus, there is no clear norm.

Compared to Woodward’s 1993 study of the relationship between sign language varieties in Hong Kong and Shanghai, this study offered a more objective perspective of the relationship between SgSL and ASL, as the results were not solely based on the judgment of participants, but also the Levenshtein distances of the transcriptions of the signs. This offers a secondary and unbiased look at the relationship between the two languages, which gives the results more credibility and accuracy, although, in general, the transcriptions gave similar results to the judgments.

5 Conclusion

The results of this study have provided a first look into the etymology of SgSL through quantitative means. The responses collected from the participants in the judgment task and the HamNoSys transcriptions indicate that 64% - 72% of the concepts on the Swadesh list have at least one sign in SgSL that is similar to the ASL sign, which suggests that ASL heavily influences SgSL. However, the many variations of signs provided by the participants suggest that SgSL is a developing language, and the definition of the language is still relatively muddy. Therefore, in order to understand the language better, further studies need to be done to determine the extent of influence that other sign languages have on SgSL. This would provide greater insight into the etymology of the language as well as the degree of development of SgSL. Ultimately, this study is intended as a first step towards a better understanding of SgSL and the building of an open corpus of the language – the data collected in this study include 100 concepts and 213 senses from 3 signers in video format, which have been transliterated into HamNoSys transcriptions, and the data is releasable under an open license (CC BY). This will provide a platform for future studies in SgSL, as well as increase its social recognition as a unique local language that the deaf community in Singapore can call its own.

Appendix A

Swadesh List

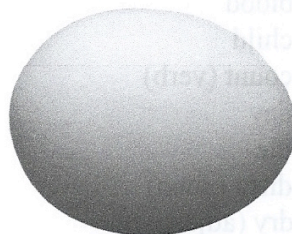
21

1. all
2. animal
3. bad
4. because
5. black (color)
6. blood
7. child
8. count (verb)
9. day
10. die
11. dirty (adjective)
12. dry (adjective)
13. dull (adjective)
14. dust
15. grease (fat, organic substance)
16. father
17. fire
18. good
19. green (color)
20. heavy
21. how
22. hunt (verb)
23. husband
24. if
25. kill (verb)
26. laugh
27. lie (on side, recline)
28. live (verb)
29. long (as in length)
30. meat (=flesh)
31. mother
32. name
33. narrow
34. new
35. night
36. not
37. old
38. other
39. person
40. play (verb)
41. red (color)
42. correct (free from error)
43. salt (noun)
44. sea
45. sharp (of an object)
46. short (as in length)
47. sing (verb)
48. sit (verb)
49. smooth (adjective)
50. snow (noun)
51. stand (verb)
52. man
53. thin
54. vomit (verb)
55. warm (adjective)
56. water
57. wet
58. what
59. when
60. where
61. white (color)
62. who
63. wide
64. wife
65. wind
66. with
67. woman
68. year
69. yellow (color)
70. full
71. brother
72. dance (verb)
73. sister
74. work

75. bird



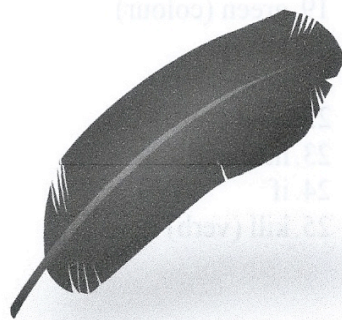
78. egg



76. dog



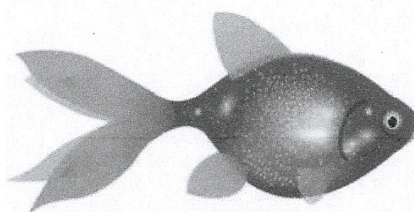
79. feather



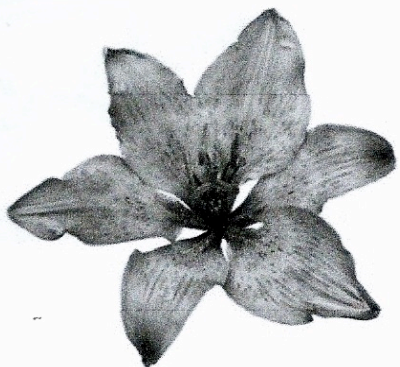
77. earth (=soil)



80. fish



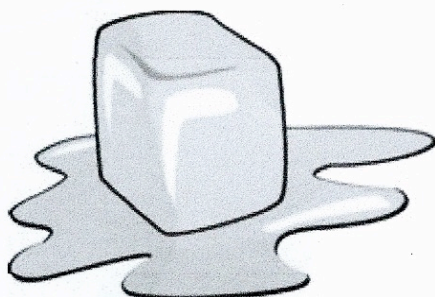
81. flower



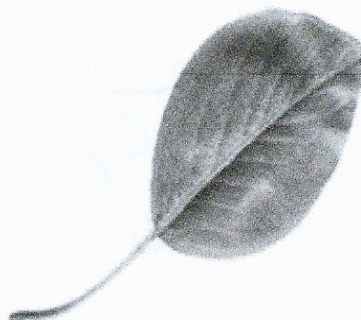
82. grass



83. ice



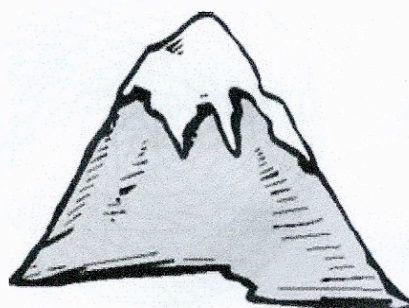
84. leaf



85. louse (Plural: lice)



