AN ANALYSIS OF TURKISH SIGN LANGUAGE (TİD) PHONOLOGY AND MORPHOLOGY

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF INFORMATICS
OF
THE MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN
THE DEPARTMENT OF COGNITIVE SCIENCE

MAY 2008

Approval of the Graduate School of Informatics

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ABSTRACT

AN ANALYSIS OF TURKISH SIGN LANGUAGE (TID) PHONOLOGY AND MORPHOLOGY

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May 2008, 174 pages

This thesis examines the phonology and morphology of Turkish Sign Language (TİD). TİD, being considered a full-fledged language, has a rich phonological and morphological system, as other sign and spoken languages do. For the purpose of this thesis; empirical data have been collected by means of a corpus study and various data elicitation tasks.

As a main result of my study of TİD phonology, I propose a complete inventory of handshapes as well as a set of unmarked handshapes which are unique to TİD. I discuss the interaction between TİD finger-spelling and TİD phonology showing that well-formedness conditions constrain the use of finger-spelled letters in lexical signs.

I also discuss psycholinguistic evidence that sign languages have phonological systems, among them phonological effects on working memory and slips of the hand

In the domain of TİD morphology, I investigate the three main morphological processes: inflection, derivation and compounding. Verb classification, plural properties, compounding, and reciprocals in TİD are investigated in detail. I argue that some TİD reciprocals use "reciprocal neutral signing space" whereby agreement becomes neutralized. TİD makes wide use of classifier constructions as for plural marking and for expressing movements of various human and non-human agents.

The thesis indicates that TİD has its own grammar, including rich and diverse systems of phonology, morphology, and classification. Thus, TİD may have had a long historical development. The comparison between TİD and other sign languages shows that TİD has exclusive linguistic properties. The comparison of TİD as a visual-gestural system and Turkish as an auditory-vocal system helps to better understand the impact of modality on language phonology and morphology.

Keywords: Turkish Sign Language, Phonology, Morphology, Classifier Expressions

ÖZ

TÜRK İŞARET DİLİNİN SESBİLİMSEL VE BİÇİMBİLİMSEL ANALİZİ

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Mayıs 2008, 174 sayfa

Bu tez, Türk İşaret Dilinin (TİD) sesbilimini ve biçimbilimini incelemektedir. Tam donanımlı bir dil olarak kabul edilen, Türk İşaret Dili diğer işaret ve konuşma dilleri kadar zengin sesbilimsel ve biçimbilimsel sistemlerine sahiptir.

Bu tezde, deneysel veri bir derleme çalışması ve çeşitli veri temin etme yöntemlerinin aracılığıyla toplanmıştır.

TİD sesbilimi üzerinde yaptığım çalışmaların sonucunda, TİD'e özgü olan el şekilleri haznesini ve imlenmemiş el şekilleri kümesini öne sürülmüştür. TİD alfabesi kullanılarak yapılan işaretler ile TİD sesbilimi arasındaki ilişki incelenmiştir. Çalışan hafıza üzerindeki sesbilimsel etki ile el kaymaları gibi, işaret dillerinin sesbilimsel sistemlere sahip olduğunu gösteren yansısal dilbilim kanıtları da tartışılmıştır.

TİD biçimbilimi alanında; çekimleme, türeme ve birleşme olmak üzere üç temel biçimbilimsel süreç incelenmiştir. Türk İşaret Dilindeki fiillerin sınıflandırılması, çoğul özelliği, bileşik işaretlerin ile işteş fiillerin yapıları detaylandırılmıştır. Bazı işteş fiillerin, özne-nesne uyumunu nötr hale getiren "işteşsel nötr işaretleme alanı"nın kullanıldığı öne sürülmüştür. TİD'de, çoğul işaret üretiminde ve insanların ile diğer varlıkların hareketlerinin işaretlendirilmesinde geniş bir sınıflandırıcı yapılarının kullanıldığı da gözlemlenmiştir.

Bu tez, TİD'in zengin ve farklı sesbilimsel, biçimbilimsel ve sınıflandırıcıları içeren kendine özgü bir dilbilgisine sahip olduğunu göstermektedir. Böylelikle, TİD'in uzun bir geçmişe sahip olduğu düşünülmektedir. TİD ile diğer işaret dilleri arasında yapılan karşılaştırma, TİD'de özel dilbilimsel özelliklerin bulunduğunu göstermektedir. Görsel-jestsel bir dil olan Türk İşaret Dili ile duysal-sessel bir dil olan Türkçenin karşılaştırılması, biçimsel farklılıkların biçimbilim ve sesbilim üzerindeki etkisini daha iyi anlamamıza yardımcı olacaktır.

Anahtar Kelimeler: Türk İşaret Dili, Sesbilim, Biçimbilim, Sınıflandırıcılar

To Annette Hohenberger

ACKNOWLEDGMENTS

I am grateful to Asst. Prof. Dr. Annette Hohenberger, my advisor, for her guidance and insight throughout my research and for introducing me to Sign Linguistics and Psycholinguistics as well as guiding me through the entire thesis process from start to finish. Has it not been for her faith in me, I would not have been able to finish the thesis. Heartful thanks go to my co-advisor Assoc. Prof. Dr. Cem Bozşahin for his valuable support and ideas. I am very fortunate to write my thesis in such an excellent academic milieu such as the Informatics Institute. I appreciate very much the constructive criticisms and suggestions provided by my thesis examiners Prof. Dr. Deniz Zeyrek, Prof. Dr. Şükriye Ruhi and Dr. Ceyhan Temürcü.

I am also grateful towards Ayça Müge Sevinç's helfpul comments on the draft. She has encouraged me in every possible way as a colleague and a friend. All the times we have had together discussing on different aspects of TİD have been utmost appreciated.

Sinan Yıldırım has helped me for his insight and comments as a native signer of TİD. I appreciate his support, feedback, and most of all, his friendship. This thesis would not be as rich without the help of many Deaf people who participated in the data elicitation tasks as well as their brilliant ideas about TID: Turgut Can Yılmaz, Ercan Çevik, Hatice Baloğlu, Mehmet Ünsal Narşap, and Leman Öztürk.

Thanks given to Betül Baktır, Bekir Burak Durmaz, Burcugül Önal, Claire Özel, Didem Tufan, E. Berna Çıbık, Emel Tahir, Fatih Arı, Gönül Çevik, Gözde Bahadır, Hayal Yaşam Moran Yıldırım, Işın Demirşahin, İsmahan Arslan-Arı, Nurşen Gümüşay, Oya Tanyeri, Öznur Eroğlu, Sedat Özcan, Serdar Abacı and Yalçın Çetinkaya who were more than very helpful throughout my academic career.

I want to take the opportunity to thank Shane Gilchrist Ó Eorpa and Christian Rathmann for their special friendship. They were always there for me during the process, whenever I needed an advice or two, or a listening ear. I can't imagine how I have survived this without their words of encouragement. I will also like to convey my gratitude to MinYuen Teo for helping out now and then.

Last but not least, I offer my heart-felt thanks to my family: My grandparents Melahat and Süleyman Karayeğen for their effort in my social and intellectual development since my birth; my mother Zuhal Karayeğen and my aunts, Nuray and Ayşe Karayeğen, who supported me both emotionally and financially.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The aim of this thesis is to analyze the phonological and morphological properties that are observed in Turkish Sign Language (TİD). There is strong evidence that sign languages do have phonology, morphology and syntax. However, research on TİD does not date back as long as research on ASL does (Stokoe, 1960); rather it dates back to the beginnings of 2000s. Previous studies on TİD are fairly restricted to just a few studies of Zeshan (2002, 2003, 2004 and 2006a), Acan (2001), Özyürek, İlkbaşaran and Arık (2004) and Sevinç (2006). As Sevinç (2006) states there are few studies on TİD so that there is no chance to compare the findings with other publicly available and linguistically annotated data. Therefore, this thesis will hopefully serve as an introduction to TİD phonology and morphology. I chose phonology and morphology since they comprise the smaller components in a language from which increasingly bigger units can be built. TİD, like other sign and spoken languages, has phonological features and morphemes. In the traditional linguistics of spoken language, morphemes are constructed from sounds or "phonemes". Even though spoken languages and sign languages have different modality, the hands and non-manual markings are equally successful to build phonemes and morphemes in sign languages.

Stokoe (1960), who first investigated ASL in depth, indicated that sign languages have phonological features which are the smallest units of a sign: handshape, movement, location and also non-manual (for further detail see Chapter 3.) When analyzing the sign YANLIŞ (WRONG) in the Figure-1, we can say that the sign has its own handshape, movement, location, and hand orientation. These properties are the smallest units of a sign languages which are not meaning bearing.

Figure-1 The sign YANLIŞ (WRONG) in TİD

As can be seen in Figure-1, the handshape of the sign is the X-handshape in ASL, in which the index finger is open and bent and the other fingers are closed. However, ASL handshapes and TİD handshapes do not have to be the same. Rather, TİD has its own handshape inventory which is different from ASL (for all handshapes see section 3.3 on the TİD Handshape Inventory). According to the TİD Handshape Inventory, we can say that the sign YANLIŞ sign has the 9-handshape.

The location of the sign is also a parameter of a sign. The sign in Figure-1 is located at the "chin" which is a specific and distinctive place of articulation in TİD. Generally, all signs are signed in the signing space (for further information see section 4.1). Signs can be located at distinctive parts of head, body, hand and at any other distinctive loci in signing space.

Hand orientation specifies the initial orientation of the palms. Hand orientation of signs can generally be categorized in six groups: palms up, down, right, left, front and back. Therefore, the hand orientation of the sign YANLIŞ is “left”.

Moreover, signs have different movements. The movements of the sign YANLIŞ are small front and back movements in front of the chin. The length, duration and type of movement may vary among TİD signers. They are not phonemic.

A non-manual property of this sign is the facial expression of “furrowing the eye brows” which transports a message of “unwillingness to do this”. In general, there are many specific non-manual expressions which are fairly complex to analyze compared to the other properties of phonemes.

All phonological properties, handshape, hand orientation, location, movement and non-manual expression construct a specific sign. In summary, we characterize the sign “YANLIŞ” phonologically, with the 9-handshape, palm left, and having slight front-back movement in front of the chin. Besides being constructed by five different phonology properties, signs may also be inflected, derived or changed by some morphological process. In Figure-2 an agreeing verb: DAVET-ETMEK (INVITE) is inflected for person by signing it at different locations.

Figure-2 Different inflections of the verb DAVET (Sevinç, 2006 p.25)

Movements from different locations as in the sign DAVET in Figure-2 are a good example of morphemes. The locations refer to subject and object or source and goal. Agreeing verbs can be inflected according to these locations. The handshapes of such verbs do not change but the locations and movements change when they are inflected.

Sign languages also have classifier constructions which, however, may not be categorized as morphological processes, because their form is "*different from that of complex lexical word*" and although classifier constructions "*may translate as whole prepositions*"; they are not formally like ordinary sentences either (Sandler & Lillo-

Martin 2006 p.76). They are hard to define as lexical or grammatical categories since they represent the iconic form/shape of an artificial or natural object. An instance of a classifier predicates can be seen in Figure-3. The dominant hand (referring to a human) has the V-handshape, whereas the non-dominant hand (referring to a wall) has the flat-handshape. The V-handshape in this figure is an example of a legged-object classifiers where the two fingers refer to the two legs of a human being (for detailed information see section 5.3.7). Similarly, the flat hand refers to a wall, which is a thin, flat object. With these sign combinations, the signer indicates that "a human is jumping on the wall".

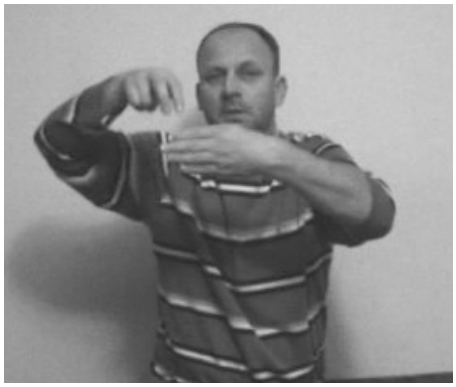


Figure-3 As an example for a Classifier Predicates: The dominant hand refers to a human and the non-dominant hand refers to a wall.

This thesis covers the following three phenomena: phonology, morphology and classifier constructions in TİD. The different phonological properties, processes and handshape inventory of TİD are discussed. Also different morphological processes like inflection, derivation and compounding are analyzed. Finally, TİD Classifier Constructions are investigated. Examples and linguistic analyses are provided for all phenomena.

Chapter 2 introduces how the data were collected and which methods were used in this thesis. Three different methodical approaches were taken. The first one is collecting a small TİD corpus, the second is an experimental task for eliciting classifier constructions and the final one is a visual data elicitation task for inflectional (plural) morphology. I also explain how the data are annotated.

Chapter 3 focuses on TİD phonology. Evidence for various properties of TİD phonology is discussed and different models of phonology that have been suggested by different researchers Liddell (1984), Sandler (1989) and Brentari (1998), are discussed with respect to TİD. The handshapes that are observed in TİD are listed and phonological processes related to them are discussed.

Chapter 4 is mainly about TİD morphology. This part consists two sub-parts: inflectional morphology and derivational morphology. Verb inflections, plurals, reciprocals, and negations are explored in the area of inflectional morphology, whereas, compounds, borrowed fingerspelling, incorporation and serial suffixation are discussed in the area of derivational morphology.

Chapter 5 gives an overview of Classifier Predicates in TİD. Firstly, the classifiers are categorized into three groups: Size and Shape Specifies (SASSes), handling and entity classifiers. Some frozen verbs and animal classifiers in TİD are demonstrated. Finally, I explain how plural strategies operate with classifiers.

Chapter 6 summarizes the main findings in TİD phonology and morphology. The history of TİD is briefly reviewed. I discuss evidence that TİD may be fairly old and therefore have rich and well-developed phonological and morphological structures. Furthermore, similarities and differences between Turkish and TİD are outlined in order to show that TİD has its own grammar.

CHAPTER 2

METHODOLOGY

The goal of this thesis is to construct the basics of grammar in TİD with respect to phonology and morphology. Therefore, I conducted (i) a classical grammatical analysis of aspects of TİD phonology and morphology and (ii) empirical studies on selected aspects of TİD morphology and phonology. Collecting and eliciting new data is necessary for a better understanding of these areas. Benefiting from various methodological approaches, this thesis aims to present a rich analysis of both TİD phonology and morphology.

2.1 Data Collection

The data for the present thesis was collected in various ways. Note that naturalistic, spontaneous data collected during social events of the deaf community may include ungrammatical signs according to their level of TİD and therefore may be unreliable. However, since I am bilingual, using both Turkish and TİD, I can discriminate ungrammatical signs collected in naturalistic settings. Therefore, before starting to collect the data, I observed TİD native signers in terms of (i) what kind of phonemes and morphemes there are in their signing, (ii) how these phonological and morphological properties are expressed and (iii) how frequently they are used. The observations were noted and subsequently I either followed up on them with an in-depth grammatical analysis or I devised an elicitation study. I also conducted a small-scale corpus study.

In general, four types of data have been collected: (i) TİD lexical signs (mainly for phonological and morphological analysis, e.g., reciprocal verbs), (ii) verbalization of pictures (for elicitation of plural data), (iii) verbalization of movements in a show-jumping course (for elicitation of Classifiers) and (iv) story telling / telling one's own life for the small TİD corpus. However, the majority of these data stems from the collection of TİD lexical signs (i) and storytelling (iv). A native TİD signer signed lexical signs that I identified for subsequent use in the thesis and for providing some examples. Picture stories for story telling were taken from ASL teaching material (Smith, Lentz, and Mikos 1988; Lentz, Mikos, and Smith 1989). Free signing was requested by asking signer to report their autography. Both data sets were annotated.

Initially, I benefited from Sevinç's (2006) classification of TİD verbs (See APPENDIX-3). The plural and reciprocal attributes of these TİD verbs were analyzed. I came up with a list of verbs that were grouped together in terms of their reciprocal properties. Then I asked a TİD native signer to sign these verbs marked for reciprocity.

In order to construct the phonological inventory of TİD, the different handshapes whose identification was informed by minimal pairs, were listed. A native TİD signer helped me to find all possible handshapes and gave an example for each handshape.

In order to signify the grammatical attributes (i.e. morphemes, phonological features) of TİD, various data elicitation techniques have been devised. Especially plural properties and classifier constructions were not easy to determine by observing the deaf participants because they used different signs. Those varying signs had to be classified and the most frequently used signs would be utilized. Hence, the richness of the signs in terms of morphological and phonological attributes could not be included straightforwardly.

It should be noted that TİD lexical signs are mainly those from the Ankara dialect. It is assumed that there are three main dialects in Turkey. The Istanbul dialect is utilized in the Marmara and Aegean regions, whereas the Ankara dialect is mainly observed in Ankara and its neighboring cities. The eastern dialect is signed in east and southeast regions of Turkey. However, these distinctions are just generally assumed and further sociolinguistic research is required to determine how many dialects of TİD exist in Turkey and as well as in the Turkish Republic of Northern Cyprus. However, it is clear that there is a main distinction in the lexicon in terms of dialect between Ankara and Istanbul.

2.1.1. Elicitation of Plural Forms

For studying the plural markings of noun, the different types of noun signs (i.e. B-nouns, C-nouns, M-nouns and L-nouns, Pfau and Steinbach 2005) were classified in TİD and then analyzed. Pictures of single and multiple objects were shown to five deaf participants so as to elicit nouns in their singular and plural forms. The five deaf informants (two of them having a deaf parent and one of them having an elder deaf sibling) who acquired TİD before or during primary school were asked to sign the pictures. There were 75 pictures in the plural data elicitation task and these pictures were categorized into 4 groups (see Figure-4), namely singular, dual, paucal (countable plural), and plural.

Figure-4 Examples for number sets (singular, dual, paucal and plural sets)

2.1.2. Elicitation of classifiers:

The five deaf informants who participated in the plural experiment were also asked to sign the movements of animals in the model shown in Figure-5. The model was adapted from Hong's Obstacle Model (2003) whose primary aim was to investigate

semantic classifiers, namely (i) legged object classifiers, (ii) whole body classifiers and (iii) unmarked classifiers. Eight different animals (worm, horse, cat, frog, spider, cow, snake and chicken) and a human were used in the model with eight obstacles (affording going upstairs, slipping, swimming, climbing, jumping, zigzagging and bouncing).

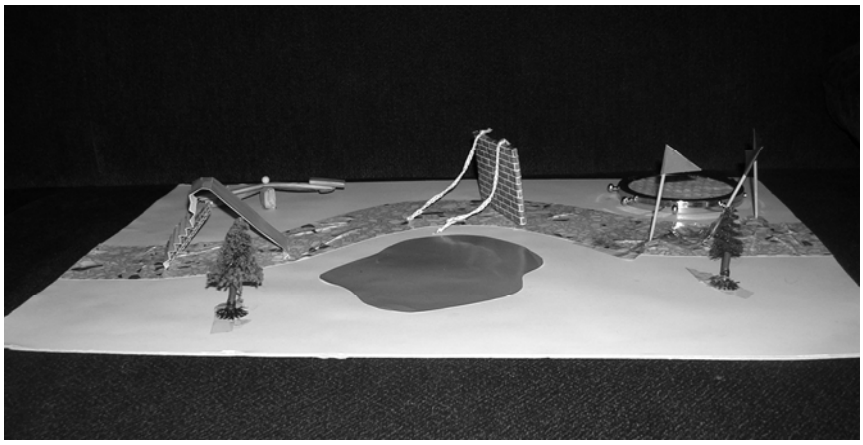


Figure-5 Model for classifier elicitation (adapted from Hong, 2003)

2.1.3. Collecting a small TİD corpus:

A small TİD corpus was collected by asking signers to tell their autobiography and picture stories as in naturalistic free signing. The corpus study was helpful in analyzing some compounds and classifier constructions in TİD. In the corpus study, the frequencies of handshape use were also analyzed and the handshape inventory was reconstructed in terms of these frequencies.

Two deaf subjects participated in this corpus study. They are both male. The first one is 40 years old and has a deaf sibling 6 years older than him. He became deaf due to a fever disease when he was three and a half years old. He learnt Turkish Sign Language when he was 5 years old from his elder sister. The second participant is 22 years old and has a deaf sibling 8 years older than him. He is profoundly deaf and uses Turkish Sign Language since he was 3 or 4 years old. Both of them attended deaf schools in Ankara. Therefore, their signs belong to the TİD variant signed in and around Ankara.

In the TİD corpus, two Panasonic Handycam PV-GS9 MiniDV Digital Camcorders have been used. The first camera was for recording the facial movements of the participants, whereas the second one was used for the signs and body movements. The background color was white to create a strong contrast and maintain the visibility of the signs.

2.2 Data Annotation

I intended to prepare a small sign language corpus on Turkish Signs using the ELAN Annotation Software which is a free software supplied by the MPI, Nijmegen. In this corpus, TİD signs and their morphological and phonological properties were studied. The aim was to show which kind of morphological indicators exist in TİD and how frequently the various handshapes occur in TİD. Since ELAN is flexible in terms of annotation and depends on the annotators, it is used only for investigating the frequency of these morphological forms and handshapes in a restricted set of signs of the entire TİD corpus.

As a literature review revealed, there exist no resources such as corpus studies in TİD. However, worldwide, there exist some international sign language corpora studies. Unfortunately, corpus studies in sign language research are not as common as in spoken language research due to the different modality of sign language. The main study, of which I took advantage, was conducted by ECHO (European Cultural Heritage Online), an organization producing and publishing data in Netherlands Sign Language (NGT), British Sign Language (BSL) and Swedish Sign Language (SSL), using the ELAN annotation software. The samples consist mainly of annotated signs in story-telling settings. Indeed, the main problem is how to annotate the signs: there are no standardized notations of sign language. Nevertheless, Johnston and Crasborn (2006, p.9) defined and justified some possible tiers in the ELAN tool. In addition, Schwager et al. (2007) denoted possible ELAN transcription conventions for glossing sign language. These principles of annotations are mainly used in the present TİD sign language corpus project.

Sign-language studies (ECHO, 2002) (http://corpus1.mpi.nl/ds/imdi_browser/ECHO), gesture studies (Enfield) (http://corpus1.mpi.nl/ds/imdi_browser/Enfield) and many other studies on sign language or gestured languages have been developed with different tools including different formats like Shoebox, CHAT, EAF. These tools differ in terms of utilization of tiers and the nature of encoding (Berck & Russel, 2006). However, ELAN permits direct access to archival content like Shoebox and CHAT without the need for importing different kinds of tools or software. In general, this tool stores the transcribed data in a specialized XML format (EAF: ELAN Annotation Format) which is an XML format used by the ELAN software. It allows us to construct, justify and analyze the visual annotations, since the recordings are converted to Mpeg1 or Mpeg3 video formats. The programmer can define numerous tiers; he/she can also construct these tiers in terms of a tree-hierarchy since ELAN allows several annotations on different tiers on the same time line, as can be seen in Figure-6.

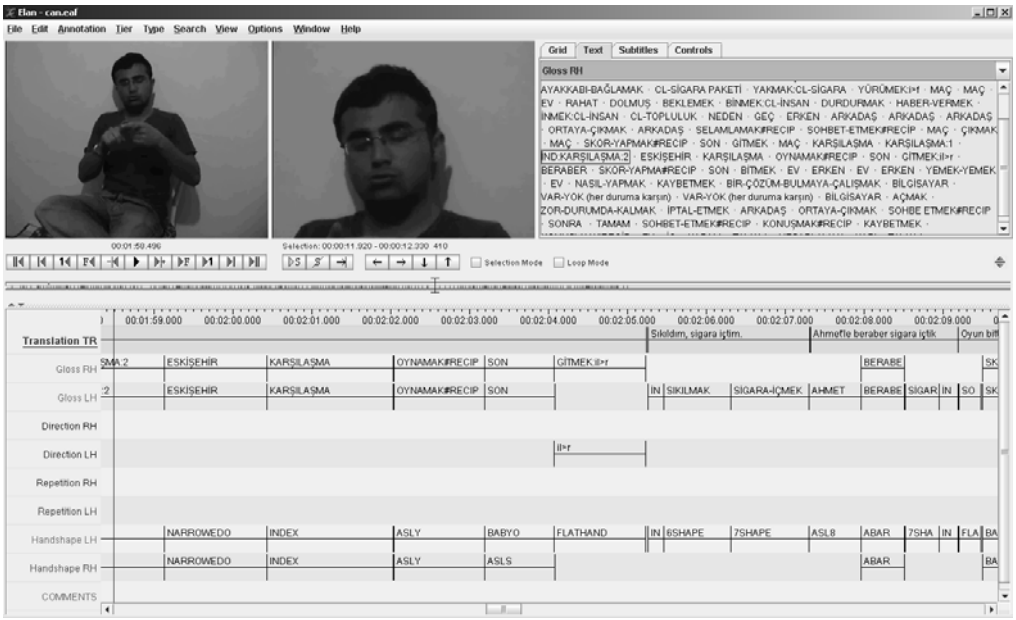


Figure-6 a sample of annotation in ELAN

The ELAN tool allows for time alignment and for searching multiple annotation ELAN files. The ELAN tool has various valuable features (Johnston and Crasborn,

2006): (i) 4 different synchronized views can be screened, (ii) it has the ability to zoom into a range of 1 millisecond, (iii) numerous tiers and annotations can be constructed, (iv) modules such as Shoebox and CHAT can be imported, (v) the tool is compatible with different characters (i.e. Turkish, Chinese) and (vi) annotations can be linked to other annotations.