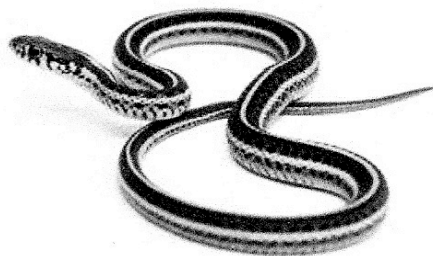
86. mountain



87. rain



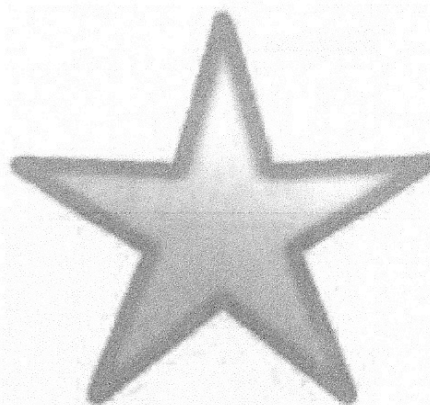
90. snake



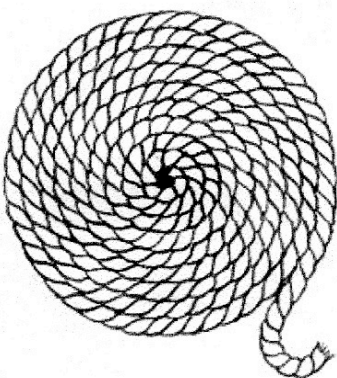
88. river



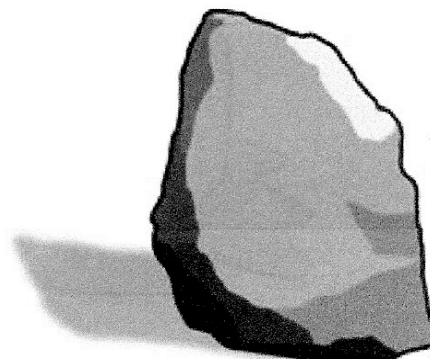
91. star



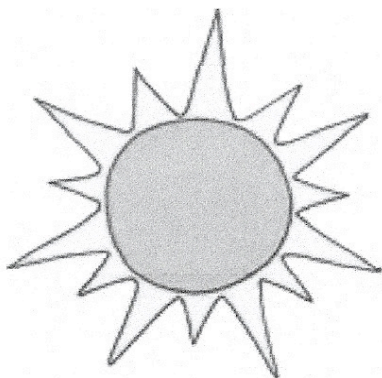
89. rope



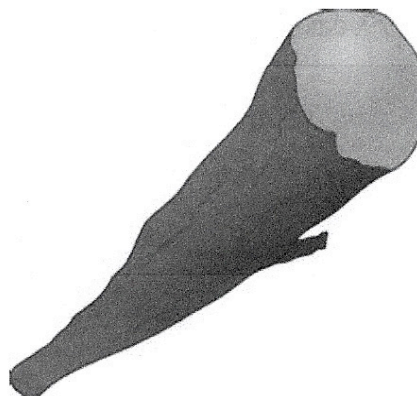
92. stone



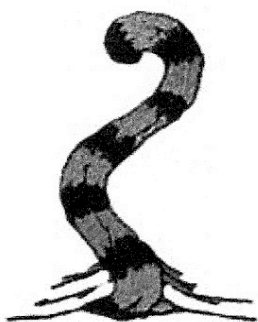
93. sun



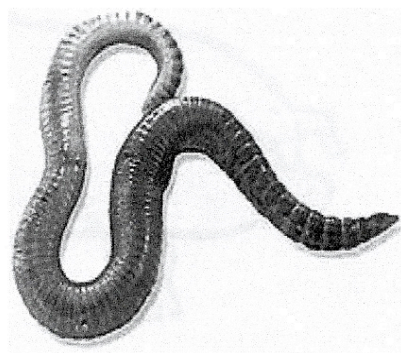
96. wood



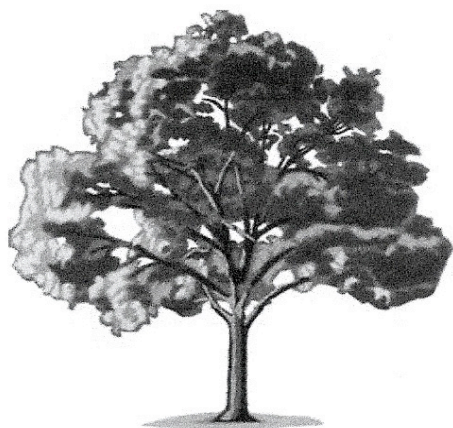
94. tail



97. worm



95. tree



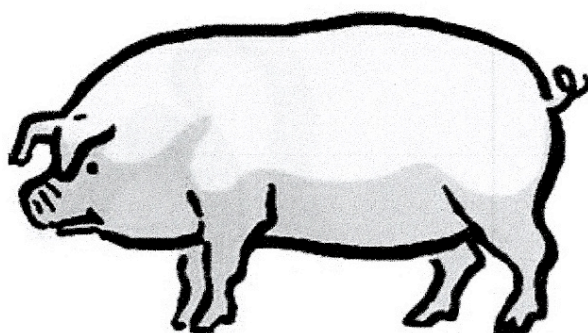
98. moon



99. cat



100. pig



Appendix B

Part I. Individual Responses (Judgment Task)