Johnston and Crasborn (2006, p.9) defined and justify some possible tiers in the ELAN tool, as in Table-1. Table-2 shows a similar but different set of tiers, as proposed by Schwager et al. (2007). In the present corpus, which seeks for morphological and phonological clues of Turkish Sign Language, some of the above-mentioned tiers were used (for the research domain). Since the annotation of non-manual expressions, role shifts and body positions are complex and time consuming, they were not annotated for this small project. The 10 tiers in Table-3 from the possible tiers defined above were utilized in this project.

Table-1 The suggested tiers and their functions.

Tiers	**Functions**
Sign type	lexicalized, productive, gesture
Sign class	noun, verb, adjective, etc.
Verb type	plain, indicating (‘agreeing’ ‘spatial’), depicting (‘classifier’)
Perspective / role shift	The changes in perspectives and role playing status of signers
‘Prosody’	eyebrows, head movements in signs
Expression	head, eyes, mouth gestures
Mouthing	Mouthing of spoken words

Table-2 Another suggestion for tiers and their functions.

Tiers	**Functions**
Main Gloss	lexicalized, productive, gesture
Non-dom. hand Gloss	noun, verb, adjective, etc.
Eyes/Hand Direction	plain, indicating (‘agreeing’ ‘spatial’), depicting (‘classifier’)
Eyebrows	The changes in perspectives and role playing status of signers
Face & mouth	eyebrows, head movements in signs
Head position	head, eyes, mouth gestures
Body/ Role shift	head, eyes, mouth gestures
Comment	head, eyes, mouth gestures
Translation	Mouthing of spoken words

Table-3 the tiers used in the small TİD corpus in this study

Tiers	**Functions**
Translation TR	the signs and segments were translated into Turkish in the first tier
Gloss RH	the signs signed by the right hand
Gloss LH	The signs signed by the left hand
Direction RH/LH	signs signed with the right & left hand (in their respective tiers) as in agreeing or spatial verbs and their loci are annotated in this tier.
Repetition RH/LH	repeated signs signed with the right & left hand (in their respective tiers) are identified and the numbers of repetitions are annotated.
Hand-Shape RH/LH	the handshapes in the signs used by the right and left hand (in their respective tiers)
Comment	Additional Information

The individual signs are annotated with meaningful Turkish words using capitalized letters (GLOSS - i.e. OKUL). Since some signs are two-handed, these two-handed signs are annotated in both Gloss RH and Gloss LH (GLOSS - i.e. HEMEN is annotated in both tiers). On the other hand, 'GLOSS-GLOSS' glosses indicate one sign represented by several Turkish words. Table-4 defines all glosses used in the corpus annotation.

Indices (Personal Pronouns), Agreeing Verbs and Spatial Verbs vary in terms of their locations. In this project, the following horizontal locations (see Figure-7) are used: ipsilateral-left (il), left (l), front-left (fl), front (f), front-right (fr), right (r), and ipsilateral-right (ir) (Schwager et al. 2007).

Table-4 the following morphological indications were defined in the glosses

Annotation	**Glossing**
Index	IND:x (i.e. IND:i ~ BEN)
Possessives	POSS:x (i.e. POSS:I ~BENİM)
Plain Verbs	"GLOSS (-MAK)" (i.e. AÇMAK)
Agreeing Verbs	"GLOSS (-MAK): x>y" x and y are individuals and > indicates direction. (i.e. ANLATMAK:f>i)
Spatial Verbs	"GLOSS (-MAK): x>y" x and y are locations and > indicates the direction. (i.e. YÜRÜMEK:l>r)
Reciprocals	"GLOSS#RECIP" (i.e. SELAMLAMAK#RECIP)
Plurals	GLOSS^PL (İND:f^PL ~ ONLAR)
Negations	GLOSS^DEĞİL (i.e. ANLAMAK^DEĞİL)
Classifiers	CL-GLOSS or GLOSS:CL-GLOSS (i.e. CL: SİGARA-PAKETİ or GELMEK:CL-DOLMUŞ)
Compounds	GLOSS^GLOSS (i.e. ANNE^BABA ~ EBEVEYN)
Fusion Signs	GLOSS#GLOSS (i.e. ÜÇ#HAFTA)

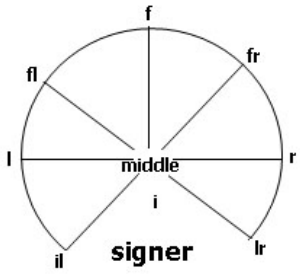


Figure-7 Horizontal signing spaces and directions

CHAPTER 3

TURKISH SIGN LANGUAGE PHONOLOGY

Words in spoken languages consist of segmental phonemic units: consonants and vowels and these spoken languages vary in terms of their inventory of phonemes. Similarly, one sign language can also differ from another sign language with respect to the inventory of handshapes. Sign language phonology research has shown that there are handshape inventories and these inventories are also distinctive among sign languages. Mandel (1981, as cited in Sandler & Lillo-Martin 2006) indicated that Thai Sign Language differs from ASL (American Sign Language) in terms of the existence of a ring finger handshape. Similarly, Chinese SL has an A-handshape (Figure-8) with more tensed fingers as compared with the A-handshape in ASL (Klima & Bellugi, 1979 as cited in Sandler & Lillo-Martin 2006) (for further information, see handshape inventory of TİD).

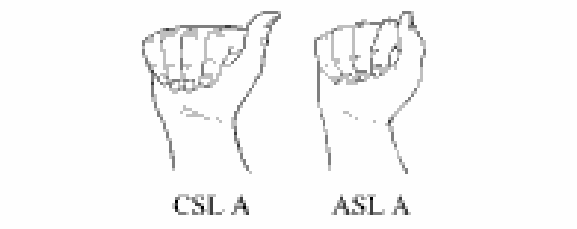


Figure-8 Chinese SL A vs. ASL A (Ursula Bellugi, the Salk Institute in Sandler and Lillo-Martin, 2006, p.148)

In his seminal study on ASL, Stokoe (1960) showed that a sign is composed of meaningless subunits. When these units come together, possibly meaningful words can be constructed. Stokoe's four meaningless units are hand shape, hand orientation, location and movement. Moreover, the change of just one unit also enables us to produce another meaningful sign. These two signs form a minimal pair. For instance, one minimal pair in terms of the location feature in ASL is SICK and TOUCH (Figure-9)

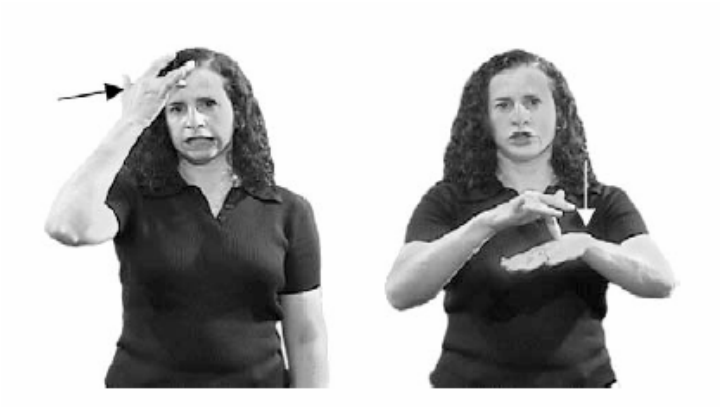


Figure-9 sample minimal pair in terms of location: SICK vs. TOUCH (from Sandler, Sign Language Overview, p.4)

Such minimal pairs give us a clue that sign languages have the same kind of phonology as spoken languages and that sign languages are also fully fledged natural languages. In this chapter, more evidence for phonological systems in sign languages is given. After Stokoe's findings, Liddell, Brentari and Sandler (among others) have developed phonological systems. The characteristics of these systems are presented and then comparisons between these systems are made. Some relevant phonological processes will be discussed.

3.1 Evidence for Sign Language Phonology

One piece of evidence that sign languages have a phonological system comes from minimal pairs. In minimal pairs only one phonological feature differs and the other phonological features remain the same. Even though spoken language and sign language differ in modality, sign languages also have minimal pairs. Another piece of evidence for sign language phonology stems from slips of the hand which mostly occur in phonological features. Slips in any of the four meaningless phonological

units in sign language are very similar to phonological slips of the tongue in spoken languages. The last piece of evidence comes from phonological working memory. The phonological loop effects, the phonological similarity effect, the articulatory suppression effect, and the word length effect can be observed in both spoken and sign languages. In the following, I will discuss these three aspects of sign language phonology in more detail.

3.1.1 Minimal Pairs

In TİD, TAVUK / CHICKEN and CEZA / PUNISHMENT have the same handshape for the non-dominant hand, orientations, locations and movements, however, they have different handshapes of the dominant hand: TAVUK / CHICKEN has the 9-handshape (for further information, see the Handshape Inventory in 3.3), whereas CEZA / PUNISHMENT has the extended middle finger handshape: therefore they are minimal pairs with respect to handshape. (Figure-10)

Figure-10 A sample minimal pair in terms of handshape in TİD: CEZA vs. TAVUK

DEPREM / EARTHQUAKE and ELEK / SIEVE have the same movement, handshape and location, however their orientation differs: The palm of the hand of the first sign is looking downward whereas it is looking upward in the second sign (Figure-11).

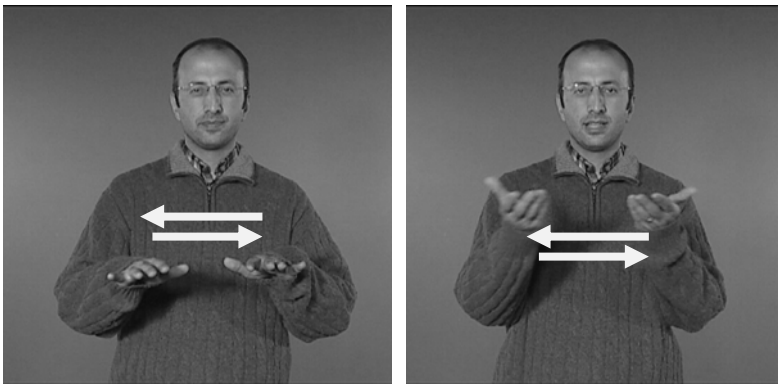


Figure-11 A sample minimal pair in terms of hand orientation in TİD: DEPREM vs. ELEK

YIL / YEAR and KABA / RUDE have the same movement, handshape and orientation, but the location is different: The first sign is located at the chin while the location of the second one is at the nose. (Figure-12)

Figure-12 a sample minimal pair in terms of location in TİD: YIL vs. KABA

The last minimal pair SERBEST / FREE and BAZEN / SOMETIMES have the same handshape, and orientation (Figure-13). The beginning and the end location differs but the signing area is the same. Moreover, the first sign is a symmetric, whereas the second is an alternating sign. However, the beginning and end locations and the type of two-handed sign (i.e. alternating or symmetric) are not related to phonological features. The main difference is movement: the first sign has an arc movement, whereas the second one has a straight movement. Therefore, we can say that these two signs are minimal pairs in terms of movement.

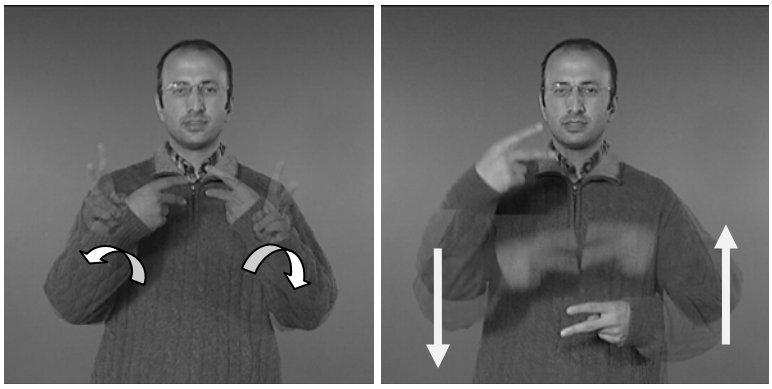


Figure-13 A sample minimal pair in terms of movement in TİD: SERBEST vs. BAZEN

3.1.2 Slips of the hand in sign language

The first studies on slips of the hand were carried out by Klima and Bellugi (1979) and Newkirk, Klima, Pedersen, and Bellugi (1980), showing that sign languages are "fully-fledged natural language systems (Hohenberger & Waleschkowski, 2005, p. 288). These studies showed that slips of the hand provide external evidence for Stokoe's four phonological features. Leuninger, Hohenberger, Waleschkowski, Menges, and Happ (2004, p.13) studied slips in DGS and Spoken German. They showed that phonological slips were not only observed in Spoken German but also observed frequently in DGS *("...German (30%) and DGS (41%)"*). One example of a slip of the hand in terms of handshape can be seen in Figure-14. The signer wanted to sign SITZEN/SIT but used the handshape of KAFFEE-TRINKEN/DRINK-COFFEE which she had signed before signing SITZEN/SIT. The signer should have signed the sign with a hooked V-shape, but instead she signed it with the DGS F-handshape which was actually the handshape of KAFFEE-TRINKEN/ DRINK-COFFEE.

Figure-14 (a) The slip of the hand (b) KAFFEE-TRINKEN / DRINK COFFEE (c) SITZEN/ SIT

Hohenberger, Happ & Leuninger (2002, p.127) compared phonological slips of the hand in ASL and DGS. Klima and Bellugi (1979) had reported 89 phonological slips in the ASL corpus of which 73% were slips in terms of hand configuration; 15% of them were location slips and 12% were movement slips (see Table-5). The results of the frequency of phonological errors in terms of parameters were similar in the study of Klima & Bellugi (1979) and in the study of Hohenberger et al. (2002). Handshape errors clearly dominated all other phonological error types.

Table-5 Frequency of phonological errors by parameter in ASL (Klima & Bellugi 1979) and in DGS (from Hohenberger, Happ & Leuninger (2002) p.127)

Parameter	ASL	DGS
Hand configuration	65(73)	47(82.5)
Place of articulation	13(14.6)	5(8.8)
Movement	11(12.4)	5(8.8)
Total	89(100)	57(100)

Even though there is no research on slips of the hand in TİD, some slips occurred in the small TİD corpus. In one of them, the signer signed İZMİR, whose original handshape is the L-handshape, with the TİD O-handshape. This handshape is actually the handshape of the next sign, VARMAK/REACH (see Figure-15). This anticipatory slip of the hand occurred in terms of handshape.

Figure-15 (a) The slip of the hand (b) VARMAK/ REACH (c) İZMİR

3.1.3. A Phonological Loop for Sign Language: Emmorey's visuo-spatial "phonological loop" model

Baddeley & Hitch (1974) (as cited in Emmorey 2002, see also Baddeley 1986) modeled the human working memory as including two slave systems: the phonological (previously called 'articulatory') loop (PL) and the visuo-spatial sketchpad (VSSP) (see Figure-16).

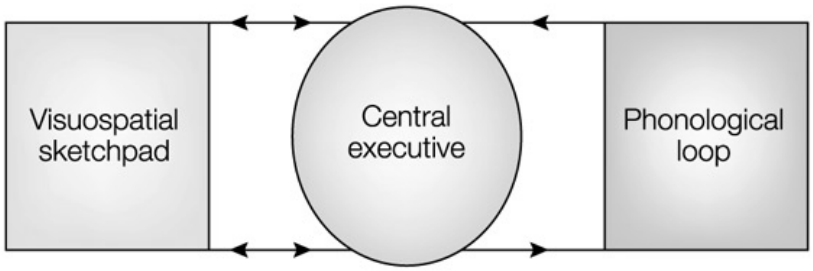


Figure-16 Baddeley's (2003, p.830) simplified working memory mode

The phonological loop functions as a temporary store of "verbally coded information" whereas the visuospatial sketchpad (VSSP) serves the temporary maintenance of "visual and/or spatial information" (Baddeley & Logie 1999 p. 29). According to Baddeley & Logie (1999, p.41) the phonological loop is "a major bottleneck in the process of spoken language comprehension." The VSSP does not play as big a role in language comprehension as the PL does because visually presented language like printed words can enter the phonological loop by silent articulation (Baddeley 1986). Interestingly, sign languages are both verbal and visuo-spatial; the separation of these two major components in the architecture of Baddeley's WM (1986) potentially raises a controversy for sign languages (Emmorey, 2002). Does the working memory for sign language differ from the working memory for spoken language?

Baddeley (1986) presents four main pieces of evidence for the PL: the phonological similarity effect, the articulatory suppression effect, the word length effect, and the irrelevant speech effect. These effects suggest that speech is encoded phonologically. Are the effects also found in sign languages?

The phonological similarity effect refers to the difficulty in remembering lists of words that are phonologically similar. "*Poorer short term memory for similar sounding stimuli supports the notion of a temporary storage system specifically for speech-based items.*" (Baddeley & Hitch, 1974, p.11) Similarly, in the studies of Bellugi, Klima and Siple (1975) it was found that signers misremembered phonologically similar signs (as cited in Emmorey, 2002). Wilson and Emmorey

(1997) also found that signers have poorer memory recall for a list of phonologically similar signs, namely minimal pairs in terms of articulation, orientation and handshape. Besides, Emmorey (2002) cites that semantic similarity between to-be-remembered words leads to much weaker effect for both English (Baddeley & Levy, 1971) and American Sign Language (Poizner, Bellugi & Tweeney, 1981). These studies on the phonological similarity effect indicate that the effect is due to the phonological code rather than the semantic code.

Another piece of evidence for the phonological loop is the word length effect which refers to the fact that lists of short words are remembered better than lists of long words. Andrade (2001, p.11) gives the following reason for this effect: the phonological loop is restricted in terms of "the rate" and "the time" of the storage of items, in other words, "short words do not deplete the time necessary for rehearsal so that their acoustic traces do not decay from the phonological loop". Similarly, Baddeley (2003) explains that short words can be articulated faster, so that more words can be articulated before they decay. However, is the word length effect also found in Sign Languages? Wilson and Emmorey (1998) investigated "the sign length" effect, presenting signers with short signs, containing short repeated movements and long signs constructed by circular and path movements. They discovered that the signers had better memories for short signs as compared to long signs.

Finally, Wilson & Emmorey (2003) explored the "irrelevant sign effect" in two different experiments. In the first experiment, baseline, shapes and pseudo signs were presented to hearing participants who did not know sign language. Conversely, the second experiment was for deaf signers and the stimuli were the same as in the first experiment. The hearing participants did not show the irrelevant sign effect as opposed to the irrelevant speech effect and the same responses were obtained in both baseline and pseudo signs. Interestingly, there was a significant distinction between baseline and pseudo signs in the second experiment. The result of these experiments reflected the fact that irrelevant visual input affects deaf signers and irrelevant signs were disruptive for them. This situation indicates that the working memory code for

sign language is sign based since assuming sign based WM and speech based WM shares a common phonological substrate.

Kubuş & Hohenberger (2007) investigated both the effect of "phonological similarity" and "irrelevant visual input" on serial recall of word lists in Turkish Sign Language (TİD). 6 lists with 4 dissimilar signs and 6 lists with 4 similar signs were shown to TID signers (see Figure-17). Phonologically similar signs were constructed by a combination of similar movement, location, orientation and handshape (Hildebrandt and Corina 2002) and were highly confusable due to their indistinctiveness (Nairne 2005). After showing these lists, there was a retention phase in three different conditions: baseline, meaningful signs and motor movements. Then, the Deaf participants had to recall the initially presented lists with either similar or dissimilar signs in correct serial order. They recalled dissimilar signs significantly better than similar signs. Moreover, they were more successful at recalling the baseline conditions which show the irrelevant input effect in the other two experimental condition.

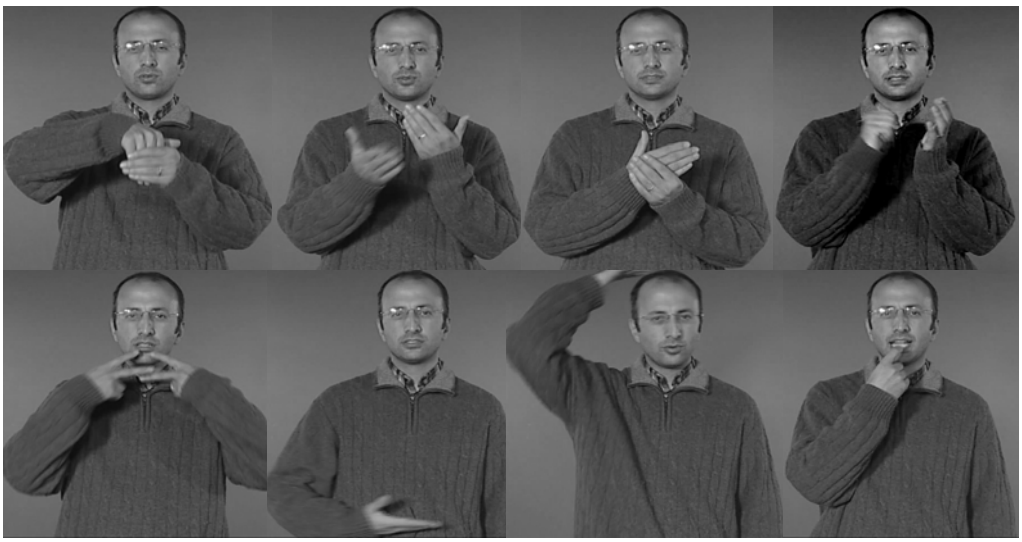


Figure-17 Phonologically similar (upper row) and dissimilar signs (lower row) (Kubus & Hohenberger 2007)

The last piece of evidence, the articulatory suppression effect, is about memory impairment for verbal material when subjects are asked to utter irrelevant items. Murray (1967) explains this effect by the prevention of articulatory rehearsal of "to-be-remembered" words by requiring subjects to repeat a simple word such as "the"

aloud, which damages verbal working memory (as cited in Andrade, 2001). However, Andrade (2001) claims that this effect does not occur for visual material and therefore this effect relates only to the phonological loop mechanism. Besides, it has been found that "articulatory suppression eliminates the phonological similarity effect" (Wilson 2001, p. 45), since the stimuli are then coded non-phonologically. Indeed, articulatory suppression eliminates not only the phonological similarity effect but also the irrelevant speech effect. Wilson (2001) suggests that, unlike the irrelevant speech and the phonological similarity effect, the word length effect is only a phenomenon of articulation, not interfering with phonological processes. Hence, it is argued that Baddeley's (1986) model needs an articulation mechanism for translating the visual material into a phonological code (Wilson, 2001).

In view of the articulatory suppression effect, research on sign languages leads to similar conclusions as Emmorey (2002) pointed out. Wilson and Emmorey (1997) presented meaningless movements during an immediate serial recall task. It was found that the meaningless movements decreased the memory performance of the signers. Hence, from this result we can conclude that the irrelevant sign effect disappeared under articulatory suppression. In the same study they also discovered that in sign language, the phonological similarity effect of signs disappeared under articulatory suppression similar to the vanishing phonological similarity effect under articulatory suppression in spoken language. Moreover, apart from the sign language phonological similarity effect, the sign length effect was eliminated under articulatory suppression, too. Hence, the working memory for sign language is parallel to the working memory for oral language considering the results related to articulatory suppression.

Related with the phonological loop, there is a modality effect for remembering the last item of a list of words (namely, the recency effect). Condrad & Hull (1968) showed that recency had no effect on visually presented word lists (as cited in Emmorey, 2002). Similarly, Wilson (2001, p.46) states that "the modality effect (a large recency effect for speech but not print) and the suffix effect (disruption of the recency effect by an irrelevant final stimulus, for speech but not print)" should

explain why the process of encoding printed stimuli is different from the process of encoding speech. If we look at the modality effect in sign languages, Shand & Klima (1981) detected a recency advantage for Deaf native signers for ordered recall of ASL signs, but not for printed English words. Although both lists were visually presented, signers more easily recalled the last few signs on the ASL lists, but did not show this advantage for the last few English words on the written list. The parallel results for the recency effect in terms of the comparison of the phonological codes and printed forms in spoken and sign languages indicate that for native signers signs are encoded phonologically rather than visuo-spatially.

In contrast to the four main pieces of evidence for the phonological loop and the recency effect, which indicate comparable working memory processes in sign and speech, the discussion of the working memory storage capacity, namely the memory span for spoken vs. sign languages hints at a difference. Thus, Wilson and Emmorey (2005) report that the storage capacity for sign language is not the same as the one for spoken language, notwithstanding the parallelism in the four effects mentioned above. For spoken language, the temporal Working Memory span is restricted to 2 seconds (Baddeley, 1986). Furthermore, Baddeley (1997) demonstrated that it is easier to remember digits if their number does not surpass 7 ± 2 items (magical number 7, see Miller (1956)). Conversely, Boutla, Supalla, Newport & Bavelier (2004, p.997) report that "the average STM capacity when using ASL rather than English is only 5 ± 1 items." They suggest that the difference between the memory spans may be due to a modality effect. Wilson and Emmorey (2005, p.522) explain that "WM for ASL appears to involve less temporally ordered, spatial coding that is unavailable for spoken language". Emmorey (2002, p.233) claims that there is no "correlation between rate of articulation and number of items recalled correctly" comparing the WM for sign and spoken language.

Another disparity between the WM of sign and spoken language is the possible variation in working memory because of the divergence of visually and auditory processing (Emmorey, 2002). When visual stimuli are presented, the coding process differs from that of auditory stimuli. The study of the irrelevant sign effect by Wilson

and Emmorey (1997) showed a difference in memory between the baseline, shape and pseudo sign condition for signers (i.e. signers had difficulties in remembering pseudo signs rather than the others). This result simply shows that baseline and shape were coded visually; however, the pseudo signs were considered as phonological. Therefore, Emmorey (2002) concludes that there is a different phonological buffer for sign language.

Baddeley's (1986) WM model holds that the VSSP and PL are modality specific. However, Emmorey (2002, p.239) states that "…spoken language is a primary linguistic code, and understanding speech is directly affected by visual perception of articulatory gestures (e. g., the "McGurk" effect; McDonald & McGurk, 1978), indicating that…" visual perception "… is integral to speech perception (see also Massaro, 1998). Like speech, sign language is also a primary language code, and static drawings of signs, although not natural language input, transparently represent actual signs— only the movement of the sign is missing from the representation. It may be that stimuli presented in a primary language code, whether auditory or visual, have direct and immediate access to a storage buffer within working memory."

According to Baddeley's (1986) WM model, the phonological loop (PL) processes and stores verbal material, and consists of two parts: a phonological Short-Term Store and a sub-vocal rehearsal loop (SRL) (see Figure-18). First, the phonological store which is holding the phonological data can be used to make up words. Second, the SRL process holds words and sounds in memory through rehearsal. However, how is sign input processed? Signs cannot be coded like speech input because they have also visuo-spatial forms. Similarly, signs are not non-speech input. Indeed, Baddeley (2003, p.830) presents a more developed model of the phonological loop which consists of two systems: "a phonological store, which can hold memory traces for a few seconds before they fade, and an articulatory rehearsal process that is analogous to sub-vocal speech"

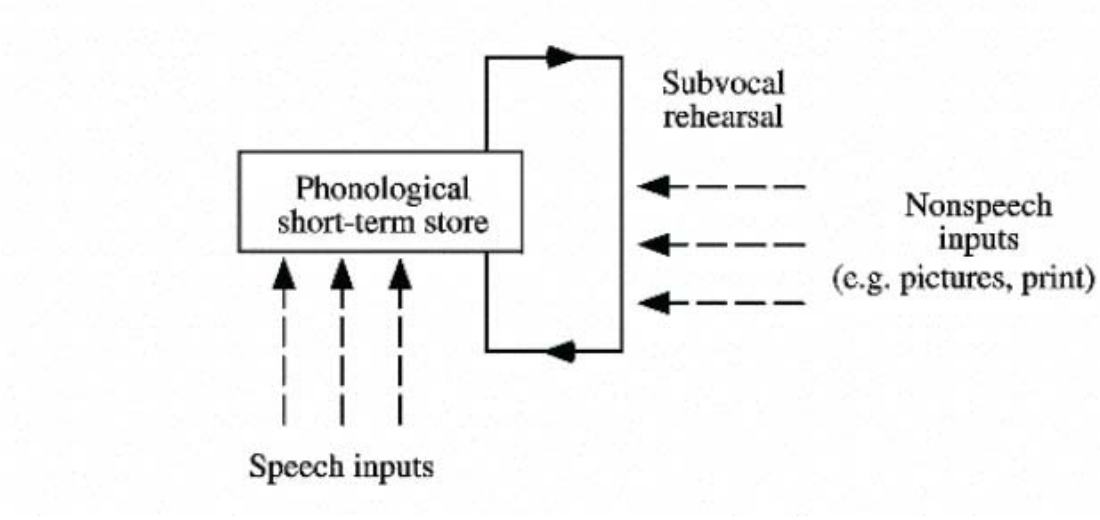


Figure-18 Phonological Buffer model of speech based WM (Gathercole & Baddeley, 1993) (Derived from Emmorey 2002, p.231)

Emmorey (2002) constructed a phonological buffer for sign language (see Figure-19), because there is similarity in the main four effects which constitute evidence for WM in both sign and spoken language. In addition, there are similar findings for the recency effect in spoken and signed languages. Nevertheless, the main differences, the memory span and the irrelevant visual effect in pseudo-signs (but no irrelevant visual effect in printed materials or visual items) forced her to model a "visuo-spatial phonological loop" which is specific for Deaf signers.

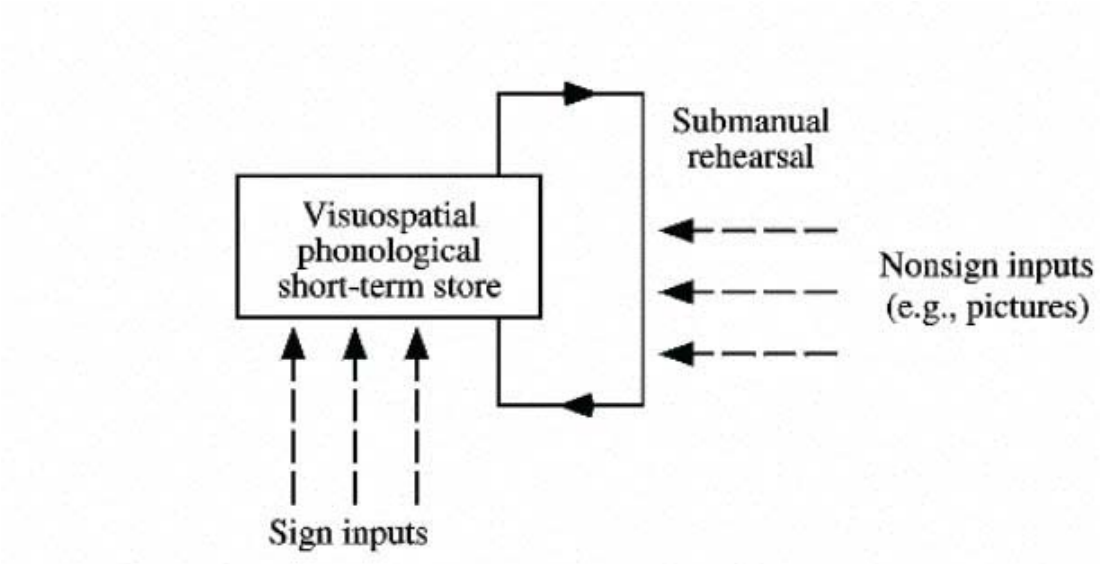


Figure 19 Phonological Loop model of sign based WM (Wilson & Emmorey, 1997) (Derived from Emmorey 2002 p.240)

The fact that memory span is universal among deaf signers (5 ± 1) sits well with this model, because memory span for spoken language is also universal (7 ± 2) among speaking persons. Hence, Emmorey's perspective on working memory is more appropriate for sign language. Within Emmorey's model, the similarities between sign language working memory and spoken language working memory show us that the processes are not related to the modality difference. Rather they depend on the phonology of the languages.

The research on the main pieces of evidence for the existence of a phonological loop for signers shows that sign and spoken language, despite their modality difference, behave similarly, in terms of psycholinguistics. Hence, there must be phonology in sign language, since signers show the main effects of phonological similarity, sign length, irrelevant sign and articulatory suppression.

3.2 Sign Language Phonological Models

In this section, first some models of phonology are presented. Then, comparisons between these models are made.

3.2.1 Phonology Models

Stokoe (1960) described signs as composed of three feature classes simultaneously: these three groups are (1) tabula (position of the sign), (2) designator (hand configuration) and (3) signation (movement) (see also Corina & McBurney 2001). Following Stokoe's model, in order to account for the sequentiality of signs, various models have been developed that attempted to structure the signs into sequential phonemes, like the Move-Hold Model (Liddell 1984), the Hand-Tier Model (Sandler, 1989, Sandler & Lillo-Martin 2006) and the Prosodic Model (Brentari, 1998).

The first attempt to model the phonology of sign language is the Move-Hold Model (Liddell, 1984) in which signs are segmented into Movements and Holds sequentially. The signs consist of Holds (H) and Movements (M) like consonants (C) and vowels (V) in spoken words (Sandler & Lillo-Martin, 2006). However, this model has some weaknesses: the Hold segments are appearing only at the beginning

and the end states (Sandler, 2006) and Minimal pairs sometimes cannot be captured by this model (Brentari, 1998).

In an attempt to overcome the weaknesses of Liddell's model, Sandler developed her Hand-Tier Model (1989), in which signs are sequentially segmented into Movements and Holds. A sign is represented on different tiers, namely on the Hand Tier, the location and movement tier as well as on the place tier, as can be seen in Figure-20. With this model, it is possible to signify different morphological and phonological attributes.

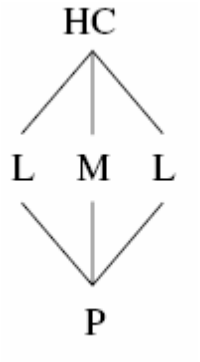


Figure-20 The Hand Tier Model (taken from Sandler & Lillo-Martin, 2006, p.150)

The first tier, Hand Configuration (HC), covers both handshape and hand orientation. The hierarchical level of handshape includes "selection of fingers", and "joints". Hand orientation is considered as a sublevel of handshape, as can be seen in Figure-21 on Hand Configuration (Sandler & Lillo-Martin, 2006,). Returning to Figure-20, "The Hand Tier Model", there are two locations indicating the start and end points of the sign, and a movement indicating the direction and the type of the action. Movement and Location are posited on the second tier of the Hand Tier Model. Location segments specify the sign's place ([head], [trunk], [hand2], [arm]) and settings ([hi], [lo], [ipsilateral], [contralateral], [proximal], [distal] and [contact] (see Figure-22). The Movement segment can be [arc]-[convex], [restrained] and/or [tense] if the movement of the sign is a path.

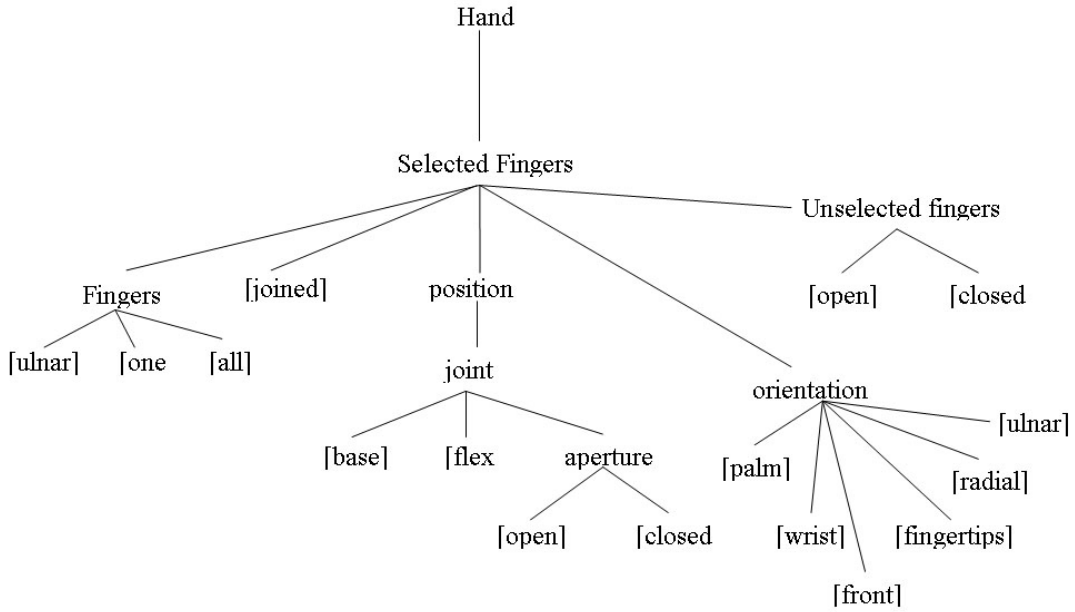


Figure-21 Hand Configuration in the Hand-Tier Model (Sandler and Lillo-Martin 2006 p.163)

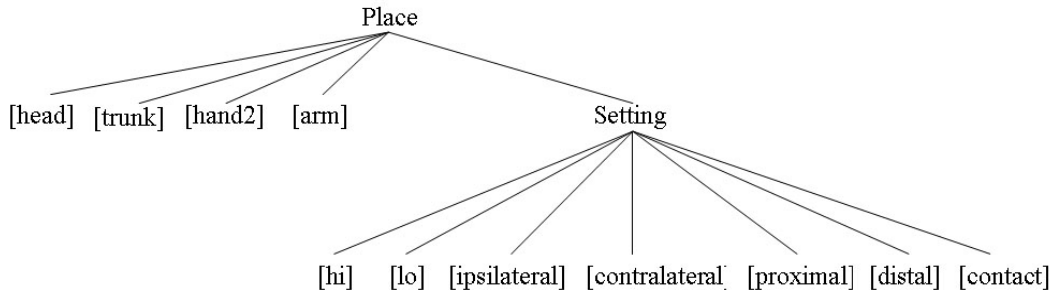


Figure-22 Place in the Hand-Tier Model (Sandler and Lillo-Martin 2006 p.176)

Brentari (1998) subsequently developed a Prosodic Model of Sign Language, which has two main feature classes: Inherent and Prosodic Features (see Figure-23). Like in the Move-Hold model, Inherent Features consist of the unchangeable (static) features of the sign, whereas Prosodic Features cover the dynamic features of the sign. As can be seen in the diagram below IF (Inherent Features) are composed of articulators and place of articulation.

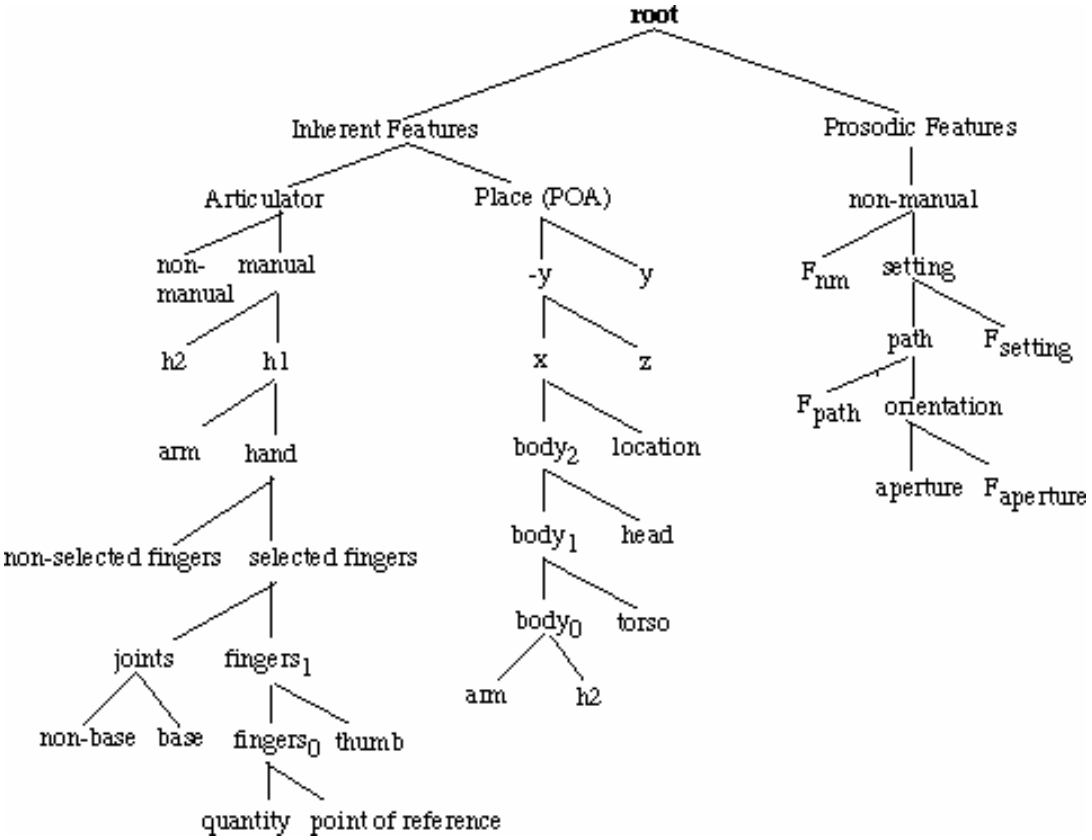


Figure-23 Brentari's Prosodic Model. (Brentari, 1998 p. 26)

Articulators comprise both manual and non-manual components and the manual component includes both hands: the dominant and the non-dominant hand. The subsequent nodes refer to the hand and arm positions and to the hands' selected and non-selected fingers and their properties. Non-selected fingers indicate the fingers that are closed or open in a specific hand-shape but do not belong to the selected ones. The selected fingers are differentiated in terms of the joints being spread or crossed, as well as in the way the thumb and other fingers are included. In the POA part of the IF branch, the signs are considered in the three spatial dimensions (x, y, z) and their location with respect to the body are specified. On the other hand, the PF (Prosodic Features) branch is related to the features covering various movement types.

In the following, I would like to exemplify how a TİD sign, DAYI / UNCLE, is represented differently by the three phonological models. Figure-25 and Figure-26 represent the different phonological modeling of the sign DAYI / UNCLE (Figure-

24). DAYI has the following (informal) phonological properties: (i) handshape: 9-handshape, (ii) hand orientation: the palm is facing to the left, (iii) POA: starting position of the sign: at the chin and the end position of the sign: in a distal and slightly lower position away from the chin; (iv) movement: straight path movement executed at a 90^0 angle and an internal wrist movement.

Figure-24 DAYI/UNCLE sign

Reviewing the sign with the Hand Tier Model (Figure 25) the 9-handshape represents the handshape used in the sign. The start location is making contact with the chin and the end location is a distal location in front of the chin. The movement is a small arc movement.

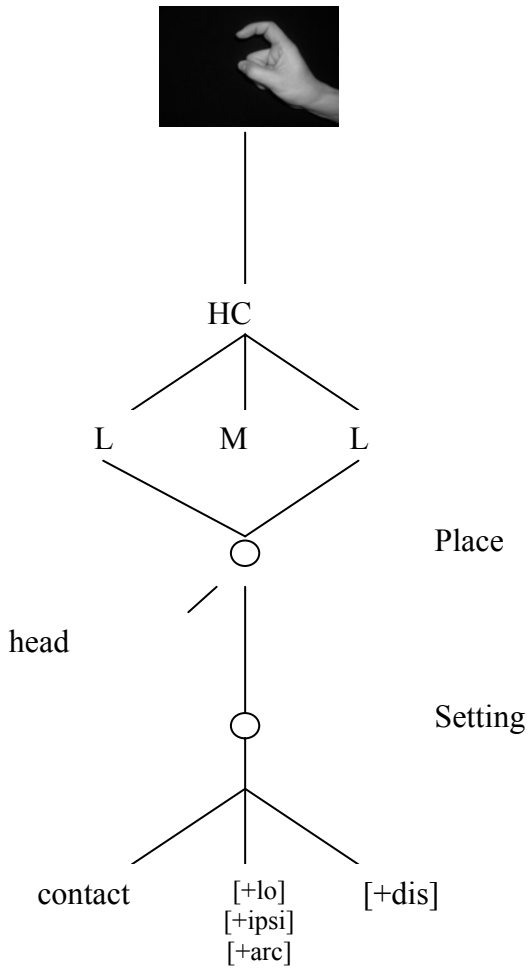


Figure 25 Hand Tier Representation of DAYI (Hand Tier Model)

In the Prosodic Model DAYI has a different structure (Figure 26). In the Inherent Feature's Articulator part DAYI is signed by only the dominant hand (H1). The Feature [4] refers to the orientation of the hand (back of fingers). The selected branch refers to the 9-handshape, i.e. only the index finger is selected and is flexed tensely. The Place of Articulation refers to the locations of the sign. The chin is one of the POA's for which the "head" location can be specified. On the other main branch, the Prosodic Feature "path" shows how the sign is moved between the two specified locations.

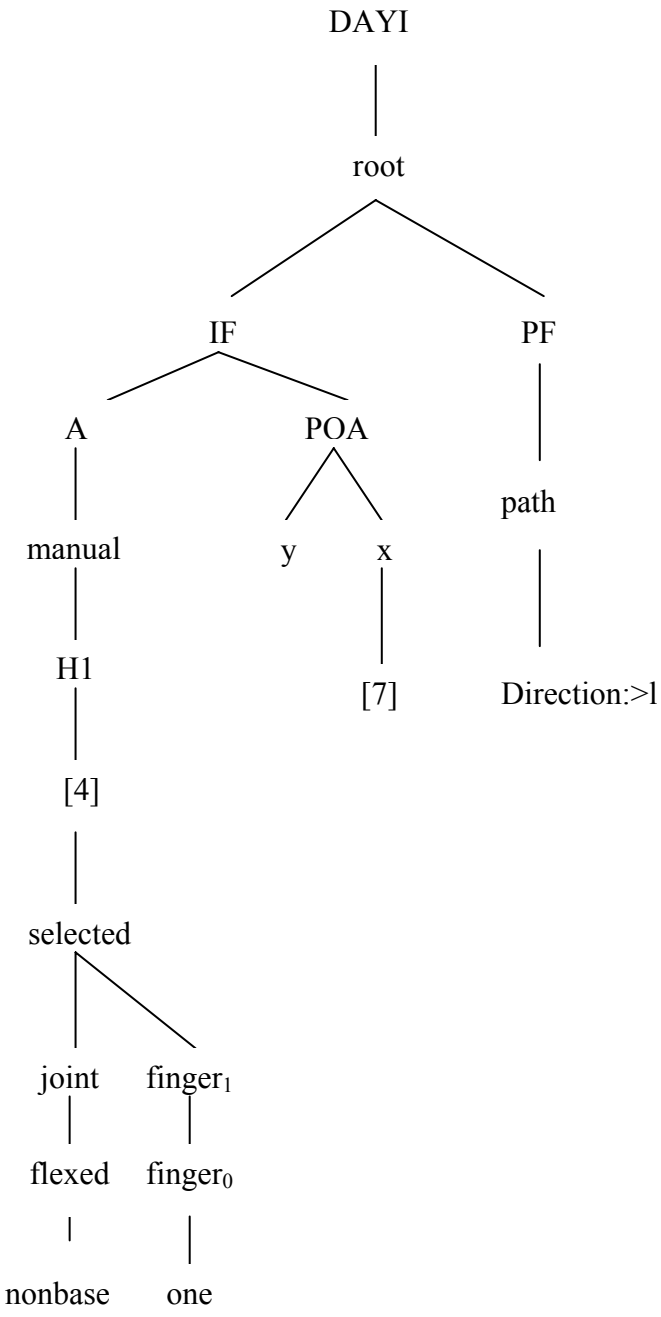


Figure-26 DAYI in Brentari's Prosodic Model for DAYI

3.2.2 Comparison of the Models

Considering all three sign language phonology models mentioned above, the Move-Hold model does not present the simultaneity of signs, rather it is interested in the sequentiality of signs. Sandler & Lillo-Martin (2006, p.128) explain the deficiencies of the Move-Hold Model as follows: "The Move-Hold Model rejects two fundamental properties that had been introduced by Stokoe: the tripartite categorization of major phonological categories as handshape, location, movement; and simultaneity of organization among all categories and their features." However, Sandler (1986) developed the Hand-Tier Model which was derived from the Move-Hold Model but overcame its shortages, as mentioned above.