Word	Participant									
	1	2	3	4	5	6	7	8	9	10
1a. all	a	a	a	a	a	a	a	a	a	a
1b. all	b	b	d	d	b	b	b	b	d	b
1c. all	a	a	a	a	a	a	a	a	a	a
2. animal	a	a	a	a	a	a	a	a	a	a
3a. bad	a	a	a	a	a	a	a	a	a	a
3b. bad	b	b	d	b	b	b	b	b	b	c
3c. bad	b	b	d	b	b	b	b	b	b	c
3d. bad	b	b	a	a	a	b	b	b	d	a
4a. because	a	b	b	c	a	b	a	b	b	a
4b. because	a	b	d	d	b	b	b	b	d	b
5a. black	a	a	a	a	a	a	a	a	a	a
5b. black	d	b	d	d	b	b	b	b	d	b
5c. black	a	b	d	a	b	b	a	b	b	a
6a. blood	a	a	b	a	a	a	a	b	a	b
6b. blood	a	b	b	a	b	b	a	b	b	ab
6c. blood	b	b	d	d	bd	b	b	b	b	b
7. child	a	a	a	b	a	a	a	a	a	a
8a. count	b	b	c	c	a	b	b	b	a	ac
8b. count	b	b	c	d	b	b	b	b	b	b
8c. count	b	d	d	b	b	b	b	b	b	ac
8d. count	d	d	d	c	b	b	b	b	b	d
9. day	a	a	a	a	a	a	a	a	a	a
10a. die	a	a	a	a	a	a	a	a	a	a
10b. die	b	b	b	b	b	b	b	b	b	a
10c. die	b	b	b	b	b	b	b	b	b	c
11. dirty	a	a	a	c	a	a	a	a	a	a
12. dry	a	a	a	a	a	a	a	a	a	a
13. dull	a	a	a	b	a	a	a	a	a	b

Participant / Word	1	2	3	4	5	6	7	8	9	10
26b. laugh	a	a	a	a	a	a	a	a	a	a
27a. lie	b	b	b	b	b	b	b	b	b	b
27b. lie	b	b	b	d	b	b	b	d	b	ab
28. live	a	b	b	d	b	b	b	b	b	a
29a. long	a	a	b	a	a	a	a	a	a	a
29b. long	d	b	b	b	b	b	b	b	b	c
30a. meat	b	b	b	b	c	b	a	b	b	c
30b. meat	a	a	a	a	a	a	a	a	a	a
31a. mother	a	a	a	a	a	a	a	a	a	a
31b. mother	e	b	d	b	b	b	b	e	b	b
32a. name	a	a	a	a	a	a	a	a	a	a
32b. name	e	b	d	b	b	b	b	e	e	b
33a. narrow	b	b	b	c	a	b	a	a	b	a
33b. narrow	a	a	a	d	b	a	a	a	a	a
34a. new	a	a	a	a	a	a	a	a	a	a
34b. new	d	b	d	b	b	b	a	b	b	e
35a. night	a	a	b	a	a	a	a	a	a	a
35b. night	b	b	d	b	b	b	b	b	d	b
35c. night	b	b	d	d	b	b	b	b	d	b
36a. not	a	a	a	a	a	a	a	a	a	a
36b. not	a	b	c	b	bc	b	b	b	a	b
37. old	a	a	a	a	a	a	a	a	a	a
38a. other	a	b	b	c	b	b	a	b	b	a
38b. other	b	b	d	d	bc	b	b	b	b	b
39a. person	a	a	a	a	a	a	a	a	a	a
39b. person	a	a	a	a	a	a	a	a	a	b
39c. person	b	b	b	d	b	b	b	b	b	b
40a. play	a	a	a	a	a	a	a	a	a	a

Word \ Participant	1	2	3	4	5	6	7	8	9	10
40b. play	e	b	d	e	d	b	b	e	e	b
41. red	a	a	a	a	a	a	a	a	a	a
42a. correct	a	a	a	a	a	a	a	a	a	a
42b. correct	b	b	b	b	b	b	b	b	b	b
43. salt	a	a	a	a	a	a	a	a	a	a
44. sea	b	b	c	b	b	b	b	b	b	a
45a. sharp	a	b	b	b	b	a	a	b	a	a
45b. sharp	b	b	c	b	b	b	b	b	b	b
46a. short	b	b	d	b	b	b	b	b	b	c
46b. short	b	b	d	d	b	b	b	b	b	b
46c. short	a	a	a	b	a	b	a	a	a	a
47a. sing	b	b	d	d	b	b	b	b	b	b
47b. sing	b	b	d	d	b	b	b	b	b	b
47c. sing	b	b	c	d	b	b	b	b	b	d
47d. sing	a	b	d	d	b	b	b	b	b	a
48a. sit	a	a	b	c	a	a	a	a	a	a
48b. sit	b	b	d	b	b	b	b	b	b	b
49a. smooth	b	b	d	d	b	b	b	b	b	b
49b. smooth	d	b	d	d	d	b	b	b	b	b
49c. smooth	a	a	b	b	a	a	a	a	a	a
50a. snow	b	b	c	b	b	b	b	b	b	b
50b. snow	a	b	b	b	b	b	b	a	a	a
51a. stand	b	b	b	b	b	b	a	b	b	b
51b. stand	a	a	a	a	a	a	a	a	a	a
52a. man	b	b	c	b	b	b	b	bd	b	a
52b. man	d	b	d	d	b	b	b	e	b	b
52c. man	b	b	c	b	b	b	b	b	b	a
53a. thin	b	b	a	a	a	a	a	a	a	a