As one can see even with a hasty look, Sandler's Hand Tier Model and Brentari's Prosodic Model differ in one major feature: Brentari considers the movement features on the Prosodic Feature branch as separate from the other features (i.e. the Inherent Features), whereas Sandler prefers to show how a sign is constructed sequentially in terms of LML. These models also differ in terms of two kinds of movements: (i) internal movements, which are movements without paths, like wiggling and wagging and (ii) path movements. Sandler allocates the internal movement on the Hand Configuration tier, using only L (Location) features in the LML construction and path movements on the Movement branch in the LML construction. In the Prosodic Model, both movements appear within the Prosodic Features, namely as aperture features for internal movements and as setting features for path movements.

3.3 TİD Handshape Inventory

Handshape is highly distinctive and categorical in sign languages, as compared to other phonological features. It is known that inventories comprise up to approximately 30-40 distinctive handshapes. However, each sign language has different types and numbers of handshapes. As Leuninger et al. (2004) found, in slips of the hand, the handshape feature is affected most often, covering half of all phonological slips (see also Table-5). Hohenberger et al. (2002, pp. 126-127) explain this finding along the following lines:

> *The reason why handshape is so frequently involved in slipping may have to do with inventory size and the motoric programs that encode handshape. In DGS the signer has to select the correct handshape from a set of approximately 32 handshapes (Pfau 1997) which may lead to mis-selection to a certain degree. One might conjecture that the bigger the inventory, the more error-prone the process of selection is both because there is higher competition between the members of the set and because the representational space has a higher density.*

The Location feature refers to the hand position of the sign in signing space and/or at the signer's body. Johnston (1989) sub-categorizes the locations into primary and secondary locations. Primary locations are articulated on the body, while secondary locations are signed on the hand.

The Movement feature is fairly complex among the phonological features. It covers hand movements such as [straight], [arc], [circular] and many others. In general, sign languages have two kinds of movements: path movements and internal movements. Internal movements can be either "handshape changes" and/or "orientation changes" (Sandler & Lillo-Martin, 2006, p. 197)

The Hand Orientation feature is the weakest feature among the main phonological features. In general, there are six main orientations: [palm], [wrist], [radial], [ulnar], [fingertips] and [front] (Sandler-Lillo-Martin, 2006). Therefore, handshapes are easy to define and compared to the others. In the following paragraphs, the focus will be primarily on TİD handshapes.

The handshape feature of signs is the most arbitrary and categorical one among the features as well as easy to represent. TİD is known to have 32 handshapes plus one special sign, namely "snapping" (Table-6)

Table-6 TID Handshape Inventory

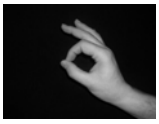
Figures	Hand shape name and examples
	**C-handshape**: AY – MOON / KAHVE – COFFEE / TÜRKİYE –TURKEY /ŞEYTAN – DEVIL
	**L-handshape**: FESTİVAL – FESTIVAL / BAĞIRMAK – SHOUT / ÇARŞAMBA – WEDNESDAY /PERŞEMBE-THURSDAY
	**O-handshape**: YEŞİL –GREEN / GÜMÜŞ – SILVER / LÜTFEN – PLEASE
	**P-handshape**: ALDANMAK – BE MISTAKEN / DOLANDIRICI – FRAUD / BOŞ – EMPTY / KANDIRMAK – CHEAT / KAVGA – FIGHT
	**U-handshape**: BOĞAZ – THROAT (OR BOSPHORUS)
	**ASL A-handshape**: SIKILMAK – TO GET BORED / KIZMAK – TO BE ANGRY
	**ASL A-bar**: BAŞKAN – PRESIDENT / BABA – FATHER / SPOR – SPORT / YARIŞMA – COMPETITION
	**ASL B-handshape**: İSTANBUL / FARE - MOUSE CAM/ AYNA – GLASS/ MIRROR / EŞİT -EQUAL
	**Flat Hand**: DUR –STOP / YARDIM – HELP / DÖVMEK – HİT / ARKADAŞ – FRIEND
	**Hooked Flat Extended**: KENDİ – SELF / ANNE – MOTHER / SAHİP – OWN / DELİ – MAD

Table 6 TID Handshape Inventory (cont.)

Figures	Hand shape name and examples
	**Bent Flat**: DESTEK –SUPPORT / KOMİK – FUNNY / ANNEANNE – GRANNY / PEYNIR – CHEESE
	**ASL C-handshape**: SERVIS – BUS / DURBUN – FIELD GLASSES / BARDAK-GLASS
	**Bent Flat Bar**: YUMUŞAK – SOFT / VIDEO / OY – TO VOTE / DOSYA – FILE
	**ASL Q-handshape**: ŞÜPHE – SUSPICION / DÜDÜK – WHISTLE / İNCE-THİN
	**Middle selected ASL (open 8):** CEZA – PUNISHMENT / GOL – GOAL / VICDAN – CONSCİENCE / AF – FORGIVE
	**ASL O-handshape**: classifiers (PIPE, CYLINDIRIC OBJECTS)
	**Narrowed O**: KİBRİT – MATCHES / İZİN – PERMISION / AVERAJ – AVERAGE / AZ – FEW / İP – STRING
	**Baby-O handshape**: ÇOCUK – CHILD / YEMEK – EAT / PROBLEM / SUÇ – GUILT / YUMURTA – EGG
	**ASL 8-handshape**: ÇIKARMAK / KOVMAK – TAKE OUT/ FIRE –SOMEONE / REJİM – DIET
	**12-handshape /ASL R-handshape**: RAPOR – REPORT / SAAT12 – TIME: 12:00

Table 6 TID Handshape Inventory (cont.)

Figures	Hand shape name and examples
	**Covered T**: YAPMAK – TO DO / TO MAKE / ZOR – DIFFICULT-HARD / TEKLİF – OFFER
	**Horn / Combined ASL I and H**: GEZMEK – TO WANDER / YATAK – BED
	**Little finger / ASL (I-handshape):** MİSAFİR – GUEST / KÖTÜ– BAD/ TORPİL – BACKER/SUPPORTER / SALI – TUESDAY
	**Little + Thumb / ASL (Y-handshape):** AYNI – SAME / AĞIR – HEAVY / OYUN – GAME / UÇAK - AİRPLANE
	**ASL 3-handshape**: ALEVİ – (partisan of the caliph Ali.)/ ZİRAAT – AGRICULTURE
	**4-flexed**: AİLE – FAMILY / HAPIS -PRISON
	**I/1-handshape**: EMİR – ORDER / KIRMIZI – RED / HAYIR – NO / ŞANS – LUCK / PAZAR – SUNDAY
	**V/2-handshape**: MODA – FASHION / TİYATRO – THEATRE / NORMAL – NORMAL / BAKMAK – LOOK/ SEE / POLİS - POLICE
	**5-handshape**: VAR – TO EXIST / İSTEMEK – WANT / SİYAH – BLACK /BİLMEK – KNOW

Table 6 TID Handshape Inventory (cont.)

Figures	Hand shape name and examples
	**7-handshape / V-closed**: KIZ – GIRL / CUMA - FRIDAY / YILDIZ – STAR / ÇABUK – QUICK-HASTY
	**8-handshape / V-hooked**: OTURMAK – SIT / MAVİ – BLUE / AŞK - LOVE
	**9-handshape / ASL X-handshape**: YIL – YEAR / YANLIŞ – WRONG / DAYI – UNCLE / KRAL – KING / DEDİKODU - GOSSIP
	**Finger Snapping**: UNUTMAK – FORGET /OYUN OYNAMAK – DANCE / KAÇMAK – RUN AWAY / HIZLI (ARABA) – FAST (CAR)

3.4 Allophones

Allophones are the phonetic variants of phonemes in spoken languages e.g. dental /t/ vs. Retroflex [□]/ [□□], which is not distinctive in English but in Hindi (Werker & Tees, 1984). Such allophones can also be found among TİD phonemes. For example, even though the F-handshape (TİD O-handshape) and different types of the O-handshape observed in TİD are distinctive handshapes in some sign languages (DGS and ASL), it seems to be indistinctive in TİD (see Figure-27).

Figure -27 Allophones: ASL F, various forms of 0/O

The ASL-A handshape and the ASL-S handshape are also allophones in Turkish Sign Language. TİD native signers do not differentiate between the different thumb positions as in the ASL-A and -S handshape. (See Figure-28)

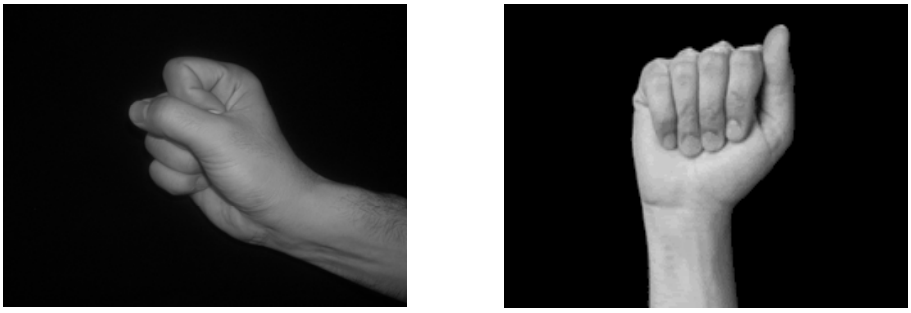


Figure-28 Allophones: ASL A and ASL S

The ASL-G handshape can be considered a variant of index finger (1/I handshape in TİD). The index finger in G is not fully opened as in I-handshape (Figure-29).Turkish native signer cannot discriminate between ASL-G handshape and I-handshape, hence the ASL-G handshape is not found in the TİD handshape inventory.

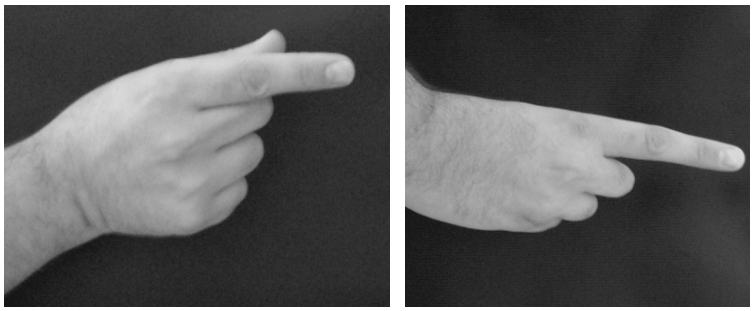


Figure 29 Phonetic difference between G vs. TID 1-handshape

3.5 Handshapes not found in TİD

It is known that languages differ in terms of the elements in their phoneme inventories. Languages differ both in terms of how many and which phonemes they have. English has 46 phonemes, whereas the Hawaiian language has much less, i.e., 13 phonemes. As for distinctive phonemes in their inventories, while spoken English has both /l/ and /r/ phonemes; Japanese has only the /r/ phoneme. Therefore, Japanese native speakers may not differentiate between /l/ and /r/. A similar phenomenon is also found in sign languages, for example, the ASL T-handshape, the 8-handshape and the E-handshape are found in the American Sign Language

phoneme inventory, whereas the middle finger and ring finger handshapes are used in Taiwan Sign Language (Johnston & Schembri, 2007); however none of these handshapes are found in Turkish Sign Language (see Figure-30).

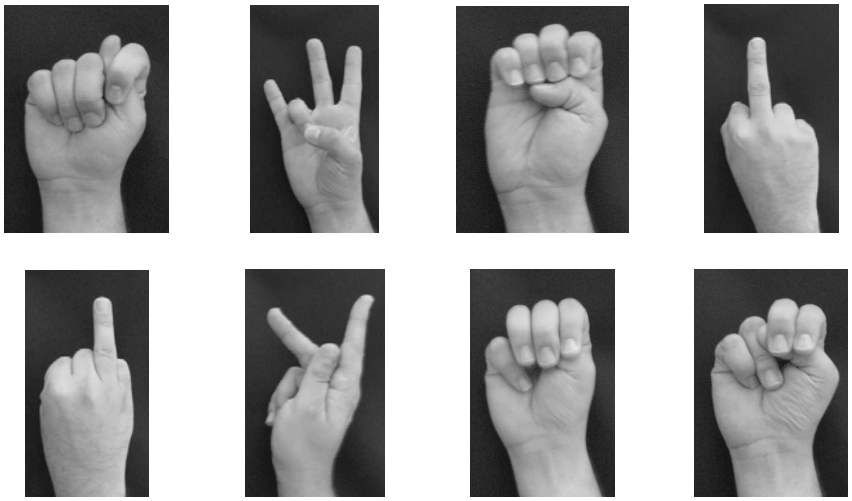


Figure-30 Handshapes that are absent in TİD: ASL: T, 8, E, Taiwanese Sign Language: middle finger, ring finger handshape (see Johnston & Schembri, 2007, p.101) as well as ASL K, M, N handshapes

3.6 One- and Two-handed of signs

There are three types of signs in terms of handedness: one-handed, two-handed signs and compounds consisting of one one-handed and one two-handed sign (Johnston & Schembri, 2007). Two-handed signs vary in terms of hand dominance of the hand and the handshapes of the two hands:

(i) *Type 1*: Both hands have the same handshape, the same movement and generally either the same location or a symmetric location. (FESTIVAL (Figure-31a) BERABER/TOGETHER, AYNI/SAME)

(ii)*Type 2*: Even though the hands have the same handshape, one hand is dominant and other is non-dominant. (DÜĞÜN/WEDDING (Figure-31-b) TEKRAR/AGAIN, DOĞRU/RIGHT, ÇABUK/QUICK) and

(iii) *Type 3*: the hands have different handshapes, one is dominant and one is non-dominant (PORTAKAL/ORANGE, TAVUK/CHICKEN (Figure-32)) In these signs

the non-dominant hand acts as articulator and its handshape must be taken from the set of unmarked handshapes.

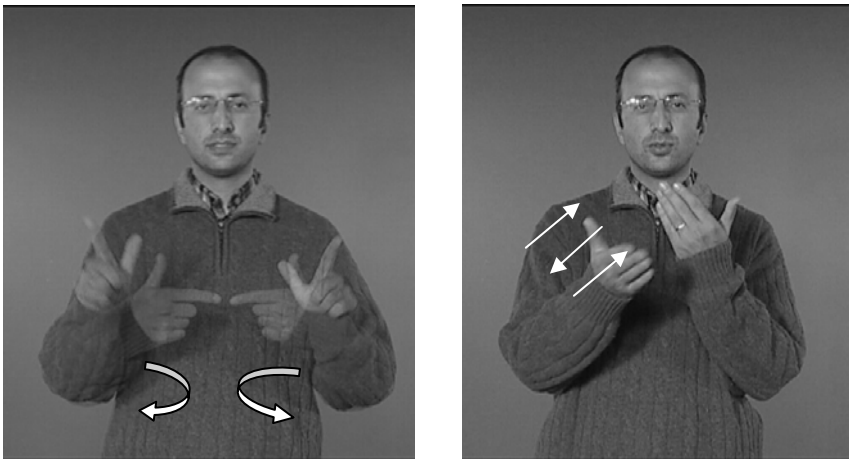


Figure-31 (a) Type 1 FESTIVAL (b) Type 2 DÜĞÜN/WEDDING

Figure-32 Type 3 TAVUK/CHICKEN

In type 1 two-handed signs, the non-dominant hand copies the movement of the dominant hand, as in the TİD sign FESTIVAL. These signs are called "symmetric signs". However, in other types of two-handed signs, one hand is dominant and the other is non-dominant. Type-1 and Type-3 two-handed signs obey either one of the following two conditions: the Dominance or the Symmetry Condition (Battison, 1978)

> ***The Symmetry Condition*** *states that (a) if both hands of a sign move independently during their articulation, then (b) both hands must be specified for the same handshape, the same movement (whether*

performed simultaneously or in alternation), and the specifications for orientation must be either symmetrical or identical.

The Dominance Condition *states that (a) if the hands of a two-handed sign do not share the same specification for handshape (i.e., they are different), then (b) one hand must be passive while the active hand articulates the movement and (c) the specification of the passive handshape is restricted to the small set of unmarked handshapes: A, S, B, G, C, O.*

However, Type-2 signs do neither obey the symmetry nor the dominance condition. Therefore, Sandler & Lillo-Martin (2006, p.184) revised the rule as follows:

Revised Dominance Condition*: In signs in which h2 is passive (i.e., does not move),. h2 must either be unspecified underlyingly, or it must be characterized by an unmarked handshape.*

In addition, in the comparative study of Eccarius & Brentari (2007) on two-handed classifier in three sign languages: ASL, HKSL (Hong Kong Sign Language) and DSGS (Swiss German Sign Language), nearly half of the two-handed classifier constructions do not obey Battison's rule. These signs are generally type-3 signs. Therefore, following up on Battison's account of two-handed signs, Eccarius & Brentari (2007, p.1182) refine the original conditions in terms of featural complexity according to Classifier Constructions:

Featural Dominance *(or ''Restrict Complexity''): The amount of featural complexity (i.e., complexity in the selected fingers or joints) possible in the construction as a whole is limited to two marked structures, and the complexity on the passive hand is limited to one.*

Featural Symmetry *(or ''Maximize Symmetry''): The amount of featural complexity in the construction is reduced by making the two hands identical in their selected finger combinations, joint specifications, or both.*

Moreover, Eccarius and Brentari (2007) point out that in classifier constructions the second hand adds a "morphological feature" to the sign and therefore the morphological complexity is increased. These conditions consider the reduction of complexity in two-handed signs. These conditions will be discussed in more detail

inthe morphology chapter 4.2.3 on reciprocals. The handshapes that are frequently used with the non-dominant hand (A, S, B (flat hand), G, C and O in ASL), as mentioned in Battison's Dominance Condition, are also called "unmarked" handshapes in the linguistic literature (see Figure-33). Johnston (1998, as cited in Johnston and Schembri 2007 p.106) reports that these unmarked handshapes are used mainly, i.e. in 60%, in the signs of AUSLAN (Australian Sign Language).

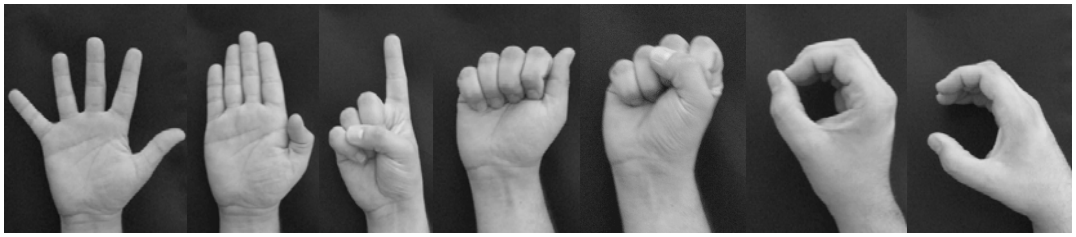


Figure-33 Unmarked handshapes in ASL

However, the set of unmarked handshape is slightly different in TİD, according to my corpus study (see Table-7): unmarked handshapes in TİD may comprise the Flat hand (ASL B-shape), the Index-handshape, Baby-O handshape, ASL S-handshape and O-handshape (ASL F-handshape) and the 5-handshape (extended fingers).

Table-7 The frequency and percentage of the main handshapes in the TİD Corpus

Handshapes	Count	Percentage
FLATHAND	243	23,68 %
INDEX	187	18,23 %
BABY O-SHAPE	96	9,36 %
ASL S SHAPE / ASL-A SHAPE	72	7,02 %
O SHAPE	64	6,24 %
5 SHAPE	54	5,26 %
ASL A-BAR	52	5,07 %
Others	258	25,15 %
TOTAL	1026	100 %

However, whether the 5-handshape (Extended fingers) and the ASL A-Bar handshapes are unmarked or not is not clear because the small TİD-Corpus comprises only 1026 handshapes and the bigger the corpus the clearer the unmarked

handshapes. Assuming that the 5-handshape and the A-bar handshape are also unmarked handshapes, B, G, baby O, S, O (ASL F), 5 and A-bar can be identified as unmarked handshapes in TİD (see Figure-34).

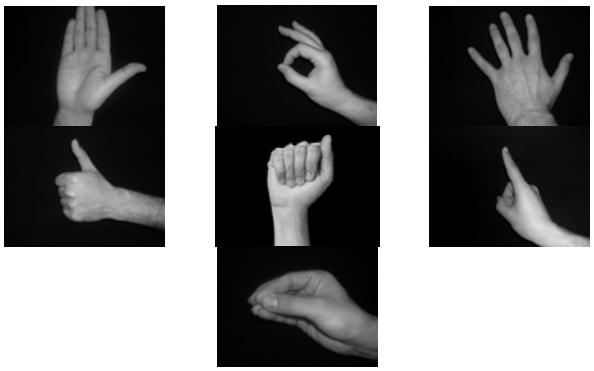


Figure-34 The most frequent handshapes in the small TİD corpus

Since ASL-S and A-handshape are considered as allophones in TİD, ASL-A and S are combined together in the unmarked handshape ASL-A or simply "fist". The fist handshape is also less marked than the A-bar handshape. Moreover, the flat hand [joined], the baby O handshape [closed] and the 5-handshape are similar.[1] For similar reasons, Sandler & Lillo-Martin (2006) reduce the set of unmarked handshapes to S, 5, 1 and O. Hence, we can narrow down the set of unmarked handshapes in TİD to Fist, 5, Index and TİD O-shape (see Figure-35).

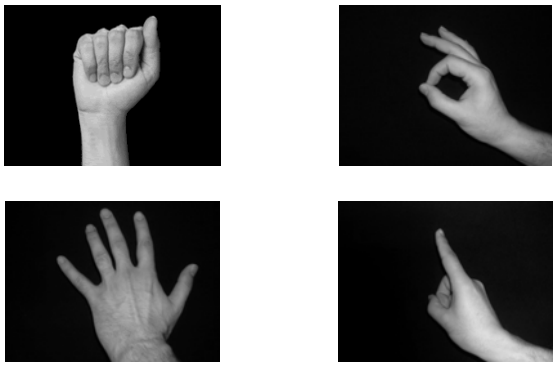


Figure-35 Narrow set of unmarked handshapes in TİD

[1] Extended flat hand and flat hand are differed in terms of aperture: [open] or [close]. The Extended flat hand and Baby-O handshape differs in terms of joints. Hence these handshapes are generalized as extended flat hand. Baby-O shape and TİD O-shape have also commonalities.

3.6 The TİD Manual Alphabet

Sign Language manual alphabets are visual forms of alphabets of spoken languages. Since they are obtained from spoken languages, fingerspelling may not be thought of as a proper part of sign language phonology. However, Sutton-Spence (2006, pp.468) claims that *"...the phonological patterning of sign languages may affect the ultimate form of a finger- spelled word..."*

Sign language manual alphabets can be either one-handed or two-handed. Like BSL (British Sign Language), TİD has a two-handed manual alphabet which is fairly different from ASL and DGS having a one-handed manual alphabet. The TİD manual alphabet has 29 manual letter signs which are derived from the Turkish Alphabet (see Figure-36). Some letter signs such as Q, X and W, which are used less frequently by TİD native signers, are not considered in the following TİD manual alphabet:

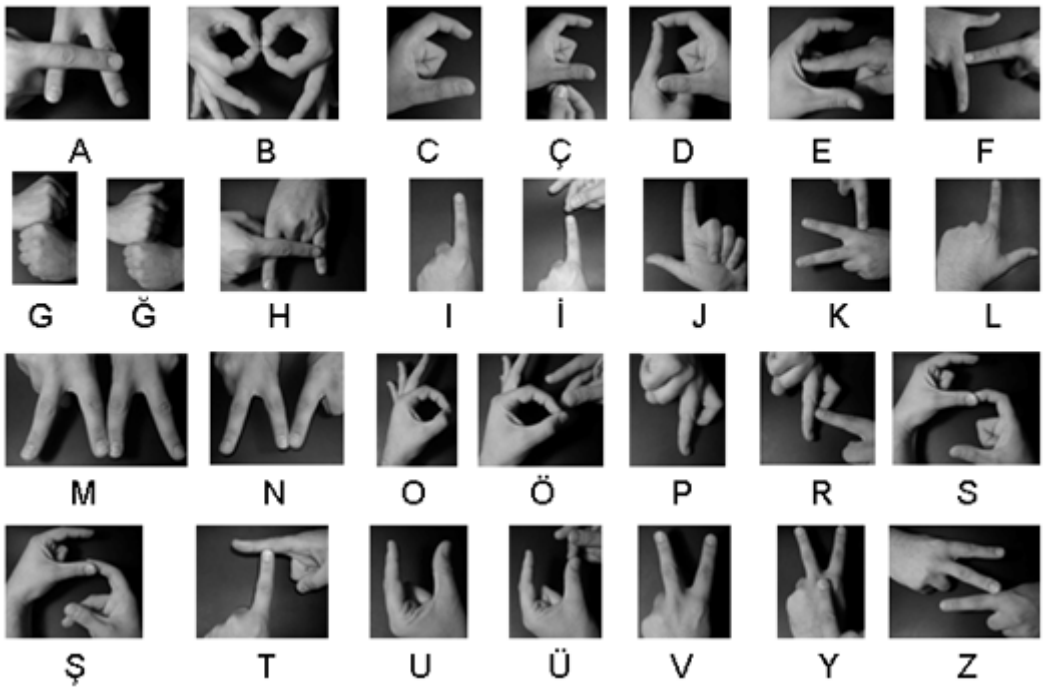


Figure-36 The X Manual Alphabet of TİD.

The handshape inventory of sign languages with a one-handed manual alphabet such as ASL and DGS has great similarities with the manual alphabet signs. The one-handed manual alphabet mainly overlaps with the handshape inventory, whereas two-handed alphabets only overlap with the handshape inventory when the alphabet has also one-handed letter signs. Even though some letters (i.e. C, I, L, O, P, V) are one-handed manual alphabet signs and also handshapes in TİD, the other manual alphabet signs are not observed in the TİD handshape inventory. Sutton-Spence (2006, p.470) comments on two-handed alphabets as follows: "… Finger-spelling violates essential rules of sign language phonology, primarily because natural signs rarely use more than two handshapes, whereas the fingerspelled sign may be made up of several different handshapes..."

It is questionable whether these two-handed manual alphabet signs contain handshapes or not, for example whether the "A" letter is composed of a V-and an I-handshape or not. Most two-handed letters do not conform to constraints on two-handed signs such as the "Symmetry Condition" and the "Dominance Condition" (Battison 1978); therefore, they are not usable as signs. Most letters do not obey the symmetry condition, and then unmarked handshapes are restricted for the non-dominant hand. For instance, in the "A" letter which can be classified as a Type-3 sign, the non-dominant hand has the V-handshape while the dominant hand has the I-handshape. This condition indicates that this letter sign is an iconic form which may not be counted as a sign constructed from handshapes in terms of phonemes.

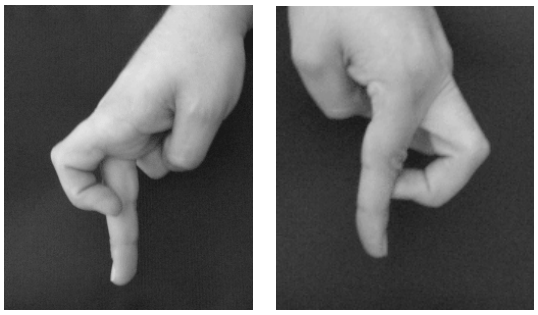


Figure-37 (a) The P-handshape in the TİD handshape inventory (signed with the dominant hand) and (b) the "P" letter in the TİD Manual Alphabet (generally signed with the non-dominant hand)

Moreover, the P-handshape in the handshape inventory and the “P” letter in the manual alphabet differ in interesting ways (see Figure-37a,b). It is possible to relate the “P” letter to an existing handshape, namely the one with the extended middle finger. This handshape can be seen in signs that use the P-handshape (i.e. KAVGA-ETMEK / FIGHT). The middle finger is longer; therefore it is phonetically more leading. However, most native TİD signers generally prefer to sign the “P” letter by letting the middle finger contact the index finger (see Figure-37b). Overall, in the TİD manual alphabet, the index finger is much more frequently involved in letter signs than the middle finger. This may be the reason why also in the “P” letter it is the index finger and not the middle finger that is acted upon. . Furthermore, in the “P” letter the middle finger may have been chosen for reasons of iconicity. If the middle finger bends, the “P” looks somewhat rounder and more visually similar to the letter “P” than if the index finger bends. Alternatively, the “P” letter is not considered as related to the “P” handshape from the handshape inventory at all, which might indicate that letters are not phonological at all. This, however, is rather unlikely.

Surprisingly, both one-handed and-two handed letter signs are surprisingly all articulated with the non-dominant hand as the base hand. TİD seems to make a generalization across one-handed and two-handed signs in that they are all non-dominant in the letter alphabet. This condition is also found in the BSL two-handed manual alphabet except for the letter “C”.

If a letter sign is used as a TİD handshape, it must conform to phonological well-formedness conditions, i.e. a TİD sign with a one-handed letter handshape must be signed with the dominant hand. This is exactly the case with “P”: the phonological “P” is signed with the dominant hand, whereas the letter “P” is signed with the non-dominant hand. Another piece of evidence that the manual alphabet signs are not phonemes is that this alphabet is visually modeled from the Turkish Alphabet, depicting the form/outline of the letters of the Roman alphabet. As such, it is quite “far away” from phonologically well-formed signs.

In spoken languages, the alphabet has a long history and can be considered as the nucleus of written language. However, we may not say the same for sign languages, because, as Sutton-Spence (2006) points out, the manual alphabets for sign language have been constructed for raising the literacy of deaf signers in the 1600s, and they are fairly artificial. However, this does not mean that letter signs are not related to phonological parameters at all, because there are various signs using letter signs as in initialized signs, i.e., borrowings of fingerspelling which have been developed throughout the history. In the following, I will discuss how some TİD letter signs undergo phonological processes.

3.6 Phonological processes related to the manual alphabet

There are various kinds of phonological processes in which letters of such a two-handed alphabet engage in, similar to a one-handed alphabet whose handshapes are frequently used for initialization. For example, there are "epenthetic", "path", "arc", and hand-internal movements which are added to TİD letter signs to make them conform to lexical sign stems. The movement of the dominant hand or contact of the dominant hand with the non-dominant hand satisfies this basic requirement. "Epenthetic movements": e.g., TEŞEKKÜRLER- THANKS with the "T" letter; FEDERASYON-FEDERATION with the "F" letter; "Path movements": e.g., TAKSI-TAXI with the "T" letter; DOLMUS-MINIBUS with the "D" letter, and SORU-QUESTION with the "S" letter.

Also, a default way for producing initialized sign names is to add a wrist movement does to the respective letter sign. This phenomenon, however, is only observed with one-handed letters, e.g., with "O" for ORTAOKUL –SECONDARY SCHOOL. L letter, which is one of the one-handed letter, has three different initializations: "Wrist movement": LOKAL-ASSOCIATION, "Path movements": LAZIM-NEED; "Arc" movement: LISE-HIGH SCHOOL.

Another interesting phonological process in the manual alphabet is observed with SORU-CEVAP / QUESTION-ANSWER. Analyzing separately SORU and CEVAP, the sign SORU is made by adding path movement to the S-letter whereas the sign CEVAP is made by adding a path movement to the one-handed C-letter. If the sign

pair SORU-CEVAP (ASK-ANSWER) is repeated several times, the S handshape of SORU/ASK becomes separated into two C handshapes which move back and forth alternately.

3.7. Finger snapping

Finger snapping is observed in both the TİD manual alphabet (for the vowels i, ö, ü and for the consonants ç, ş) and in some signs like HIZLI-GITMEK / GOING-FAST, UNUTMAK-FORGET. In the latter, path movements are added to the finger snapping, which are an example of internal movements. While the cedillas and dots on the umlaut vowels in the above-mentioned letters are shown with finger snapping in TİD, in DGS umlauts (ä, ö, ü) show a different movement, namely moving down and up again. This is because in DGS all letter signs are one-handed. The finger snapping is iconic in that it makes prominent through the clicking/snapping the single or the two dot(s) above or the "cedilla" below the letter. Phonologically, this counts as a "hand internal movement" which renders those letters sign-like. They can be compared to "clicks" or "snaps" which are rarely seen in spoken languages.

CHAPTER 4

TURKISH SIGN LANGUAGE MORPHOLOGY

Morphology is concerned with the regular, minimal, meaning bearing units in language – morphemes – which are words or parts of words. Morphemes can effect changes in meaning by signaling the creation of a new word or a change in word class (derivation), or by signaling grammatical information such as case, number, person, aspect, tense, etc., (inflection) (Johnston, 2006). Sign Languages have many morphological processes and constructions, including inflectional and derivational morphological processes as well as classifier constructions (Sandler and Lillo-Martin, 2006).

In this part, complex sign forms and morphemes in TİD will be presented and analyzed. First of all, I present the psycholinguistic evidences for sign language morphology and subsequently I explain the use of signing space for morphological processes and personal pronouns with their special areas. Then inflectional morphology will be discussed and some examples will be presented. As for inflectional morphology, different types of verbs, plural forms of signs, reciprocal TİD verbs, and aspect will be presented. Thereafter, inflectional morphology will be introduced. Compounding, fused signs, and numerical incorporation will be discussed.

4.1 Psycholinguistic Evidence for Sign Language Morphology

There exist some psycholinguistic studies on sign language morphology. One of the pieces of evidence for sign language morphology comes from morphological priming experiments. Another one comes from repetition priming experiments in sign language which usually require lexical decisions with primed and non-primed signs. Another evidence for sign language morphology is morphological slips of the hands. Finally, there is evidence from the acquisition of morphology of deaf children.

As one of the earliest studies on morphology, Poizner, Newkirk, Bellugi and Klima (1981, as cited in Emmorey, 2003) conducted an experiment on serial recall of signs with deaf participants. These signs covered various morphologically complex signs. They found some morphological errors like switching morphemes or deleting morphemes when attempting to recall the signs serially. From these errors, Poizner et al. (1981) concluded that morphemes in sign language exist and that they are inflected on the basis of the primary lexical signs. However, it was questionable whether morphemes could be shown in all lexical signs, since mostly sign languages have simultaneous morphemes. It is hard to separate the signs into morphemes since they are not constructed serially as most often in spoken languages. Are the inflected signs considered as consisting of a base form plus various inflectional morphemes or are they constructed as new inflected signs which are listed separately in the lexicon? In order to better understand the morphological complexity of the signs, Emmorey (1991) conducted a repetition priming experiment.

Emmorey (1991) investigated the morphological organization and recognition of ASL signs, using morphological repetition priming. She conducted two different experiments. The first experiment (26 deaf – 14 native deaf subjects and 12 late learners) covers prime- target verb pairs, non-sign priming, filler signs and non-filler signs. Prime-target verb pairs are usually composed of two different structures of the verbs (i.e. one is the verb in its base form while the other one is the verb inflected with an agreement morpheme (dual, reciprocal and multiple) or aspect (habitual or continual)). Target verbs were usually the base form of the verb. However, if the

verb was inflected with agreement then this verb was not used for aspect inflection (i.e. verbs were inflected for either aspect or agreement but not both). The second experiment differed from the first experiment only in that the verbs are inflected with both aspect and agreement. Non-signs are signs which are not lexical but have been varied by changing one or two phonological parameters in order to understand whether the priming effect is lexical, phonological, or morphological. According to these experiments, verbs inflected with aspect morphemes facilitate, that is, prime, the base forms of the verb, whereas verbs with agreement morphemes do not. Non-signs were not significant in terms of priming. Hence, this result indicated that aspect morphemes can be considered strong morphemes that are processed and stored in the mental lexicon in a decomposed way.

According to the study of slips of hands in German Sign Language (DGS) of Hohenberger et al. (2002), there also exist morphological slips; however, they were not prominent compared to phonological or lexical slips of the hand: Morphological slips in DGS were not as frequent as morphological slips in spoken German. However, they did not believe that sign languages were of less morphological complexity. They suggested that this asymmetry was due to the lack of "stranding errors" which happen when two root morphemes are exchanged between two signs. If root morphemes and inflectional or derivational morphemes are organized simultaneously, however, they can not be readily decomposed.

Newkirk, Klima, Pedersen and Bellugi (1980, as cited in Emmorey 2003) did not observe this type of errors, either. This result indicates that sign language morphology is mostly simultaneous and/or fusional. As an example for the organization of morphemes in sign language, Brentari (1998, p.21) showed nine morphemes within a sign: "*two, hunched, upright-beings, facing forward, go forward, carefully, side-by-side, from point a, to point b*". Similarly, Leuninger et al. (2004, p.21) showed six morphemes within a sign: "*Animate beings approaching each other slowly, reluctantly, hostile*." In order to better understand whether morphemes would detach form their base form or not, Hohenberger and

Waleschkowski (2005) conducted an additional experiment to. In this experiment, a sign list with a pair of two elements (one of which was a base form and the other one was inflected) was given to the participants (N=16 deaf German signers). Subjects should learn this list by heart. Then, in the retention interval they saw a priming list which primed for a morpheme exchange in the complex sign. After having seen these primes, subjects had to either repeat the critical last elements or exchange them. They were, however, not told whether to exchange the whole word, the lexical content morpheme or the inflectional morpheme. Morphemes like aspect, reduplication (plural), agreement, and negation were involved in the study. Among these morphemes, the deaf participants made error mostly with α-negation and other serial morphemes. In α-negation an α-like movement of the hand is fused onto the base modal sign, as in MUSS (must) vs. MUSS-α-neg (need-not). What happened in morphological errors involving this morpheme was that only the α-negation between two modal verbs, one affirmative, one negative, was exchanged (suffix-exchange) but neither the whole word nor the modal verb. This result indicates that serial morphemes have a tendency to produce a slip of the hand in such a "repeat-reverse" paradigm, whereas simultaneous one do not.

The process of acquiring morphology in deaf children also gives a clue about the morpheme structure of sign language. Supalla (1982) investigated the acquisition of verbs of motion in ASL. Verbs of motion are morphologically complex including path, manner, direction, and location. He discovered that young deaf children produce the morphemes for manner of motion and path sequentially at early ages, which indicates that children can understand the complex morphological structure of those motion verbs, but tend do produce them separately rather than simultaneously. The production of the children often lacks complex fused movements like jumping up, bouncing up-and-down. However, before the age of 5 years, the children can produce the simple verbs of motion as well as two morphemes separately; after the age of 5 years, they can also produce the signs with complex morphemes simultaneously.

4.2 Signing Space

Signers sign in a specific area where their hands can reach at most (see Figure-38). In a quarter-spherical area, signs have various locations including the head, above the head, the body and the empty space in front of the body and the two sides of the body.

Figure-38 Signing Space (Pfau and Steinbach 2006 p.27)

Sign Languages also have personal pronouns, like spoken languages. Since "signs are articulated in space and the specified location are themselves components of sign formation" (Sandler and Lillo-Martin, 2006 p.24), sign language indicates pronoun through locating them in signing space. Thus, the first person reference is indicated by the pronominal sign being directed toward the signer's own chest. Likewise, the second person reference is indicated by the pronominal sign being directed toward a point in front of the addressee's chest. Except for the first person and the second person pronoun any point can be pointed to as indicating third person. (Figure-39) In order to establish agreement in sign language, the agreement relation between subject and object is generally conveyed by these pronominal references. However, Mathur and Rathmann (2005, p. 236) state that the distinction between the second person and third person lies on the "pragmatic level" (i.e. between them grammatical distinction is not observed (Meier, 1990)); hence sign languages are considered to have "first person" and "non-first person" pronouns.

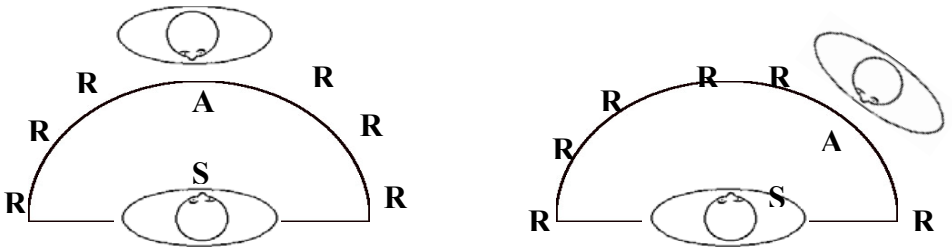


Figure-39 Signer (S), Addressee (A) and Referee areas (R) in signing space.

Traditionally, personal pronouns are distinguished from possessive and reflexive pronouns. TİD does not seem to have different forms of personal and possessive pronouns. The first singular personal pronoun is BEN (I), in which the signer refers to him/herself with the index finger, as in indexing. For a possessive pronoun, TİD signers use the same form as for the personal pronoun, e.g. they sign BEN ARABA (‘my car’). Moreover, TİD does have V-handshaped possessive pronouns as in BU ARABA BENIMKİ (‘this car is mine.’) (see also Sevinc, 2006). It should be noted, however, that these forms are not adjectival (as in my, your, his, her, its …), rather they behave like nominals (like mine, yours, his, hers, its…). That is, the function of the former is that of an attribute while the function of the latter is that of a predicate.

According to Zeshan (2002, p.265), TİD may not have reflexive pronouns, instead it has the sign “KENDİ” which emphasizes that “*the action is done by the agent, not by others*” (Sevinc, 2006 p. 16).

4.3 Inflectional morphology

Some phenomena related to inflectional morphology such as different verb types, rules for adding adverbial, numerical, or distributive morphemes to root signs also exist in TİD. TİD also marks plural forms on nouns and adjectives, even though such forms are not observed commonly. TİD verbs can also be reciprocally marked and it has a rich and intricate system of reciprocal verbs. Furthermore, TİD seems to have two different aspects namely “past” and “progressive” or, in different terminology

"completive" and "continuative", has different forms of negation and negative morphemes. In this chapter, inflectional morphology will be discussed.

4.3.1 Verb types and Pluralization

Padden (1988) classifies the verbs in ASL into three groups: plain, spatial, and agreement verbs (see Figure-40 and also Table-8). Plain verbs are not marked morphologically for subject or object agreement. Spatial verbs and agreement verbs both use signing space. Agreement verbs also categorized into two groups: single agreement verbs which agree only with the object and double agreement verbs which agree with the subject and object. Double agreement verbs are also come in two kinds: forward agreement and backward agreement verbs. Forward agreement verbs start from the subject and end at the object, whereas backward agreement verbs start from objects, and end at subjects.

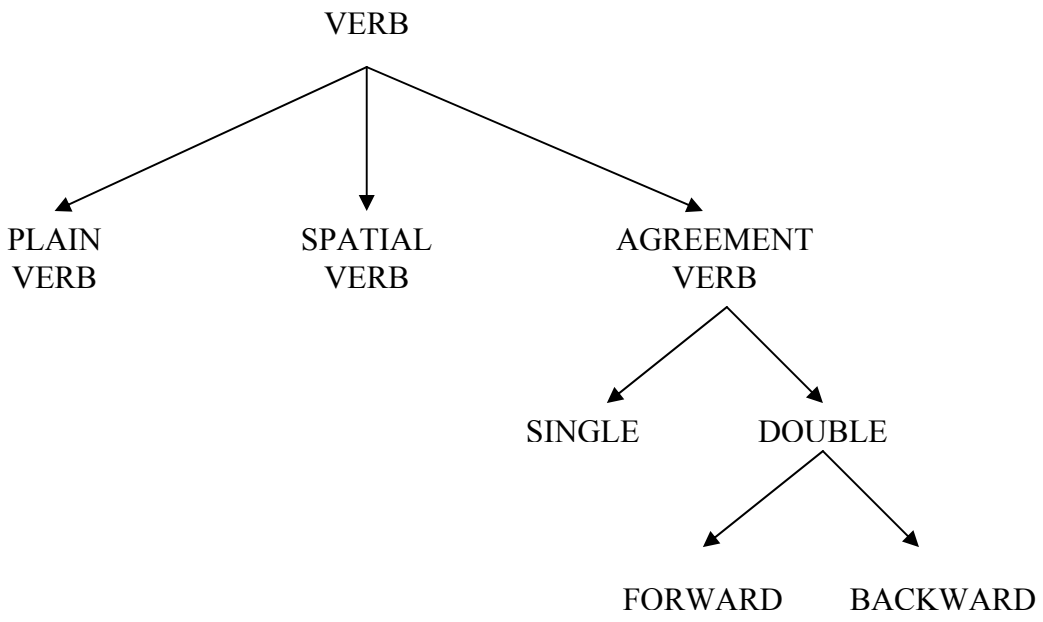


Figure-40 Verb types in Sign Languages

"*This classification is widely accepted in the sign linguistics literature, has been applied to other sign languages, e.g., Israeli SL (Meir, 2002), Danish SL (Engberg-Pedersen, 2002) and British SL (Kyle and Woll, 1985)"* (as cited in Sevinc, 2006, p.16). Sevinc (2006, p.74) also categorizes TİD verbs as in Table-9.

Table-8 Examples of Padden's (1990) typology of verbs in ASL

Verb types	Verbs
Plain	LOVE, CELEBRATE, LIKE, TASTE, THINK. WONDER
Agreeing	GIVE, SHOW, TELL, ASK, SEND, INFORM, ADVISE,FORCE, PERSUADE
Spatial	MOVE, PUT, CARRY-BY-HAND, VEHICLE-MOVE

Table-9 TİD verbs and verb types (Sevinc 2006)

Verb types	Verbs
Plain	UYU- "sleep"
Agreeing	
a)Single	BAK- "look at"
b)Double	
i)Backward	DAVET –"invite"
ii)Forward	DURDUR-"stop"
Spatial	YÜRÜ –"walk"

Mathur and Rathmann (2004) classify agreeing verb in terms of phonological parameters: (i) changes in orientation and direction of movement (DESTEKLEMEK / SUPPORT), (ii) only orientation changes (BİRİNDEN-HOŞLANMAK / DESIRE-SB), (iii) only direction of movement changes (SATMAK / SELL), (iv) changes in orientation, direction of movement and order of hands and (v) changes in orientation and order of hands (for list of all agreeing verb see APPENDIX-3). In TİD, the fourth and fifth group of agreeing verbs, are not observed, like in DGS. However, the first group with a percentage of 65% is prominent among agreeing verbs. The second most prominent group is the third group in the above classification, change in direction of movement, which has a percentage of 29%. Both the first and the third group indicate that TİD agreeing verbs are most frequently marked with direction of movement. However, there also exist agreeing verbs in which only orientation changes, like in the signs BİRİNDEN-HOŞLANMAK / DESIRE-SB, ÖĞRETMEK / TEACH, SORGULAMAK / QUESTION and PAYLAŞMAK / SHARE. These signs show an internal movement within the verb. Hence, they are not required to mark

agreement with a path movement, but rather mark agreement with internal movement.

Agreeing verbs can be inflected for number. Generally, number comprises singular and plural. The plural, however, can be further subdivided. Thus, the sign language literature assumes that there are four possible values for the number feature: singular, dual, exhaustive and multiple (Klima and Bellugi 1979, Padden 1983 as cited in Sandler 2006) (see Figure-41). However, Mathur and Rathmann (2005) do not consider the dual and exhaustive values as a number feature, because the dual is composed of two singular agreement forms and exhaustive is also composed of several singular agreement forms, i.e. repetition of singular agreement. Hence, they conclude that the number features can be restricted to singular or plural in sign languages. If one wants to maintain various kinds of plural, as many sign researchers do, the plural feature may be further differentiated into "*dual*", "*exhaustive*" and "*multiple*". Exhaustive number is applied when an event is distributed over persons (i.e. "*I gave a paper to each participant*.") On the other hand, multiple number is utilized when there are more and scattered people, emphasizing the crowd of persons (i.e. "I give a paper to all the participants.") Exhaustive and plural are marked differently in sign language: "…the *phenomenon in verb inflection refers to distribution and involves a 'plural sweep' in which the end point is moved in an arc through locations associated with referents or relocated and redirected at each in a series of repetitions, as in the modification of ASK to mean 'ask all' or 'ask each'* " (Johnston, 2006, p.326). A special case of number inflection in sign languages is reciprocals (see Chapter 4.2.3).