Participant Word	1	2	3	4	5	6	7	8	9	10
53b. thin	b	b	c	b	b	b	b	b	b	b
53c. thin	b	b	c	b	b	b	b	b	b	b
53d. thin	a	a	a	b	a	b	b	a	a	b
54a. vomit	b	b	b	a	a	a	a	a	a	a
54b. vomit	b	b	b	b	b	b	b	b	b	ab
54c. vomit	b	b	c	c	bd	b	b	bd	b	a
55. warm	a	a	a	a	a	a	a	a	a	a
56. water	a	a	a	a	a	a	a	a	a	a
57a. wet	a	a	a	b	a	a	a	a	a	b
57b. wet	b	d	a	b	c	b	b	d	a	d
58a. what	b	b	d	b	b	b	b	b	b	a
58b. what	a	b	a	a	a	a	b	a	a	b
59a. when	a	a	a	b	a	a	a	a	a	a
59b. when	e	b	d	b	e	b	b	d	e	b
60a. where	a	a	a	a	a	a	a	a	a	a
60b. where	b	b	d	b	b	b	b	d	b	b
61. white	a	a	a	a	a	a	a	a	a	a
62a. who	b	d	c	b	b	b	b	b	b	a
62b. who	a	a	b	a	a	a	a	a	a	a
63a. wide	a	a	a	a	a	a	a	a	a	a
63b. wide	b	b	b	b	b	b	a	b	b	a
64. wife	a	a	a	a	a	a	a	a	a	a
65a. wind	a	a	b	b	b	b	b	b	b	b
65b. wind	b	b	c	b	b	b	b	b	b	c
65c. wind	b	b	b	b	b	b	b	b	b	a
66. with	a	a	a	a	a	a	a	a	a	a
67a. woman	b	b	d	b	bd	b	b	d	b	b
67b. woman	b	b	d	b	b	b	b	c	b	b

Participant Word	1	2	3	4	5	6	7	8	9	10
67c. woman	b	b	c	b	b	b	b	b	b	a
68. year	a	a	a	a	a	a	a	a	a	a
69. yellow	a	a	a	a	a	a	a	a	a	a
70a. full	a	a	a	a	a	a	a	a	a	a
70b. full	a	b	a	b	a	a	a	a	a	c
71a. brother	b	b	a	b	b	a	a	b	b	a
71b. brother	b	b	d	b	b	b	b	e	b	b
71c. brother	b	b	b	b	b	b	a	d	b	a
72. dance	a	a	a	a	a	a	a	a	a	a
73a. sister	b	b	a	b	b	a	a	b	b	a
73b. sister	e	b	d	b	b	b	b	e	b	b
74a. work	a	b	b	b	b	b	a	b	b	a
74b. work	a	a	a	a	a	a	a	a	a	a
75a. bird	a	a	a	c	a	a	a	a	a	a
75b. bird	b	b	d	d	b	b	b	b	b	cd
76a. dog	a	a	a	a	a	a	a	a	a	a
76b. dog	b	b	d	b	b	b	b	c	b	b
77a. earth	b	b	d	d	bd	b	b	b	b	e
77b. earth	a	a	a	a	a	a	a	a	a	a
78a. egg	b	b	b	b	b	b	b	b	b	b
78b. egg	a	a	a	a	a	a	a	a	a	c
78c. egg	b	b	b	b	b	b	a	b	b	a
79a. feather	e	b	c	e	b	b	b	b	b	b
79b. feather	e	b	d	e	e	b	b	bd	b	a
80a. fish	a	a	a	a	a	a	a	a	a	a
80b. fish	b	b	a	b	a	a	a	a	a	b
80c. fish	b	b	c	b	b	b	b	b	b	e
80d. fish	b	b	b	b	b	a	a	b	b	a

Participant \ Word	1	2	3	4	5	6	7	8	9	10
81a. flower	a	a	a	a	a	a	a	a	a	b
81b. flower	b	b	d	d	e	b	b	b	b	d
81c. flower	b	b	c	b	b	b	b	b	b	a
82a. grass	a	a	a	a	a	a	a	a	a	a
82b. grass	b	b	b	b	ab	a	a	a	b	a
83a. ice	b	b	d	b	b	b	b	b	b	b
83b. ice	b	b	d	b	b	b	b	b	b	b
83c. ice	a	a	a	a	a	b	a	a	a	b
83d. ice	b	b	d	b	b	b	b	b	b	a
84a. leaf	b	b	b	e	d	b	a	b	b	e
84b. leaf	b	a	a	a	a	a	a	a	a	b
85a. louse	b	b	d	e	b	b	b	b	b	e
85b. louse	b	b	d	e	d	b	b	b	b	e
86a. mountain	b	b	c	b	b	b	b	b	b	a
86b. mountain	b	b	c	b	b	b	b	a	b	b
87a. rain	b	b	b	b	a	b	a	a	a	a
87b. rain	a	a	a	a	a	a	a	a	a	a
88a. river	b	b	c	d	b	b	b	b	b	d
88b. river	b	b	c	d	b	b	b	b	b	b
89. rope	a	b	a	b	b	a	a	a	b	a
90. snake	b	b	c	c	b	a	b	b	b	a
91a. star	a	a	a	b	a	a	a	a	a	a
91b. star	b	b	c	b	b	b	b	b	b	d
92. stone	b	b	b	b	b	b	a	b	b	a
93a. sun	b	b	b	b	b	b	b	b	b	b
93b. sun	a	b	a	b	b	a	a	a	b	a
93c. sun	a	b	b	a	ab	a	a	a	b	c
94a. tail	b	b	c	b	b	b	b	b	b	b