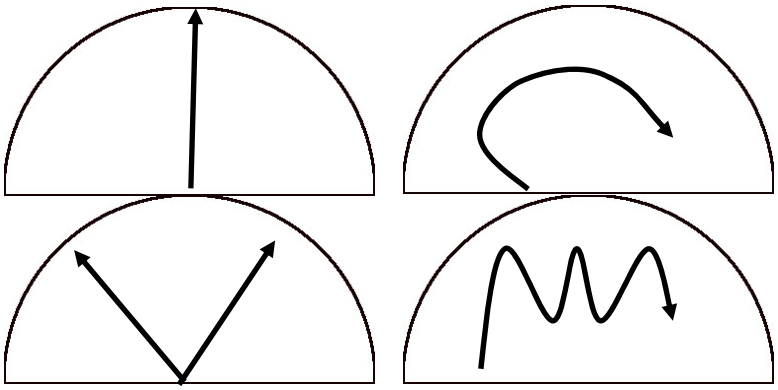


Figure-41 Singular, Dual, Multiple, and Exhaustive (adapted from Sandler & Lillo-Martin, p.39)

4.3.2 Pluralization

Pluralization in nouns can also be morphological. Most often the plural is expressed by reduplication (Sandler, 2006). According to Pizzuto & Corrazza (1996 as cited in Sandler 2006) body-anchored signs are not marked for plural whereas the constructions covering nominal classifiers take morphological plural. Moreover, Pfau & Steinbach (2005) show that DGS includes various plural marking approaches (see Figure-42). Their study showed that the plural strategy depends on the phonological properties of nouns. They identified four types of nouns (Pfau and Steinbach, 2005, p.2):

> (i) *Body-anchored (B-nouns):* the signs which are contacted to a place on the face or body,
>
> (ii) *Complex structured signs (C-Nouns):* the signs with various "*complex movements*" like "*circulating, alternating, or repeated*"
>
> (iii) *Midsagittal plane signs (M-nouns):* the signs which are "*signed symmetrically to or on the midsagittal plane*"
>
> (iv) *Lateral signs (L-nouns):* the signs "*signed at the lateral side of signing space*".

They discovered that both B and C-nouns ("FRAU" and "FAHRRAD" in Figure-42) can not take an overt plural; M-nouns ("BUCH") take simple reduplication and L-nouns ("KIND") sideward reduplications.

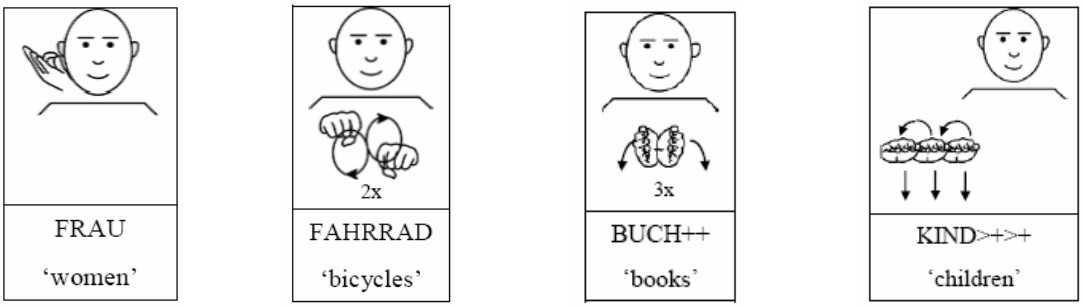


Figure 42 The pluralization properties of the different types of nouns (Pfau et. al, 2005, pp.14-40)

Like DGS, TİD also has reduplication and sideward reduplication for nouns. However, it is difficult to group the plural properties for different noun classifiers For example the sign BİSİKLET/ BICYCLE can use locative reduplication, that is, BİSİKLET is signed twice, in two different locations in order to convey the plural İKİ BİSİKLET/ TWO BICYCLES. As for the sign KİTAP/BOOK, which has two movements and is also a midsagittal noun, it cannot be marked for plural. GÜN /DAY, a lateral noun, is signed with one movement, whereas, GÜNLER / DAYS uses reduplication and is signed with three movements (see Figure-43)

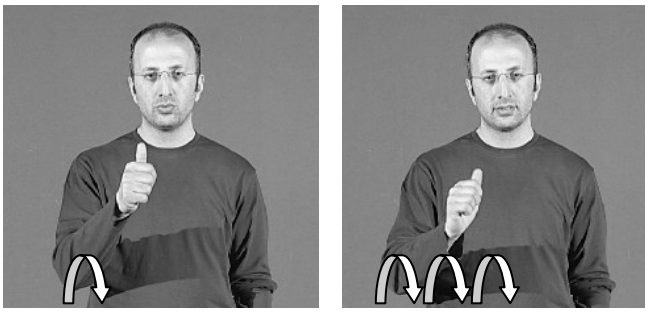


Figure-43 Singular GÜN (DAY) and Plural GÜNLER (DAYS)

These are but a few examples of noun plurals in TİD. Since TİD has a highly intricate plural system for nouns which exploits classifiers in particular, I will present a comprehensive discussion of noun plurals in section 5.3.8 "Plural strategies of TİD" as part of the survey of TİD classifiers.

4.2.3 Reciprocals

Reciprocals, in linguistic terms, indicate a mutual relation between referent and addressee or other objects (Pfau & Steinbach, 2003).Reciprocals have intricate

semantic properties and can be conveyed in many different ways –lexical, morphological, syntactic. In this chapter, I will only be concerned with the morphology of reciprocal verbs. In spoken language, for instance, in spoken Turkish, the "-ış" suffix is added to the verb stem to construct a reciprocal interpretation. For example, the verb "bakışmak" (to look at each other) is the reciprocal formation of the verb "bakmak" (to look at). As for sign languages, Pfau and Steinbach (2003, p.10) investigated the reciprocals in German Sign Language (DGS) and found that

> *...reciprocal marking not only depends on morphosyntactic properties of the underlying verb but also on its phonological form, i.e. on the phonological feature [±two-handed sign]. This phonological feature, however, only has an influence on the realization of reciprocal marking with agreement verbs.*

In other words, whether the sign is two-handed or not affects the use of the reciprocal form. Let us consider some base forms, for example: the verb "HELFEN/HELP" is two-handed in DGS, both hands move from the position of the subject ${}^{x}_{x}HELF^{y}_{y}$, whereas in the one-handed agreement verb GEBEN/GIVE in DGS, only the dominant hand moves from x to y: ${}_{x}GEB_{y}$. For DGS, there are three possible reciprocal morphemes:

(i) *Movement conversion*: Most two-handed agreement verbs use this strategy in which both hands move from the position of the subject to that of the object and, without stopping, back to the subject again. HELFEN type verbs use this reciprocal form: ${}^{x}_{x}HELF^{y}_{y}\,HELF^{x}_{x}$ (see Figure-44).

(ii) *Conversion and second hand copy*: Most one-handed agreement verbs have reciprocal forms with both movement conversion and second hand copy. In this strategy, while the dominant hand moves from subject to object, the non-dominant hand copies the movement but in reversed direction: ${}^{y}_{x}GEB^{x}_{y}$ (see Figure-44).

(iii) *Use of PAM*: Yet, another strategy can be seen in the verb 'TRUST' in DGS, which is a two-handed plain verb. Here, both hands move but the beginning and end point of the movement are not determined by agreement features; rather the agreement is shown on PAMs (Person Agreement Marker, Rathmann 2001 as cited in Pfau and Steinbach 2003) which express the reciprocal morpheme through the movement conversion, i.e. ${}^{1}_{1}VERTRAU^{2}_{2}\ {}_{x}PAM_{y}PAM_{x}$ (see Figure-44)

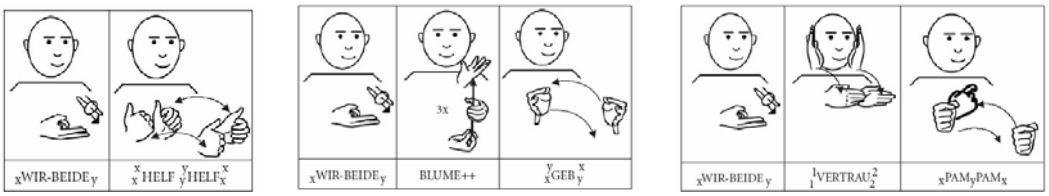


Figure-44 Reciprocals in DGS considering the two-handedness of signs and their reciprocal properties (Pfau and Steinbach 2003, pp.13-40)

The reciprocal forms of verbs in TİD also rely on the sign being one or two-handed and on being a plain or an agreement verb. However, since PAMs (Rathmann, 2001) are not present in TİD the reciprocal forms of signs do not include them.

Plain one-handed (BİLMEK / KNOW, DÜŞÜNMEK / THINK, TANIMAK / RECOGNIZE) and plain two-handed (HATIRLAMAK / REMEMBER) TİD signs cannot apply by the rules of reduplicating movement or copying the dominant hand. Rather, the reciprocal morpheme is zero-marked on the verb but is lexically expressed by pronouns. These pronouns can be of three kinds:

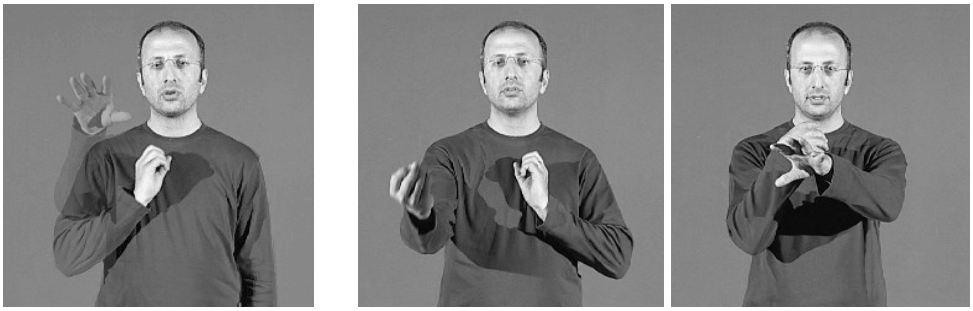
(i) Either the one-handed dual pronoun sign "İKİMİZ / BOTH US" is used before the plain verbs (i.e. İKİMİZ BİLMEK / "we both know each other") or

(ii) The two-handed reciprocal pronoun "BİRBİRİMİZİ/ WE.. EACH OF US" is used or

(iii) Personal pronouns for both arguments are signed and the sign is duplicated sequentially (i.e. BEN BİLMEK SEN BİLMEK / I KNOW YOU KNOW).

The reciprocal constructions of agreeing one-handed signs can be categorized in three groups:

(i) In the first group of one-handed agreement verbs, the non-dominant hand copies the dominant hand and moves in a reversed way simultaneously. For example, ${}^{y}_{x}GÖNDER^{x}_{y}$ (SEND) (Figure-45)



$_{X}$GÖNDER$_{Y}$ ${}^{y}_{x}GÖNDER^{x}_{y}$

Figure-45 An example of the reciprocal strategy "conversion and second hand copy" reciprocal form: GÖNDERMEK

Verbs using the strategy of reduplicating movement and H2 copy: GÖNDERMEK/SEND, ÖDEMEK/PAY[1], SORMAK/ASK[1], VERMEK/GIVE, and SUSTURMAK/HUSH.

(ii) The second group of one-handed agreement verbs uses the strategy of backward reduplication sequentially if it is a forward agreement verb or forward reduplication if it is a backward agreement verb. For example, ${}_{x}ANLAT_{y}ANLAT_{x}$ (forward agreeing verb) and ${}_{y}SEÇ_{x}SEÇ_{y}$ (backward agreeing verb) (see Figure-46).

$_{X}$ANLAT$_{Y}$ $_{x}ANLAT_{y}ANLAT_{x}$

Figure 46 An example of the reciprocal strategy "movement conversion" reciprocal form: ANLATMAK

Verbs using the strategy of reduplicating movement: ALMAK / GET, ANLATMAK / TELL, BAĞIRMAK / YELL, BESLEMEK / FEED, CEVAPLAMAK / ANSWER, DURDURMAK / STOP-S.O., EMRETMEK / ORDER, ÖDEMEK / PAY[2], FAKS-GÖNDERMEK / FAX[3], SATMAK / SELL, SEÇMEK / CHOOSE, SORMAK / ASK[1], SÖYLEMEK / SAY, TEŞEKKÜR-ETMEK / THANK. (Note that: the verbs ALMAK and SEÇMEK are backward agreement verbs)

(iii) The last group behaves very differently compared to the first two groups: some one-handed agreement verbs follow the strategy of using neutralized space and the agreement pronouns, i.e. the spatial loci, are dropped or neutralized. Verbs using both reduplicating movement and H2 copy in a neutralized space (Figure-47 a-e):

(a)ETKİLEMEK/AFFECT SOMEONE: $_{x}ETKİ_{y} > {}^{0}_{0}ETKİ^{X}_{Y}$

(b)FAKS-GÖNDERMEK / FAX: $_{x}FAKS_{y} > {}^{0}_{0}FAKS^{X}_{Y}$

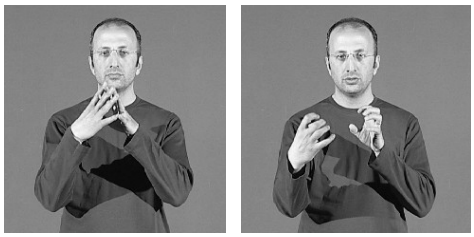
(c)GÖRMEK/SEE: $_{x}GÖR_{y} > {}^{X}_{Y}GÖR^{0}_{0}$

(d)HABER-VERMEK /INFORM: $_{X}HABER_{Y} > {}^{XO}_{XO}HABER^{YO}_{YO}HABER^{XO}_{XO} ++$

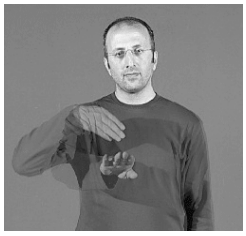
(e)KÖTÜLEMEK/FIGHT: $_{X}KÖTÜLE_{Y} > {}^{XO}_{XO}KÖTÜLE^{YO}_{YO}KÖTÜLE^{XO}_{XO} ++$

[2] Some verbs can be reciprocally marked by both movement conversion and backward reduplication.
[2] Some verbs can also be marked by either backward reduplication or the use of neutral space .

$_{x}ETKİ_{y}>$



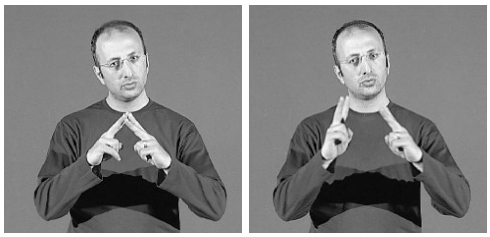
$\overset{0}{\underset{0}{\cdot}}ETKİ\overset{X}{\underset{Y}{\cdot}}$



$_{x}FAKS_{y}>$

$\overset{0}{\underset{0}{\cdot}}FAKS\overset{X}{\underset{Y}{\cdot}}$

$_{x}GÖR_{y}>$



$\overset{X}{\underset{Y}{\cdot}}GÖR\overset{0}{\underset{0}{\cdot}}$

$_{X}HABER_{Y}$

$\overset{XO}{\underset{XO}{\cdot}}HABER\overset{YO}{\underset{YO}{\cdot}}HABER\overset{XO}{\underset{XO}{\cdot}}++$

$_{X}KÖTÜLE_{Y}$

$\overset{XO}{\underset{XO}{\cdot}}KÖTÜLE\overset{YO}{\underset{YO}{\cdot}}KÖTÜLE\overset{XO}{\underset{XO}{\cdot}}++$

Figure-47 (a) ETKİLEMEK (b) FAKS GÖNDERMEK (c) GÖRMEK (d) HABER-VERMEK (e) KÖTÜLEMEK.

Two-handed agreement verbs, in which both hands move symmetrically, have the reciprocal form of movement reduplication. In the reciprocal structures of these verbs, the path of the reduplicated movement of both hands depends on whether the verb is a forward or backward agreement verb. For example, in the reciprocal form of "ALAY ETMEK/ BULLY" (${}^{X}_{X}ALAY-ET^{Y}_{Y}\ ALAY-ET^{X}_{X}$) (Figure-48a), both hands move from the position of the subject, while in the reciprocal verb of "DAVET ETMEK/INVITE" both hands move in the reversed way, i.e. moving from the locus of the object (${}^{X}_{X}DAVET-ET^{Y}_{Y}\ DAVET-ET^{X}_{X}$) (Figure-48b). Two-handed agreement verbs using the strategy of reduplicating movement: HOŞLANMAK / DESIRE, TAKİP-ETMEK / FOLLOW, SUÇLAMAK / BLAME, ZORLAMAK / FORCE, SORGULAMAK / QUESTION)

$_{X}$ALAY_ET$_{Y}$ ${}^{X}_{X}ALAY-ET^{Y}_{Y}\ ALAY-ET^{X}_{X}$

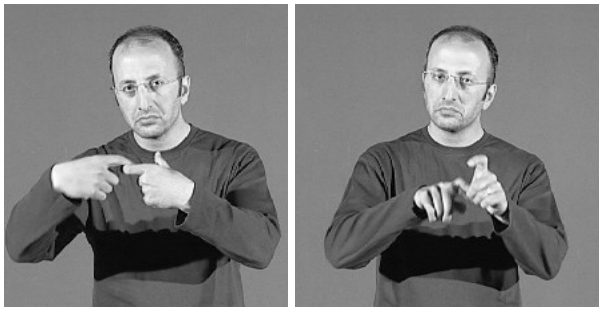
$_{X}$DAVET_ET$_{Y}$ ${}^{X}_{X}DAVET-ET^{Y}_{Y}\ DAVET-ET^{X}_{X}$

Figure-48(a) ALAY ETMEK (b) DAVET ETMEK

The reciprocal forms of two-handed agreement verbs in which both hands do not move symmetrically, i.e. where one hand is dominant and the other is non-dominant also behave similarly: ${}^{O}_{X}SORGULA^{O}_{Y}\ SORGULA^{0}_{X}++$ (Figure 49a). The handshape of the non-dominant hand is the TİD C-handshape which is not part of the set of

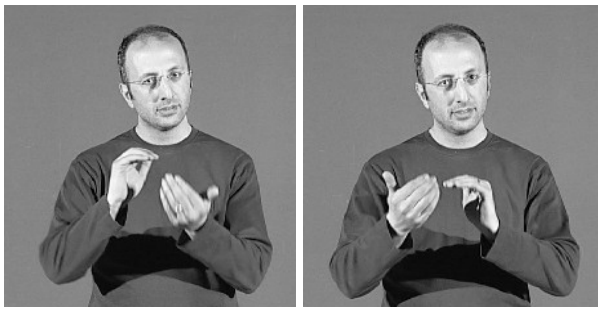
unmarked handshapes in TİD. The C-handshape is in the sign SORGULAMAK may therefore be allomorph of the TİD O-handshape, which is in the set of unmarked handshapes. The C-handshape refers to the mouth and the reason why the TİD O-handshape is not used may be due to the fact that with this handshape is not clear that someone is “extracting words from the mouth”.

However, as with one-handed agreement verbs, the reciprocal form of “DESTEKLEMEK/ SUPPORT” does not obey the movement reduplication rule; rather the hands are behaving separately as each hand is now referring to supporting the other. Moreover, in this kind of reciprocal verb, the object and subject positions are maintained in the neutral space: ${}^{YO}_{XO}DESTEKLE^{XO}_{YO}\,DESTEKLE^{YO}_{XO}++$ (Figure-49b). The orientation of each hand refers to subject and object. While twisting the wrist, the subject and object situation reverses. From the observation it may be concluded that a “shared dominance” occurs in this case, i.e. by the twisting wrist movement the non-dominant hand may also become temporarily dominant.



xSORGULAy

${}^{O}_{X}SORGULA^{O}_{Y}\,SORGULA^{0}_{X}++$



xDESTEKLEy

${}^{YO}_{XO}DESTEKLE^{XO}_{YO}\,DESTEKLE^{YO}_{XO}++$

Figure-49(a) SORGULAMAK (b) DESTEKLEMEK

In order to understand the reciprocal neutralized area observed in some TİD verbs, Figure-50 schematizes the sign area between signer and addressee and also the smaller area referred to as the neutralized area. Signing space has been defined as the area which is the half-circle area between signer and addressee. The area of neutralized space refers to the inner half-circle, called neutralized signing space "NSs", as can be seen in Figure-50.

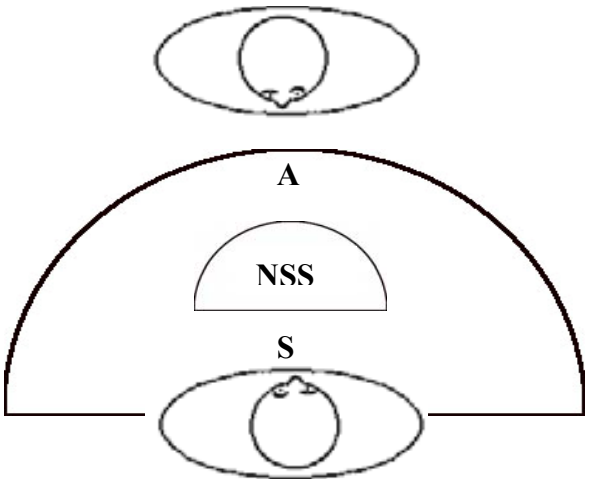


Figure-50 Signing Area and Neutralized Signing Area ("NSA")

In TİD reciprocals, phonology needs to accommodate phonetics, in order to reduce the increased sign complexity through the use of neutral signing space. However, while the reciprocal signs can be reduced quantitatively (the space can "shrink"), qualitatively they must still convey the agreement property/the thematic information, notwithstanding in a reduced form (X_O, Y_O, see Figure-51). This reduction may also reflect the lexicon-semantic "neutralization" of the thematic arguments in reciprocals (as in "each other").

The use of neutral space in reciprocal forms is not a very common finding in the sign language literature. However, Eccarius & Brentari (2007, p.1173) presume that "*both two-handed lexical items and two-handed CCs…*" *"…are often articulated in neutral space. According to the Dictionary of American Sign Language (Stokoe, [Casterline and Croneberg] 1965, as reported in Hara, 2003), this is true of 76% of Type 1, 99% of Type 2, and 98% of Type 3 signs*." Signing in a neutral space reduces the

complexity of the sign, and compensates for the use of the second hand which increases the sign complexity. Since two-handed agreeing verbs are already on the maximum side of the sign complexity, these reciprocal forms (i.e. conversion adding) add even more complexity. Therefore, the use of neutral space (or a narrower area suitable for reciprocal forms, reciprocal neutral space) will reduce the complexity of the sign with reciprocal markings.

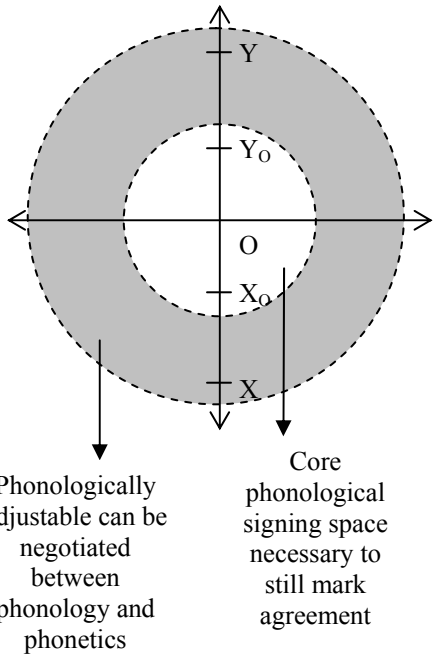


Figure-51 Y plane of signing space and neutralized signing space X: signer's locus , XO: signer's locus in neutral space ,Y: referent locus, YO: referent's locius in neutral space, O: the center of signing space

When the (reciprocal) neutral space is used, some morphological / phonological markings may drop or become reduced in several ways:

(i) the subject locus may drop/be reduced as in ETKİLEMEK

(ii) the object locus may drop/be reduced as in FAKS GÖNDERMEK

(iii) the body anchor may drop as in GÖRMEK, SORGULAMAK

(iv) internal movement may be omitted as in HABER^VERMEK

(v) path movement may reduce as in KÖTÜLEMEK

(vi) the hands may move alternately in type-1 two-handed signs (the symmetrically signed two-handed agreeing verb) as in DESTEKLEMEK.