	Same Meaning		Different Meanings		I can't identify the sign(s)
	Look the same	Look different	Look the same	Look different	
1a. all	10				
1b. all		7		3	
1c. all	10				
2. animal	10				
3a. bad	10				
3b. bad		8	1	1	
3c. bad		8	1	1	
3d. bad	4	5		1	
4a. because	4	5	1		
4b. because	1	6		3	
5a. black	10				
5b. black		6		4	
5c. black	4	5		1	
6a. blood	7	3			
6b. blood	4	6			
6c. blood		7.5		2.5	
7. child	9	1			
8a. count	3	5	2		
8b. count		8	1	1	
8c. count	1	7		2	
8d. count		5	1	4	
9. day	10				
10a. die	10				
10b. die	1	9			
10c. die		9	1		
11. dirty	9		1		
12. dry	10				
13. dull	8	2			
14a. dust		9		1	
14b. dust		9		1	
14c. dust		7.5		2.5	
15a. grease	7	3			
15b. grease	3	7			
16a. father	10				
16b. father	1	6		1	2
17a. fire	10				
17b. fire	4	6			
18a. good	2	8			
18b. good	1	8	1		
19a. green	10				
19b. green		4		3	3
20. heavy	10				

	Same Meaning		Different Meanings		I can't identify the sign(s)
	Look the same	Look different	Look the same	Look different	
21a. how	2	8			
21b. how		5		4	1
22a. hunt	2	8			
22b. hunt	8	2			
22c. hunt		6		4	
23. husband	10				
24a. if	1	8			1
24b. if	1	8			1
24c. if		7	2		1
24d. if	1	7		1	1
25a. kill	8	2			
25b. kill		8		2	
25c. kill	1	8		1	
26a. laugh		10			
26b. laugh	10				
27a. lie		10			
27b. lie	1	7		2	
28. live	2	7		1	
29a. long	9	1			
29b. long		8	1	1	
30a. meat	1	7	2		
30b. meat	10				
31a. mother	10				
31b. mother		7		1	2
32a. name	10				
32b. name		6		1	3
33a. narrow	4	5	1		
33b. narrow	8	1		1	
34a. new	10				
34b. new	1	6		2	1
35a. night	9	1			
35b. night		8		2	
35c. night		7		3	
36a. not	10				
36b. not	2	6.5	1.5		
37. old	10				
38a. other	3	6	1		
38b. other		7.5	0.5	2	
39a. person	10				
39b. person	9	1			
39c. person		9		1	
40a. play	10				

	Same Meaning		Different Meanings		I can't identify the sign(s)
	Look the same	Look different	Look the same	Look different	
40b. play		4		2	4
41. red	10				
42a. correct	10				
42b. correct		10			
43. salt	10				
44. sea	1	8	1		
45a. sharp	5	5			
45b. sharp		9	1		
46a. short		8	1	1	
46b. short		8		2	
46c. short	8	2			
47a. sing		8		2	
47b. sing		8		2	
47c. sing		7	1	2	
47d. sing	2	6		2	
48a. sit	8	1	1		
48b. sit		9		1	
49a. smooth		8		2	
49b. smooth		6		4	
49c. smooth		8		2	
50a. snow		9	1		
50b. snow	4	6			
51a. stand	1	9			
51b. stand	10				
52a. man	1	7.5	1	0.5	
52b. man		6		3	1
52c. man	1	8	1		
53a. thin	8	2			
53b. thin		9	1		
53c. thin		9	1		
53d. thin	6	4			
54a. vomit	7	3			
54b. vomit	1	9			
54c. vomit	1	6	2	1	
55. warm	10				
56. water	10				
57a. wet	8	2			
57b. wet	2	4	1	3	
58a. what	1	8		1	
58b. what	7	3			
59a. when	10				
59b. when		5		2	3

	Same Meaning		Different Meanings		I can't identify the sign(s)
	Look the same	Look different	Look the same	Look different	
60a. where	10				
60b. where		8		2	
61. white	10				
62a. who	1	7	1	1	
62b. who	9	1			
63a. wide	10				
63b. wide	2	8			
64. wife	10				
65a. wind	2	8			
65b. wind		8	2		
65c. wind	1	9			
66. with	10				
67a. woman		7.5		2.5	
67b. woman		8	1	1	
67c. woman	1	8	1		
68. year	10				
69. yellow	10				
70a. full	10				
70b. full	7	2	1		
71a. brother	4	6			
71b. brother		8		1	1
71c. brother	2	7		1	
72. dance	10				
73a. sister	4	6			
73b. sister		7		1	2
74a. work	3	7			
74b. work	10				
75a. bird	9		1		
75b. bird		7	1	2	
76a. dog	10				
76b. dog		8	1	1	
77a. earth		6.5		2.5	1
77b. earth	10				
78a. egg		10			
78b. egg	9		1		
78c. egg	2	8			
79a. feather		7	1		2
79b. feather	1	4.5		1.5	3
80a. fish	10				
80b. fish	6	4			
80c. fish		8	1		1
80d. fish	3	7			