The above variations do not mean the agreement information is dropped altogether; rather the agreement information is adapted to the neutral space. For example, the path movement indicating that the sign is agreeing in DESTEKLEMEK is completely lost when it is reciprocally marked, however the hand-orientation feature becomes more dominant, showing that the sign is an agreeing verb, (i.e. the orientation shows us who supports whom.) In other words, the DESTEKLEMEK the sign re-lexified, using the hand orientation feature instead of movement feature when it is reciprocally marked. Through the shift of the agreement feature from one phonological parameter to the other, the well-formedness of the derived sign is preserved. One may call this a re-lexicalization process. This process is comparable to Crasborn's (2001, pp. 196-201) research on "whispering" in which the NGT signers used the smaller signed space and are observed signing with distal movements rather proximal movements while they were whispering.

Some verbs have semantically reciprocal meaning (as in BULUŞMAK in TİD), and some verbs can be marked by two reciprocal forms simultaneously (the category conversion and H2 copy). However, some agreeing verbs cannot be marked by simultaneous reciprocal features because the events conveyed by these verbs cannot occur at the same time, due to their semantics. Therefore, H2 copy cannot be applied and only a reduplicating movement can be added. For example, ANLAT cannot be done at the same time, and marked by only a reduplicated movement.

There also exists a combination of a reciprocal plus a plural Sevinç (2006, p.19) identified such a reciprocal in TİD: "to look at each other." It is "used when there are at least three reciprocal pairs, and it is formed by the repetition of the verb stem at least three times." (Figure-52) Another example is seen in Figure-53: here the exhaustive reciprocal form of the sign HABER-VERMEK / INFORM is different from the one in GÖRMEK / SEE.

Figure-52 BAKreciprocal+exhaustive (Sevinc, 2006 p. 27)

Figure-53 HABER-VERMEK reciprocal+exhaustive

4.3.4 Aspects

Klima and Bellugi (1979 as cited in Sandler, 2006, p.47) state that there are many aspectual inflections in ASL articulating "temporal aspect", "manner" and "focus". Some of these aspectual markings are for verbs and some are for adjectives. In general, aspectual inflections take the form of changes in the length and speed of the movement of the verb. Using a verb sign, it is possible to inflect a verb in terms of aspect (i.e. protacted, habitual, durational, incessant... etc.) Zeshan (2002) notes that TİD does not have overt morphological tense markers which is in line with the behavior of other sign languages. However, in respect to aspect, sign languages seem to have aspects instead of tense. TİD uses two main aspect: "completive" aspect (Zeshan, 2002 p.256) and "continuative" aspect. The verbs with completive aspect are signed in a specific direction and/or have a distinct completive movement, whereas verbs with continuative aspects are signed repetitively in one direction. Completive aspect goes with a characteristic mouth gesture which is important. It starts with an aperture of the lips and ends in an inter-dental position of the tongue (as in "pt") (see Figure-54). Also, some habitual aspect maybe observed in TİD even

though it is not as strong as completive and continuative aspects. Habitual aspect is used when the action is done regularly, every day or every time. When the verb is repeated several times, at most three or four times, this verb is inflected with the habitual aspect.

Figure-54 Mouth gesture used with completive aspect

4.4 Derivational Morphology

In the previous sections I have described various inflectional morphemes which do not change the meanings of the root. Even though derivational morphology in sign language is not as rich as inflectional morphology, derivation of the signs is also possible in sign languages (Sandler & Lillo-Martin, 2006). This part describes nominalization, compounding, negation, borrowed finger-spelling, fused signs as in numerical incorporations.

4.4.1 Nominalization

Supalla and Newport (1978 as cited in Sandler and Lillo-Martin 2006 pp. 55-56) give some ASL examples of noun derivations from verbs or vice versa. SIT and CHAIR; IRON and IRON differ in terms of length or duration of movements. The movements of the verbs are usually longer than that of the nouns. This is valid for many TİD signs, too, for example OTURMAK (SIT) and SANDALYE (CHAIR) differ in terms of repetition of internal movement, i.e. SANDALYE has three repetitions of internal movement from the straight V-handshape to hooked V-handshape, whereas OTURMAK has a longer path movement with the same internal movement as in SANDALYE.

Some nouns have been derived from verbs which are semantically related with these nouns. Such derivation processes can involve eliminating the repetition of internal movement, dropping movement, dropping the agreement property, adding pauses or

decreasing the duration of path movements. SİGARA (CIGARETTE) and SİGARA-İÇMEK (SMOKE) vary with respect to whether they have a path movement or not. Another example of nominalization is dropping an agreement path, as in ZİYARET-ETMEK (VISIT), which can be inflected by person loci, however, for deriving the noun MİSAFİR (GUEST) the inflection is dropped. HAYAT (LIFE) is possibly derived form the sign BÜYÜMEK (GROW-UP) by adding pauses to the path movement. The final example is DOĞUM (BIRTH) vs. DOĞURMAK (GIVE-BIRTH); these signs actually have the same hand configuration, movement and location however they differs in terms of duration of the movement i.e. DOĞUM has a longer duration.

4.4.2 Compounds

Compounding is another concatenative word formation process in TİD. Examples such as OVERSLEEP (SLEEP+SUNRISE) and RESEMBLE (LOOK+STRONG) in ASL show that the newly formed compound also expresses a new meaning (Sandler & Lillo-Martin 2006). Basically, compounding is a process of generating new signs from two independent signs. Zeshan (2000) gives an example from Indo-Pakistan Sign Language: The sign "intelligent" is a compound of the words "understand" and "much" (SAMAJH+BAHUT). However, one of the parts or both parts may be altered in order to follow the prosodic rules in the sign language that make signs mono-syllabic, if possible, at most bi-syllabic.

There are various rules for compound formation, which are investigated from two different aspects. On the one hand, Brennan (1990, cited in Hohenberger 2006, p. 268) states three compound formation rules: (i) compound rule, (ii) hierarchy rule and (iii) rule of identical movement direction. On the other hand, Liddell & Johnson (1986, cited in Valli & Lucas 2001, p.59) state there are two kinds of rules for constructing compounds: (i) phonological and (ii) morphological rules.

Brennan's (1990) first rule, the compound rule, says that the initial part of the compound is shortened and a repeated movement in the second part is eliminated. If one of the signs is a two-handed sign, the non-dominant hand is already in place or remains in place. For example, in the DGS compound GOTT^WARTEN

(GOD^WAIT / advent) (Leuninger 2001), the movement of the sign GOTT is dropped and only its onset location is maintained and the repetition of the second part WARTEN/wait is dropped.

The second rule is the hierarchy rule in which states that the sign which is placed higher in signing space precedes the one that is placed lower. For example, in the DGS compound WEIN^ROT (WINE^RED / red wine) the sign WEIN is signed first as it has a higher position than ROT.

The third rule is the rule of identical movement direction, which says that the direction of the movement may not change within the compound. If there is a conflict in the movement direction in both signs, one part of the compound will adapt to the direction of the other part. For example, in the DGS compound MÖNCH^CHEF (MONK^CHIEF/ abbot) (Leuninger 2001), the sign CHEF has usually an upward movement, which, however, is reverted into a downward movement. This is because it follows the sign MÖNCH whose location is at the head so that correctly signing CHEF upwards would require a previous downward movement. This is ruled out by the rule of identical movement direction.

Liddell and Johnson's (1989) first compound formation rule is phonological and comprises three rules: (i) movement change or movement addition ("movement epenthesis" as in Valli & Lucas 2001, p.61), (ii) eliminating the end movement of the first component of the compound ("hold deletion" as in Valli & Lucas 2001, p.61) and (iii) affecting one of the components of the compound through the other component in terms of phonological characteristics ("*assimilation*" as in Valli & Clayton 2001, p.61).

Furthermore, three morphological rules can be observed for the construction of a compound: (i) the Single Sequence Rule: eliminating internal or repetitive movement, (ii) the Contacting Hold Rule: eliminating the movement but using the contact on the body or the face within the initial sign as in ÇİRKİN / UGLY (YÜZ^KÖTÜ / FACE^BAD) and (iii) the weak hand anticipation rule as in

HATIRLAMAK / REMEMBER (KAFA^HATIRA / HEAD^MEMORY). In Table-10 I give examples for the various compound formation rules in TİD.

Table-10 Compound Formation Rules and examples in TİD

Compound Formation Rules		
1	Compound Rule	
a	Movement epenthesis	ERKEK^BÜYÜK (MAN^TALL) / AĞABEY (BROTHER)
b	Eliminating end location ("hold deletion")	VUCÜT^SAĞLAM (BODY^STRONG) / SAĞLIK (HEALTH)
c	Assimilation	KAFA^UYUM (HEAD^MATCH) / ANLAŞMA (AGREEMENT)
d	Single Sequence Rule	BABA^ANNE (FATHER^MOTHER) / EBEVEYN (PARENT)
e	First contact rule	YÜZ^KÖTÜ (FACE^BAD) / ÇİRKİN (UGLY)
f	Weak hand anticipation	PATLICAN (EGGPLANT)
2	Hierarchy Rule	KAFA^HATIRA (HEAD^MEMORY) / HATIRLAMA (REMEMBER)

In order to analyze TİD compounds (see Table-11 for examples of TİD compounds) I will use both sets of compound formation rules mentioned above. However, Brennan's (1990) first rule, the compound rule, covers all of Liddell and Johnson's compound formation rules. The movement epenthesis rule is fairly similar to the Rule of Identical Movement. The rules will be exemplified with TİD compounds in a sequence, as in Table-10. It should be noted that a compound may undergo more than one rule in the compound formation process.

Table-11 list of common compounds in TİD together with their lexical bases

TİD COMPOUNDS		
KAFA^HATIRA / HEAD^MEMORY	N+N	HATIRLAMAK / REMEMBER
YÜZ^KÖTÜ / FACE^BAD	N+Adj	ÇİRKİN / UGLY
YÜZ^İYİ / FACE^GOOD	N+Adj	GÜZEL / BEAUTIFUL
ERKEK^BÜYÜK / MAN^TALL	N+Adj	AĞABEY / ELDER-BROTHER
KIZ^BÜYÜK / WOMAN^TALL	N+Adj	ABLA / ELDER-SİSTER
YÜZ^KÜÇÜK / FACE^SMALL	N+Adj	GENÇ / YOUNG
KAFA^SAĞLAM / HEAD^STRONG	N+Adj	İNATÇI /STUBBORN
MOR^BİRŞEYİ-ORTADAN-BIÇAKLA-KESMEK / PURPLE^CUT-SOMETHING-IN THE MIDDLE	Adj+V	PATLICAN / EGGPLANT
KIRMIZI^TOP / RED^BALL$_{CL}$	Adj+CL	DOMATES / TOMATO
VUCÜT^SAĞLAM / BODY^STRONG	N+Adj	SAĞLIK / HEALTH
KIRMIZI^TOP / RED^BALL$_{CL}$	Adj+CL	DOMATES / TOMATO
BABA^ANNE / FATHER^MOTHER	N+N	EBEVEYN / PARENT
CUMHURİYET^BAŞKAN / REPUBLIC^PRESIDENT	N+N	CUMHURBAŞKANI / PRESIDENT
ÖĞLE^SONRA / NOON^AFTER	N+N	ÖĞLEDEN SONRA / AFTERNOON
KAFA^UYUM / HEAD^MATCH	N+N	ANLAŞMAK / AGREEMENT
SU^DALGA /WATER^WAVE	N+N	DENİZ / SEA

In the following, I will describe in more detail some of the TİD compounds in Table-11. DOMATES / TOMATO (KIRMIZI^KÜRE$_S$ /RED^SPHERE$_{CL}$): Padden's Hierarchical rule can be seen at work in this compound. The sign KIRMIZI is articulated higher than the sign KÜRE and therefore the compound starts with KIRMIZI. The movement of the sign slightly changes when approaching its end location, i.e. the hand orientation, adapts to the second part of the compound (see Figure-55).

Figure-55 DOMATES / TOMATO (KIRMIZI^KÜRE$_S$ /RED^SPHERECL)

The signs AĞABEY / ELDER-BROTHER (ERKEK^BÜYÜK / MAN^TALL), ABLA / ELDER-SİSTER (KIZ^BÜYÜK / WOMAN^TALL) and ÖĞLEDEN-SONRA/ AFTERNOON (ÖĞLE^SONRA / NOON^AFTER) are good examples for assimilated lexicalized compounds. In the first two compounds: ERKEK^BÜYÜK and KIZ^BÜYÜK; BÜYÜK, whose handshape is the flat hand, assimilates to the handshape of the first component of the compound (i.e. the ASL A-Bar handshape, as in ERKEK and the Closed V-handshape as in KIZ, respectively) (see Figure-56 for ERKEK^BÜYÜK).

Figure-56 ERKEK^BÜYÜK / MAN^TALL > AĞABEY / ELDER-BROTHER)

ÇİRKİN / UGLY (YÜZ^KÖTÜ / FACE^BAD (see Figure-57): the first part of the compound loses the circular movement so that the compound starts with a hold at the face (according to the contacting hold rule) and the second part of the compound keeps the repetition of two straight movements, however the length of the path is shortened a bit (according to the movement change rule or compound rule, respectively).

Figure-57 ÇİRKİN / UGLY > YÜZ^KÖTÜ / FACE^BAD

GÜZEL / BEAUTIFUL (YÜZ^İYİ / FACE^GOOD): the handshape and hand orientation of the first part of the compound is adapted to the second part (according to the partial assimilation rule). Also, the circular movement is shortened, i.e. the full circular movement around the face is changed to a small circular movement around the nose (movement change rule). The second part of the compound loses the repetition of the movement (according to the single sequence rule) (See Figure-58).

Figure-58 GÜZEL / BEAUTIFUL > YÜZ^İYİ / FACE^GOOD

GENÇ / YOUNG (YÜZ^KÜÇÜK / FACE^SMALL): the first part of the compound adapts to the second part in terms of handshape and hand orientation (assimilation)

and loses its movement (movement change or compound rule, respectively). However, the second part of the compound has a different movement than the original one, i.e. the circular movement in the sign YÜZ passes to the second part's movement which was an internal movement, i.e. a waving movement at the wrist (movement epenthesis) (Figure-59). Brentari (1998) states that long movements are usually seen at the end of sentences. In TID compounding, there is a similar phenomenon, so that the last part of the compound has more an intense movement.

Figure 59 GENÇ / YOUNG > YÜZ^KÜÇÜK / FACE^SMALL

İNATÇI / STUBBORN (KAFA^SAĞLAM / HEAD^STRONG): the second movement loses the second hand movement (compound rule); and becomes one-handed, adapting to the first part of the compound. The last part is weighted more strongly. Similarly, SAĞLIK / HEALTH (VÜCUT^SAĞLAM / BODY^STRONG): the first part of the compound loses its path movement (the contact hold rule) and the last part is weighted more strongly. In Perlmutter's (1992) terms, a mora, that is, a syllable weight, is added.

EBEVEYN / PARENT (BABA^ANNE / FATHER^MOTHER) (see Figure-60): the first part of the compound loses the repetition of the movement (movement epenthesis, compound rule) and the sign direction is reversed in the second part of the compound (single sequence rule, hierarchical rule). Note that in TID a two-syllabic sign sequence is normally carried out from left to right. This is the case for ANNE, as a single sign. In the compound BABA^ANNE, however, the first sign BABA, which is signed at the chin now forms a movement sequence with ANNE so that a left-right movement sequence is formed for BABA and the first syllable of

ANNE. Necessarily, the second syllable of ANNE then has to be signed to the left, resulting in a position reversal for ANNE.

Figure-60 EBEVEYN / PARENT >BABA^ANNE / FATHER^MOTHER

In summary, we see that, as in spoken languages, sign languages have some compound formation rules, too, albeit different ones. Two different signs may come together (become "juxtaposed") for a compound which obeys the rules mentioned above. Comparing TID with ASL and DGS, I conclude that TID follows the same compound rules.

4.4.3 Derivation: Borrowing finger-spelling in TİD

Different from juxtaposition of two signs, some serial derivations exist in TİD which include finger-spelling. For instance, the suffix of the derived sign may be finger-spelled. Some languages may borrow lexical entries from other languages, depending on "*cultural, social and political factors*" (Uzun, 2006 p.48). Of course, there is a strong connection between Turkish and TİD since Turkish Native signers and Turkish speakers share a common culture. Manual Alphabets in sign languages are constructed to adapt words from some spoken language as an indication of education level (Sutton-Spence, 2006). In this respect, Sandler & Lillo-Martin (2006, p.105) explain that "*…finger-spelling takes various forms. One of these is a kind of code switching, in which a signer spells an English name, place, or concept if no sign is available.*"

Even though it happens rarely, the suffixes -lı and -cı in Spoken Turkish are used in TİD as derivational suffixes. In Turkish, –cı (-ci,-cu, -cü, -çı, -çi, -çu, -çü) suffixes give the root the meaning "seller of something" (equivalent to the –er suffix in

English). Likewise, –lı (-li, -lu, -lü) suffixes are added in order to convey the meaning of "belonging to something", especially conveying "where we are from" or "being endowed with something, containing something". These suffixes are widely used in Turkish. TİD uses these suffixes in the same meaning. It should be noted that "L", "C", "I" and "U" letters are one-handed in TİD so that it is easy to make a combination "L" and "I" (ANKARA^L-I), "C" and "I", "L" and "U" (İSTANBUL^L-U), and "C" and "U". Between these two letters, a movement is added, following the movement epenthesis rule which makes the suffix prosodically well-formed (see Figure-61). This combination of borrowed finger-spellings follows a noun or an adjective, respectively. Interestingly, these combinations follow the vowel harmony as in Spoken Turkish, which is probably due to the influence of the spoken language. Note also that the letters of the suffix are signed with the dominant hand and not – as letters of the manual alphabet normally are – with the left hand (see section 3.6).

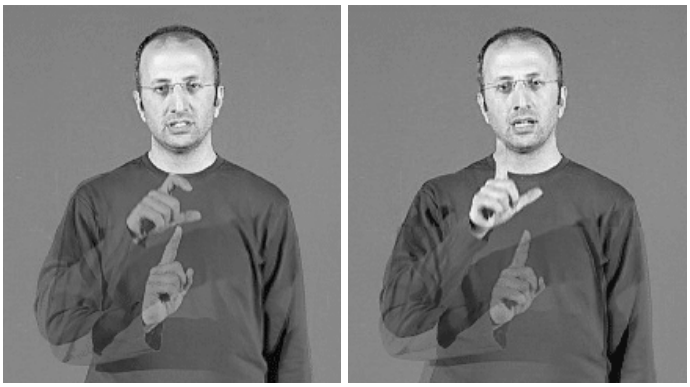


Figure-61 C-I and L-I suffixes in TİD

4.4.4 Negation suffixes in TİD

In the sign languages of the world there are various ways of indicating negation morphologically: there is the ZERO suffix as in ASL, the independent negative particle with headshake, the negative particle in sentence-final position in DGS (Pfau, 2003), and the repeated twist and 0-handshape in Indo-Pakistani Sign Language (IPSL, Zeshan, 2004). In ASL an DGS, negative constructions are generally supported by a non-manual element which is a side-to-side headshake.

However, a backward head tilt is used in Greek, Turkish, and Jordanian SL (Antzakas 2002; Zeshan 2003; Hendriks 2004, as cited in Pfau & Quer 2004, p.1).

Negation can be expressed in three ways in TİD: (i) suffixation of the verb with a negative marker NOT, i.e., VERB^DEĞİL (ii) ZERO (HİÇ) marking and (iii) adding HAYIR / NO as a negation word. The sign DEGİL (NOT) is used with a non-manual expression, namely moving the head slightly backwards (Zeshan, 2004). This form is equivalent to the Turkish –ma (-me) negative suffix and to the negation word "DEĞİL". However, some irregular TİD verbs cannot be marked by DEĞİL, such as VAR (exist) –YOK (not exist), and İSTEMEK (want) –İSTEMEMEK (not want).

The sign "DEGİL" is generally used with a non-manual expression like headshaking or moving the head slightly backwards (Zeshan, 2004). This form is equivalent to the –ma (-me) negative suffix in Spoken Turkish and the negation word "değil". Even though "değil" is a separate word in spoken Turkish, when DEĞİL is signed immediately after the verb, it functions as a bound morpheme in a derivation (SEVMEK^DEĞİL) (Figure-62). However, after nouns and adjectives, DEĞİL is signed separately.

SEVMEK

SEVMEK^DEĞİL

Figure-62 SEVMEK and SEVMEK^DEĞİL

However, another form of indicating negation is the "Zero" Morpheme as in ASL (Aronoff et al., 2005; Sandler & Lillo-Martin, 2006) which is equivalent to the suffix –SIZ (-sız) in spoken Turkish. This suffix adds the meaning "without (something)" to the word in spoken Turkish (equivalent to "without" or "free" in English). This

morpheme is signed after an adjective or noun. It has the O-handshape (zero-handshape) as in ŞEKER^SIZ (sugar-free). Actually, when it is signed alone, as in TİD sentences, it means HİÇ/NOTHİNG.

4.4.5 Fused Signs and Numerical Incorporation

Different from compounds, in sign languages, there are sign formations including spontaneous combination of two signs. This phenomenon is seen in TİD numbers (as in 11, 12, 13, 14, 15, 16, 17, 18, 19, 27, 28, 38, 48, 58, 60, 70, 72, 80, and 90). Signing simultaneously two TİD Numbers (see Figure-63) can be considered as an example of fused signs. In the following, I will describe with some examples what these fusions look like.

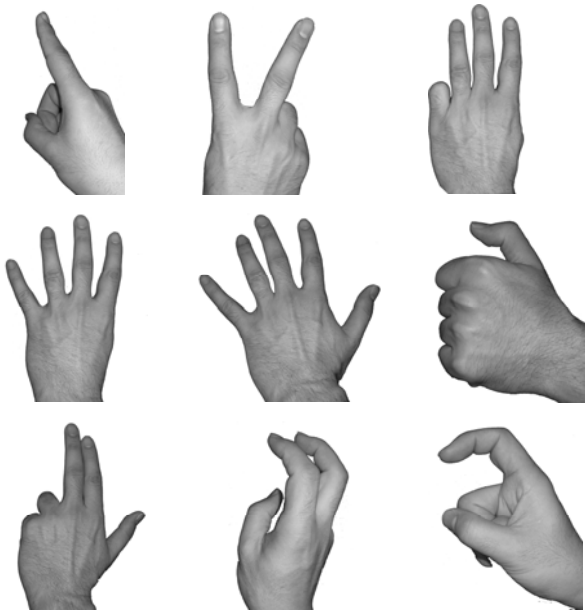


Figure-63 TİD Numbers (1-9)

In some signs in TİD indicating numbers or time the handshape may be changed while the other phonological features remain the same. In some signs indicating past, both handshape and orientation change (Johnston & Schembri, 2007). Zeshan (2002, p.261) states that " *...in TİD, numeral incorporation is quite widespread, occurring with signs for 'year', 'week', 'hour', 'grade'…….as well as multiples of 10,100, and 1000 within the system of cardinal numbers."* (See Table-12)

Table-12 List of number signs undergoing incorporation in TİD

Numerical Incorporation	**Morphological Change**
200,300,400,500,600	HC
2000,3000,4000,5000	HC
2,3,4,5,6^SINIF/ 2,3,4,5,6^GRADE	HC
2,3,4,5,6^SAAT/ 2,3,4,5,6^HOUR	HC
2,3,4,5,6^HAFTA^ÖNCE / 2,3,4,5,6^WEEK^AGO	HC+M
2,3,4,5,6^HAFTA^SONRA / 2,3,4,5,6^WEEK^LATER	HC
2,3,4,5^AY / 2,3,4,5^MONTHS	HC
2,3,4,5^YIL/ 2,3,4,5^YEAR	HC

Table-12 shows that the numbers from "2" to "5" are easily incorporated into temporal nouns, whereas the number "6" cannot be incorporated into any of them (i.e. thousand, month, and year). For "7", "8" and "9", the signs are signed separately i.e. SEVEN HUNDRED, on the other hand, "6" is either incorporated (SİX#HUNDRED) or used separately (SİX HUNDRED) (see also Zeshan 2002). This is probably due to the phonological movements of the numbers, for example "7", "8" and "9" have their own internal movements which make it impossible to have numerical incorporation. Even though "6" does not have an internal movement, its handshape sometimes does not permit numerical incorporation.