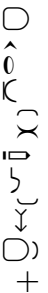




	Same Meaning		Different Meanings		I can't identify the sign(s)
	Look the same	Look different	Look the same	Look different	
81a. flower	9	1			
81b. flower		6		3	1
81c. flower	1	8	1		
82a. grass	10				
82b. grass	4.5	5.5			
83a. ice		9		1	
83b. ice		9		1	
83c. ice		8		2	
83d. ice	1	8		1	
84a. leaf	1	6		1	2
84b. leaf	8	2			
85a. louse		7		1	2
85b. louse		6		2	2
86a. mountain	1	8	1		
86b. mountain	1	8	1		
87a. rain	5	5			
87b. rain	10				
88a. river		7	1	2	
88b. river		8	1	1	
89. rope	6	4			
90. snake	2	6	2		
91a. star	9	1			
91b. star		8	1	1	
92. stone	2	8			
93a. sun		10			
93b. sun	6	4			
93c. sun	5.5	3.5	1		
94a. tail		9	1		
94b. tail	9	1			
95. tree	10				
96a. wood	1	8		1	
96b. wood	1	9			
96c. wood		8		2	
96d. wood	2	8			
97a. worm	3	7			
97b. worm	1	8		1	
98a. moon	10				
98b. moon		8	1	1	
98c. moon		7		2	1
99a. cat	2	8			
99b. cat	9	1			
99c. cat	1	8	1		

	Same Meaning		Different Meanings		I can't identify the sign(s)
	Look the same	Look different	Look the same	Look different	
100a. pig		8		2	
100b. pig	1	7		2	
100c. pig	10				
Total Frequency	846	1049	56	137	42

Words	SgSL Signs	ASL Signs
6b. blood	[ʃʁ̩̎O̎p̎)(↑ ʃ̎ O̎,̎̎O̎p̎)([]+]	[ʃ̎r̎o̎ ʰ X̎→ʃ̎↑ ʃ̎ ʃ̎,̎,̎r̎o̎ ʃ̎)(↑]
6c. blood	[O̎_̎L̎O̎ ʃ̎)(Z̎(↑ ʃ̎ X̎)](O̎,̎̎O̎ ʃ̎)(↑(↑ ʃ̎ X̎)) ʃ̎ O̎,̎,̎ ʃ̎)(?)	[ʃ̎r̎o̎ ʰ X̎→ʃ̎↑ ʃ̎ ʃ̎,̎,̎r̎o̎ ʃ̎)(↑]
7. child	O̎,̎̎ ʃ̎)(↑+]	O̎,̎̎ ʃ̎)(↑+]
8a. count	[ʃ̎r̎o̎ ʃ̎Z̎(↑ ʃ̎ X̎) ʃ̎ O̎,̎̎O̎ ʃ̎)([]+(·̎ ʃ̎,̎̎ ʃ̎,̎̎)]	[ʃ̎r̎o̎ ʃ̎±̎(↑ ʃ̎ X̎) ʃ̎ O̎,̎̎O̎ ʃ̎)([]]
8b. count	[ʃ̎r̎o̎ ʃ̎Z̎(↑ ʃ̎ X̎) ʃ̎ O̎,̎̎O̎ ʃ̎)([]+(ʃ̎,̎̎)](p̎)()	[ʃ̎r̎o̎ ʃ̎±̎(↑ ʃ̎ X̎) ʃ̎ O̎,̎̎O̎ ʃ̎)([]]
8c. count	[ʃ̎r̎o̎ ʃ̎Z̎(↑ ʃ̎ X̎) ʃ̎ O̎,̎̎O̎ ʃ̎)([]+(O̎,̎̎O̎ p̎→ʃ̎,̎̎ ʃ̎,̎̎)]	[ʃ̎r̎o̎ ʃ̎±̎(↑ ʃ̎ X̎) ʃ̎ O̎,̎̎O̎ ʃ̎)([]]
8d. count	[ʃ̎r̎o̎ ʃ̎Z̎(↑ ʃ̎ X̎) ʃ̎ O̎,̎̎O̎ ʃ̎)([]+(ʃ̎,̎̎ ʃ̎,̎̎)](ʃ̎)	[ʃ̎r̎o̎ ʃ̎±̎(↑ ʃ̎ X̎) ʃ̎ O̎,̎̎O̎ ʃ̎)([]]
9. day	[ʃ̎,̎̎O̎ p̎)(ʃ̎,̎̎ ʃ̎,̎̎ ʃ̎]	[ʃ̎,̎̎O̎ p̎)(ʃ̎,̎̎ O̎,̎̎ [o̎,̎̎ ʃ̎,̎̎ ʃ̎] X̎ ʃ̎]
10a. die	[O̎,̎̎O̎ ʃ̎)(→O̎,̎̎ ʃ̎ O̎,̎̎O̎ ʃ̎)(→O̎,̎̎ ʃ̎)]	[O̎,̎̎O̎ ʃ̎)(→O̎,̎̎ ʃ̎ O̎,̎̎O̎ ʃ̎)(→O̎,̎̎ ʃ̎)]
10b. die	[ʃ̎,̎̎O̎](p̎)(→ʃ̎,̎̎ +]	[O̎,̎̎O̎ ʃ̎)(→O̎,̎̎ ʃ̎ O̎,̎̎O̎ ʃ̎)(→O̎,̎̎ ʃ̎)]
10c. die	[ʃ̎,̎̎O̎](X̎→ʃ̎,̎̎ +]	[O̎,̎̎O̎ ʃ̎)(→O̎,̎̎ ʃ̎ O̎,̎̎O̎ ʃ̎)(→O̎,̎̎ ʃ̎)]
11. dirty	ʃ̎,̎̎ ʃ̎,̎̎ X̎ ʃ̎	ʃ̎,̎̎ ʃ̎,̎̎ X̎ ʃ̎
12. dry	[ʃ̎,̎̎O̎ ʃ̎ X̎→]	[ʃ̎,̎̎O̎ ʃ̎ X̎→]
13. dull	[ʃ̎,̎̎O̎ ʰ X̎→]	[ʃ̎,̎̎O̎ ʰ X̎→]

Words	SgSL Signs	ASL Signs
34a. new	[O₀Ṿ.)(←V(↑N) ɹO, ɹṾ)]()	[O₀Ṿ.)(←V(↑N) ɹO, ɹṾ)]()
34b. new	[O₀O ^o ↑V(↑N) ɹO, ɹṾ.]	[O₀Ṿ.)(←V(↑N) ɹO, ɹṾ)]()
35a. night	[Ō_ΔO ^o ↑[₁ ~ɹN]XṾ ɹO, ɹṾ)]()	[Ō₁ΔO ^o ↑[₁ ~ɹN]XṾ ɹO, ɹṾ)]()
35b. night	.. O_ΔO ^o ↖↗₀Ṿ.)([Ō₁ΔO ^o Ṿ.↑[₁ ~ɹN]XṾ ɹO, ɹṾ)]()
35c. night	.. O_ΔO ^o ↖↗₀Ṿ.)(+	[Ō₁ΔO ^o Ṿ.↑[₁ ~ɹN]XṾ ɹO, ɹṾ)]()
36a. not	O_ΔṾ(Xβ~1)N↗_Δ0Ṿ	O_ΔṾ(Xβ~1)N↗_Δ0Ṿ)
36b. not	O_ΔṾ(Xβ~1)±↗_Δ0[^o β_ΔṾ.][^o ↖*H]	O_ΔṾ(Xβ~1)N↗_Δ0Ṿ)
37. old	Ō₀Ṿ.)(↗O ₁ X↑Ṿ.)(Ō₁0Ṿ.)(↑↗O ₁ Ṿ.)(
38a. other	O₁0Ṿ.)(↗↗	O_ΔṾ.)(↗↗
38b. other	Ō₁0Ṿ.↖+↗	O_ΔṾ.)(↗↗
39a. person	.. Ō₂\3₁Ō₀Ṿ.)(↑Ṿ.)(.. Ō₂\3₁Ō₀Ṿ.)(↑Ṿ.)(
39b. person	.. O_Δ0O ^o)(↑Ṿ.)(.. O₁0O ^o)(↑↗_Δ0Ṿ.)(
39c. person	Ō₅Ō₀Ṿ.)(↑Ṿ.↖	.. O₁0O ^o)(↑↗_Δ0Ṿ.)(
40a. play	Ō₅Ō₁Ō₀Ṿ.)(↗↗	Ō₅Ō₁0Ṿ.)(↗↗

Words	SgSL Signs	ASL Signs
67c. woman		
68. year		
69. yellow		
70a. full		
70b. full		
71a. brother		
71b. brother		
71c. brother		
72. dance		
73a. sister		
73b. sister		
74a. work		
74b. work		
75a. bird		

Words	SgSL Signs	ASL Signs
100a. pig		
100b. pig		
100c. pig		

Words	Levenshtein Distance	Similarity
1a. all	1	0.9444444444
1b. all	16	0.1111111111
1c. all	8	0.529411765
2. animal	1	0.9166666667
3a. bad	2	0.714285714
3b. bad	9	0.1
3c. bad	11	0
3d. bad	10	0.375
4a. because	6	0.5
4b. because	11	0.0833333333
5a. black	1	0.888888889
5b. black	7	0.2222222222
5c. black	3	0.666666667
6a. blood	17	0.4333333333
6b. blood	13	0.380952381
6c. blood	29	0.1944444444
7. child	2	0.818181818
8a. count	13	0.566666667
8b. count	12	0.586206897
8c. count	18	0.485714286
8d. count	14	0.548387097
9. day	10	0.565217391
10a. die	0	1
10b. die	26	0.103448276
10c. die	28	0.034482759
11. dirty	0	1
12. dry	1	0.888888889
13. dull	1	0.875
14a. dust	36	0.027027027
14b. dust	20	0.047619048
14c. dust	20	0.047619048
15a. grease	35	0.485294118

Words	Levenshtein Distance	Similarity
15b. grease	35	0.46969697
16a. father	1	0.9
16b. father	9	0.181818182
17a. fire	3	0.785714286
17b. fire	9	0.307692308
18a. good	18	0.217391304
18b. good	8	0.2
19a. green	3	0.666666667
19b. green	30	0.0625
20. heavy	1	0.916666667
21a. how	14	0.176470588
21b. how	16	0.058823529
22a. hunt	17	0.291666667
22b. hunt	12	0.47826087
22c. hunt	22	0.12
23. husband	31	0.261904762
24a. if	12	0.142857143
24b. if	10	0.285714286
24c. if	4	0.75
24d. if	12	0.142857143
25a. kill	6	0.684210526
25b. kill	17	0.105263158
25c. kill	14	0.263157895
26a. laugh	14	0.125
26b. laugh	7	0.416666667
27a. lie	8	0.666666667
27b. lie	9	0.625
28. live	3	0.8
29a. long	2	0.909090909
29b. long	21	0.045454545
30a. meat	12	0.612903226
30b. meat	2	0.935483871

Words	Levenshtein Distance	Similarity
31a. mother	4	0.733333333
31b. mother	7	0.5625
32a. name	3	0.892857143
32b. name	23	0.206896552
33a. narrow	3	0.727272727
33b. narrow	15	0.318181818
34a. new	2	0.913043478
34b. new	9	0.608695652
35a. night	4	0.846153846
35b. night	21	0.192307692
35c. night	22	0.153846154
36a. not	3	0.833333333
36b. not	18	0.419354839
37. old	8	0.466666667
38a. other	6	0.333333333
38b. other	5	0.444444444
39a. person	1	0.9375
39b. person	5	0.666666667
39c. person	11	0.266666667
40a. play	1	0.9
40b. play	13	0.1875
41. red	2	0.846153846
42a. correct	0	1
42b. correct	25	0.107142857
43. salt	0	1
44. sea	40	0.166666667
45a. sharp	13	0.518518519
45b. sharp	29	0.171428571
46a. short	27	0.035714286
46b. short	25	0.107142857
46c. short	5	0.827586207
47a. sing	22	0.043478261

Words	Levenshtein Distance	Similarity
47b. sing	21	0.086956522
47c. sing	13	0.434782609
47d. sing	20	0.130434783
48a. sit	4	0.882352941
48b. sit	17	0.433333333
49a. smooth	21	0.16
49b. smooth	20	0.090909091
49c. smooth	16	0.272727273
50a. snow	19	0.136363636
50b. snow	1	0.9
51a. stand	9	0.653846154
51b. stand	1	0.961538462
52a. man	16	0.058823529
52b. man	14	0.176470588
52c. man	11	0.421052632
53a. thin	9	0.666666667
53b. thin	8	0.111111111
53c. thin	15	0.464285714
53d. thin	7	0.363636364
54a. vomit	13	0.409090909
54b. vomit	16	0.111111111
54c. vomit	16	0.111111111
55. warm	2	0.818181818
56. water	0	1
57a. wet	7	0.5
57b. wet	9	0.357142857
58a. what	23	0.041666667
58b. what	5	0.6875
59a. when	6	0.769230769
59b. when	21	0.125
60a. where	0	1
60b. where	7	0.533333333

Words	Levenshtein Distance	Similarity
61. white	1	0.9375
62a. who	14	0.176470588
62b. who	2	0.882352941
63a. wide	0	1
63b. wide	15	0.166666667
64. wife	0	1
65a. wind	18	0.4375
65b. wind	20	0.130434783
65c. wind	19	0.173913043
66. with	3	0.7
67a. woman	20	0.166666667
67b. woman	26	0.333333333
67c. woman	11	0.541666667
68. year	0	1
69. yellow	1	0.9
70a. full	7	0.740740741
70b. full	0	1
71a. brother	18	0.4375
71b. brother	29	0.09375
71c. brother	26	0.1875
72. dance	1	0.941176471
73a. sister	20	0.375
73b. sister	28	0.125
74a. work	7	0.72
74b. work	1	0.96
75a. bird	0	1
75b. bird	9	0.1
76a. dog	8	0.272727273
76b. dog	11	0
77a. earth	29	0.121212121
77b. earth	9	0.727272727
78a. egg	6	0.571428571

Words	Levenshtein Distance	Similarity
78b. egg	14	0.391304348
78c. egg	18	0.217391304
79a. feather	32	0
79b. feather	28	0.125
80a. fish	2	0.777777778
80b. fish	3	0.666666667
80c. fish	17	0.227272727
80d. fish	4	0.636363636
81a. flower	1	0.916666667
81b. flower	32	0.058823529
81c. flower	4	0.666666667
82a. grass	3	0.823529412
82b. grass	8	0.428571429
83a. ice	11	0.352941176
83b. ice	43	0
83c. ice	10	0.411764706
83d. ice	15	0.117647059
84a. leaf	16	0.428571429
84b. leaf	10	0.642857143
85a. louse	53	0.101694915
85b. louse	53	0.101694915
86a. mountain	20	0.285714286
86b. mountain	20	0.285714286
87a. rain	3	0.75
87b. rain	3	0.75
88a. river	21	0.25
88b. river	23	0.178571429
89. rope	1	0.9375
90. snake	27	0.129032258
91a. star	4	0.733333333
91b. star	8	0.384615385
92. stone	5	0.782608696

Words	Levenshtein Distance	Similarity
93a. sun	14	0.066666667
93b. sun	4	0.733333333
93c. sun	1	0.933333333
94a. tail	17	0.15
94b. tail	13	0.48
95. tree	5	0.807692308
96a. wood	11	0.541666667
96b. wood	21	0.25
96c. wood	21	0.086956522
96d. wood	9	0.64
97a. worm	16	0.407407407
97b. worm	8	0.703703704
98a. moon	1	0.9
98b. moon	15	0
98c. moon	6	0.4
99a. cat	3	0.769230769
99b. cat	3	0.769230769
99c. cat	10	0.411764706
100a. pig	12	0.076923077
100b. pig	12	0.076923077
100c. pig	6	0.538461538

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