CHAPTER 5

CLASSIFIER CONSTRUCTIONS IN TİD

5.1 Introduction

There is a significant number of signs produced in many expressions in sign languages which may be considered as neither lexical nor grammatical signs. Actually, these signs indicate the forms of the objects by utilizing specific handshapes. These signs are generally called "classifier constructions". The term classifier comes from "*the observation that noun referents… appear to be classified: classifiers divide [the] referents into groups of referents [which] share certain characteristics*" (Zwitserlood, 2003, p. 1); in other words, the classifiers are intended to categorize the "*real world objects*" in both spoken and sign languages. Aikhenvald (2000, p. 306 as cited in Zwitserlood, 2003) lists the possible classifier systems and their functions as observed in languages, given in Table-13.

Table-13 Functions of Classifier systems

Classifier Type	**Semantic/Pragmatic Function**
Numeral classifier	Quantification, enumeration
Noun classifier	Determination
Verbal classifier	Object/Subject agreement
Relational classifier	Possession
Possessed classifier	Possession
Locative classifier	Spatial Location
Deictic classifier	Spatial Location, Determination

In sign languages, classifiers are universal: NGT (Sign Language of the Netherlands, Zwitserlood, 2003), British Sign Language (BSL) (Sutton-Spence, Woll, 1999), Israeli Sign Language (ISL, Aronoff, Meir, and Sandler, 2005), Australian Sign Language (Johnston, 1991; Schembri, 1996) and American Sign Language (ASL, Supalla, 1982) and many other sign languages have been identified to have classifier constructions which mainly "capitalize on iconicity" (Sandler & Lillo-Martin, 2006: p.76). Classifiers have been analyzed as verb stems (Engberg-Pedersen 1993), aspectual markers (Brentari & Benedicto, 1999), or as agreement markers (Glück & Pfau 1998). Furthermore, Sandler and Lillo-Martin (2006) among many others, categorize classifiers into *CLASS classifiers* (Entity or Semantic Classifiers in Supalla 1982), *Handle Classifiers* and *Size and Shape Classifiers* (SASSes).

In class classifiers, the handshape is the classifying morpheme. Handle classifiers represent how an entity is handled or manipulated (see Figure-65). Size and shape classifiers express the form of an entity (See Figure-64). For instance, the entity classifier for "car" is marked by a particular handshape in sign languages (e.g., 3 spread fingers in ASL). This entity classifier is used when referring to a car. Similarly, persons have classifiers that differ in various sign languages. Talmy (2003) identify thirty properties of classifiers including entity, orientation, locus, motion, path and manner in sign languages.

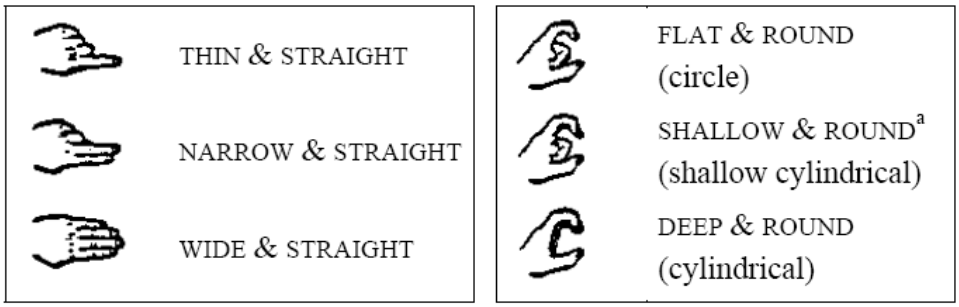


Figure-64 SASS Classifiers in ASL (derived from Supalla 1982 as cited in Sandler and Lillo-Martin 2006 p. 78)

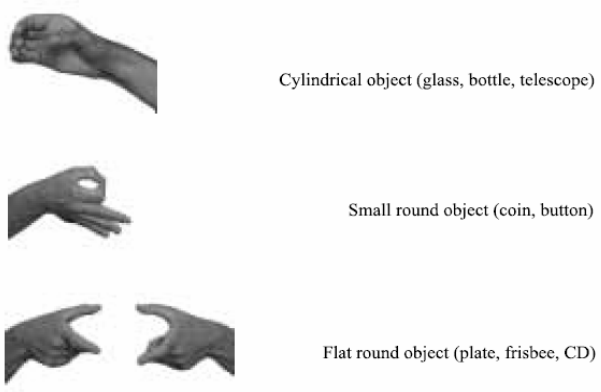


Figure-65 Entity Classifiers in ASL (derived from Supalla 1982, as cited in Sandler & Lillo-Martin 2006, p. 325)

However, the main problem with classifier predicates is how to categorize them: as a phonological, morphological, or as another unit. The functions of classifiers are varied: nominal, adjectival, subject or object (Hohenberger, 2008). Moreover, classifiers are puzzling because they also model forms from the real world. In this respect, they are iconic and gestural. Hence, we need to understand whether classifiers are gestural or linguistic, which will make it easier to define the function of the classifiers in sign languages. It is undeniable that sign languages, being visual-gestural languages, are more iconic as compared to spoken languages. Summarizing this tension, Sandler and Lillo-Martin (2006, p.17) state that classifiers are hard to define as linguistic categories because "…[t]*hey are iconic yet conventionalized, at once mimetic and linguistic."*

There are two different views on classifier predicates. Either they are considered as (i) morphemes (Supalla,1982) or as (ii) gestures (Liddell, 2003 and Cogill-Koez 2000). Supalla (1982) insisted that classifier predicates function as morphemes and therefore should be analyzed linguistically. Among others, he argues that classifiers can be separated into phonological parameters and can show agreement. On the other hand, Liddell (2003) and Cogill-Koez (2000) do not agree with Supalla's view. Rather, they think classifiers should be investigated as non-linguistic units, because classifiers are considered as gestures or Templated Visual Representation (TVR). Cogill-Koez (2000) proposes TVR's as a flexible template by which classifiers can

be analyzed at both the gestural level and the sentential level. However, Emmorey and Herzig (2003) suggest a new aspect in this debate: classifier predicates are to be located between the linguistic level and the gestural level. They conducted two different experiments, one considering location and another considering handshape classifiers. In the first experiment, a picture with a classifier construction was shown to deaf and hearing participants. In this picture, the signer uses the non-dominant hand as a horizontal line and places the dominant hand with the TİD O-handshape at any location, in order to indicate where, with respect to the line, a particular token was placed. The participants wanted to mark the place according to the place of the signers, as indicated with the dominant hand. According to the results of this experiment, the participants (both deaf and hearing) did not show different markings of placement. This result suggests that sign language does not have any influence on the processing of such classifier predicates. In the second experiment, the participants were shown 10 different pictures with the sign "MEDALLION" in different sizes (small TİD O-handshape- TİD O-handshape and TİD C-handshape). As a result, deaf participants guessed the size of the medallion well, whereas hearing participants were less successful at guessing. Both of these experiments indicated that "location" was not digital and linguistic, whereas handshapes were. Hence, some classifiers can be considered gestural (gradual and continuous) whereas others can be considered linguistic (discrete and digital).

5.2 Classifier Constructions in TİD

A large number of signs in TİD are either "frozen" classifier signs which have become standardized, or which are directly connected to classifiers. Firstly, the three kinds of classifiers in TİD will be analyzed: entity, handle and SASS classifiers. Afterwards, some frozen classifiers in TİD will be presented. Finally, the utilization of classifiers will be discussed.

5.2.1. Entity Classifiers in TİD

Entity classifiers are mainly used with subject nouns of intransitive verbs (Zwitserlood, 2003). Research on entity and numeric classifier constructions in TİD goes back to the beginnings of 2000. Zeshan (2002) proposed the following entity-classifier system (see Figure-66), comprising a "honorific person classifier"

(Zeshan, 2002, p.265). The classifiers indicating human beings are categorized into two groups: whole entity classifiers and leg-classifiers.

Whole entity classifiers can be either honorific or neutral. In honorifics, the ASL A-bar-handshape is mainly used. With this classifier, people who have higher status in terms of politics or business are referred to. In neutral classifiers, the I-handshape is mostly utilized and this classifier is generally used for human beings. Entity classifiers for human beings can also be expressed by the numbers 1-2-3-4 which adds plural information to them. These types of classifiers also can be used with two hands. Actually, honorific classifiers are not used widely, rather they are observed in frozen signs. This probably means that honorific classifiers with A-bar-handshape were classifiers in the past. Even though not commonly used, there are many lexicalized honorific classifiers. Both honorific and non-honorific whole entity CLs are also observed in lexicalized signs. The sign "MATCH-COMPETITION" with the ASL A-bar-handshape (honorific) and the sign "MEET" (also see Zeshan 2002) with the I-handshape are examples for both honorific and non-honorific lexicalized classifiers. However, non-honorific classifiers can also be used to refer to a crowd (Figure-68). The Extended Flat-Handshape is used in which each finger represents one human being. Plural whole entity neutral classifiers are also observed as lexicalized classifiers in TİD, as in the sign KUYRUK (QUEUE) sign. On the other hand, the legged Classifiers (2/V-handshape or 8-handshape) are used for a person walking, standing or sitting. Its dual form indicates two people walking, sitting or standing in different positions or lines. Reduplicating this classifier form can specify the actions as being carried out by many people.

Zeshan (2002, p. 264) presents a hierarchy of possible classifier constructions in TİD, as in Figure-66. She thinks that honorific classifiers are also used as entity classifiers, however, neither whole person dual honorific classifiers nor plural legged-object classifiers are observed commonly in TİD. In Figure-67, I have therefore changed some of the branches of the classifier hierarchy according to the Ankara dialect of TİD: (i) Honorific classifiers are not used as classifiers but as lexicalized classifiers, (ii) Neutral Plural Classifiers are also observed in lexicalized

form, (iii) Legged-object classifiers can be separated into two groups: V-shape and Hooked V-shape, (iv) since we have two hands and two legs (two fingers indicating two legs) plural legged-object classifiers cannot be phonetically signed and therefore I removed them (many-legged objects are observed in animal classifiers, e.g. ÖRÜMCEK (SPIDER)).

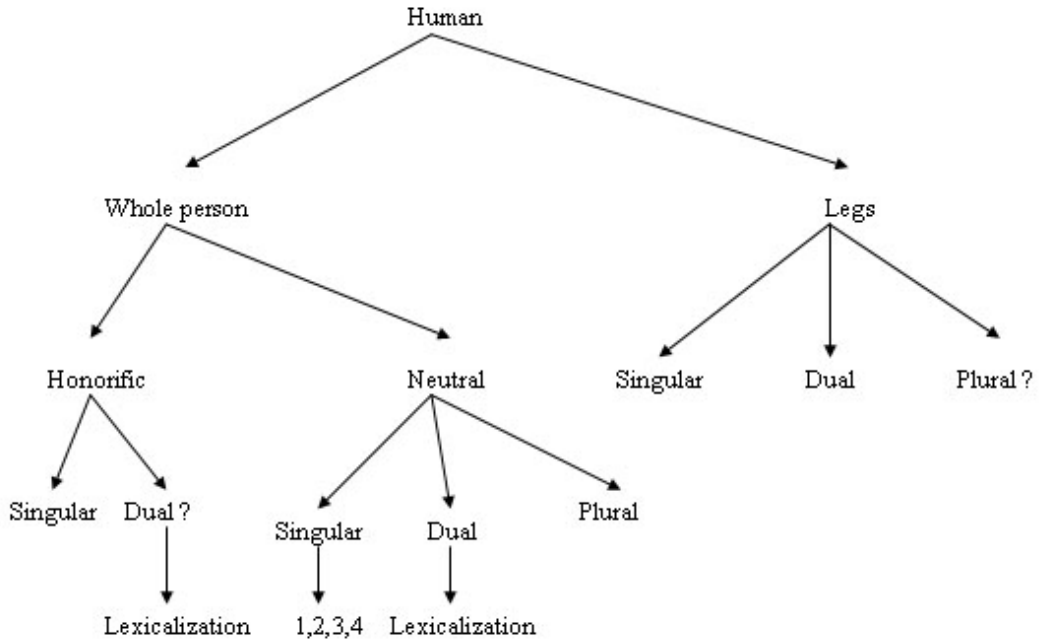


Figure-66 Hierarchy of Entity-Numerical Classifiers according to Zeshan (2002)

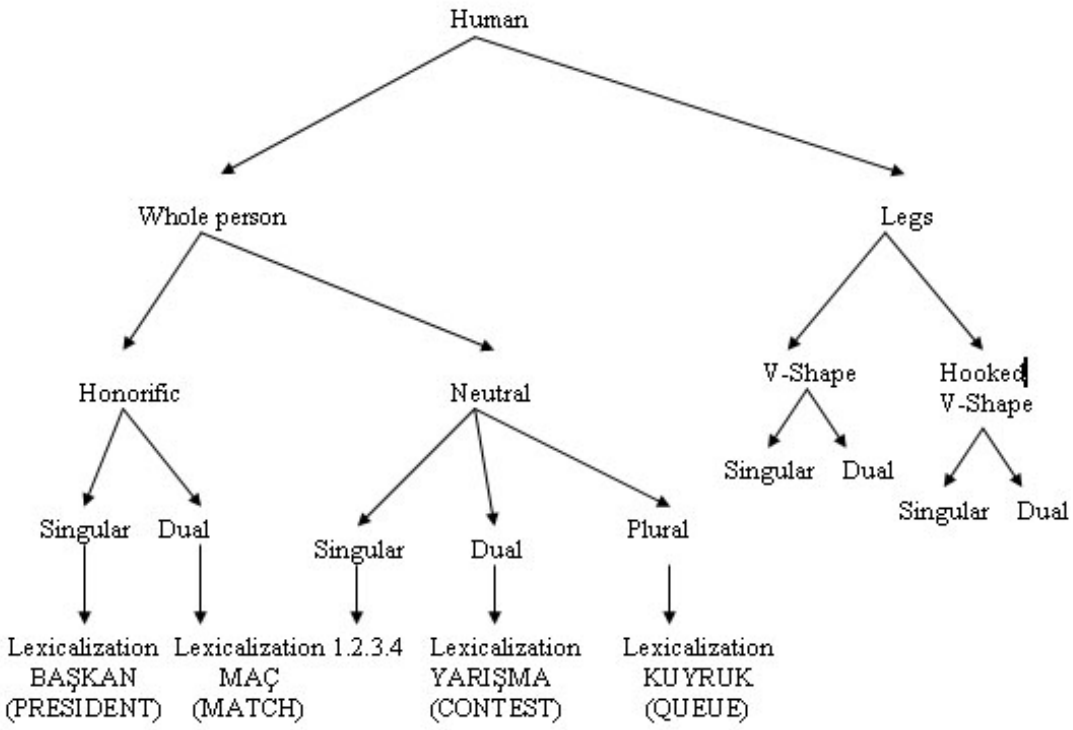


Figure 67 Revised Entity-Numerical Classifiers in TİD

Figure-68 Pluralized non-honorific person classifier, from Zeshan (2002, İNSANLAR-AYAKTA-DURMAK / MANY-PEOPLE-STAND)

Entity classifiers in Turkish Sign Language are not only used for human beings but also for animals, vehicles and geometric objects. For example, I-handshape classifiers are used both as whole body human classifiers and for long, thin animals such as snakes or for pencils, bars, etc. Another example refers to the Flat-Hand which is used for flat shapes (also observed in NGT, Zwitserlood 2003).

Furthermore, this handshape also refers to vehicles like cars, buses and bicycles (see Figure-69). However, the ASL Y-handshape is used for big flying vehicles like airplanes. A list of all entity classifiers in TİD can be seen in the Appendix-A.

Figure-69 The Flat-hand shape CL for vehicles (DOLMUŞ GELMEK ve DURMAK / MINIBUS-COME and STOP)

5.2.2. Handle Classifiers in TİD

In Handle Classifiers, the handshapes which are observed in entity classifiers are applied to transitive verbs. For instance, the Flat-Hand is used as an entity CL for wide and flat objects. When the handshape is used with a transitive verb specified for "large and bulky direct objects" (Zwitserlood 2003, p. 95) it becomes a handle classifier. These types of classifiers are also seen in Turkish Sign Language: Figure-70 shows a handle classifier for picking a cigarette out of the cigarette packet and giving it to someone else. The cigarette is indicated with the I-handshape as entity classifier; however, giving this cigarette to someone else is expressed with the O-handshape as handle classifier.

Figure-70 The O-handshape as Handle Classifier ($_{i}$ VERMEK:S-SİGARA $_{j}$ / $_{i}$GIVE:CL-CIGAR$_{j}$)

5.2.3. SASSes in TİD

Size and Shape Specifiers (SASSes) stand for the physical appearances or properties of objects. There are two kinds of Size and Shape Specifiers: Static and Tracing SASSes. "Static SASSes are similar to entity classifiers in that the hand configurations represent noun referents…. Tracing SASSes, in contrast, have very different characteristics" (Zwitserlood, 2003: p.153). Tracing SASSes cover one-dimensional (pole), two dimensional (rectangular object) and three dimensional (surfaces) objects. Figure-71 shows a tracing SASS depicting a picture frame:

Figure-71 Tracing SASSes (from Valli & Lucas, 2001: p.87)

In TİD, the C-handshape or U-handshape (Narrowed C-handshape) are commonly observed as static SASSes. As Tracing Classifier, the I-handshape is mostly used to specify different shapes (as in Figure-71), covering 2-D geometrical shapes, whereas the Claw handshape or Flat Hand are used generally to identify 3-D Shapes.

5.2.4. The Use of Classifier Constructions in TİD

Aronoff et al. (2005) emphasize that two different classifiers can be used simultaneously: for instance, in ISL, the proposition "A cup (CL-spherical) is

standing next to a newspaper (CL-flat, wide)" includes two different entity classifiers. In TİD, this situation is also observed. In Figure-72, the ASL C-handshape refers to a glass and the ASL A-bar-handshape refers to a teapot.

Figure-72 (rh) entity CL: ASL C-HANDSHAPE ‘‘He is holding the glass’’
(lh) handle CL: ASL A-BAR ‘‘He is pouring tea into the glass from the teapot ’’

Note that in Figure-72, the classifier sign for teapot, which has the A-bar-handshape, combines both an entity classifier and a handle classifier. The thumb in the sign ÇAYDANLIK / TEAPOT refers to the form of the snout of the teapot, on the other hand, the other fingers form a fist, specify the holding of the teapot. At the same time, the fist also refers to the round form of the teapot. This sign is an example of the composition of a classifier by both an entity and a handle classifier.

In Figure-73, the signer uses the V/2-handshape indicating himself and the Flat-Hand referring to a minibus (Figure-73-a). Interestingly, he continues with these two entity classifiers as a "frozen" sign "BİNMEK" (GET-ON) (For a detailed discussion of "frozen" signs, see 5.2.5).

Figure-73 (a)(rh) entity CL:V-HANDSHAPE ‘‘I was standing there’’
(lh) entity CL: FLATHAND ‘‘A minibus is standing’’
(b)(rh) entity CL:V-HANDSHAPE ‘‘I got on the minibus’’
(lh) entity CL: FLATHAND refering to a “minibus”

Classifiers are also observed in compounds. These compounds may be formed from one Classifier root, e.g.: DOMATES (TOMATO: Adjective + Classifier: RED^CL:CLAW “spherical object”) (see Figure-55).

5.2.5 Frozen (Lexicalized) Classifiers in TİD

It is commonly assumed that many signs are derived from different types of classifier constructions (Sandler and Lillo-Martin, 2006). Aronoff et al. (2003; p.69) describe this situation as follows: “*CLs may become fully lexicalized, i.e., the handshape has lost its morphological character and is not flexible anymore but has merely phonological quality*.” Like the sign FALL in ASL (Supalla, 1986 as cited in Sandler & Lillo-Martin, 2006), the TID sign DÜŞMEK (FALL) is an example of a lexicalized classifier. Moreover, the roots of some lexicalized spatial verbs like WALK, DRIVE, and WANDER are mainly classifier predicates. Engberg-Pederson (1993, as cited in Sandler and Lillo-Martin, 2006) claims that there is “a continuum” between lexical spatial verbs and classifier constructions. Sandler and Lillo-Martin (2006, p.103) give an example from ASL: The sign IRON which is obviously rooted in a handling classifier has a transparent movement indicating its being lexical.

Figure-74 lexicalized classifier BERABER (TOGETHER)

The example seen in Figure-74, BERABER (TOGETHER) stems from my small TİD corpus project. The ASL A-Bar-handshape is used on both hands. Initially, it might have been a dual entity classifier and afterwards it became a "frozen" sign. (See also Zeshan's hierarchical list of human-being classifiers.) Schembri (1996) and others propose that lexicalized signs may be "melted." Cogill-Koez (2000) explains this phenomenon in the following way: Signers are aware that the "frozen" signs are constructed from classifier predicates and may transfer these frozen signs back into classifier predicates whereby they lose their abstractness and regain their initial transparent meaning. Such phenomena are also observed in TİD. In Figure-75-a the signer uses the sign KAYIT (REGISTRATION) which is a "frozen" sign, then he preserves the non-dominant hand (CL: FLAT-HAND, a CL handshape referring to PAPER), while the dominant hand uses BAŞVURMAK (APPLICATION). This example is comparable to an example of "melting" in ISL (Israeli Sign Language) given by Sandler and Lillo-Martin (2006, pp. 96-97), including the same entity classifier for paper.

Figure-75 (a) KAYIT /REGISTER "frozen CL"
(b) (rh) BAŞVURU / "APPLY FOR"
(lh) entity CL:FLATHAND ''the paper ''

5.3 List of Classifiers in TİD

Table-14 lists the classifiers found in TİD. The table comprises entity, SASS, and some handle classifiers.

Table-14 Combined List for entity, SASS and some Handle Classifiers in TİD

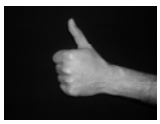
Handshapes
 **I-HANDSHAPE** Long-thin objects, Human-being (non-honorific, Zeshan,2002)
 **FLAT-HAND** Flat Objects, surfaces, vehicles (cars, minibuses, bicycles)
 **V/2-HANDSHAPE** Standing or walking human being
 **ASL A-BAR** Honorific human-being (Zeshan,2002) and bottle or alcohol, drinks
 **5-HANDSHAPE** Plural non-honorific human-beings
 **ASL O-HANDSHAPE** Cylindrical objects (i.e. telescope)
 **HORN-HANDSHAPE** Square objects (mainly used with I-handshape) e.g. HAVUZ (SWIMMING-POOL)
 **HOOKED FLAT EXTENDED** Small spherical objects

Table-14 Combined List for entity, SASS and some Handle Classifiers in TİD (cont.)

Handshapes	
	**O-HANDSHAPE** Small round objects (coins)
	**ASL S-HANDSHAPE** Handling objects (bags, buckets, baggage) Vehicles (i.e. drive)
	**ASL Y-HANDSHAPE** Airplanes

5.4 A Survey of Animal Classifiers in TİD:

According to Supalla (1990, see Hong (2003)) there are four groups of animal classifiers: (1) limb classifiers (body part classifiers), (2) legged object classifiers, (3) whole body classifiers and (4) relatively unmarked classifiers. Body part classifiers stand for body parts of human beings or animals. Similarly, limb classifiers refer to the legs and/or feet of an animal (Hong, 2003, p.79). Legged object classifiers are classifiers in terms of the number of legs of the animal. Whole body classifiers, unlike legged object classifiers, refer to the whole body of the animal or the human body. Relatively unmarked classifiers cover other classifiers used for objects.

In Hong's empirical survey (2003) of animal classifiers in Korean Sign Language (KSL), semantic and body part classifiers are investigated. His study refers to a bigger research on animal classifiers with the corpus including 1300 occurrences. A similar model of a show-jumping course with similar obstacles was prepared and used to identify animal classifiers in TİD (see Figure-5 and section 2.1.2 on the elicitation of classifiers). This model was presented to four TİD native signers in order to understand which classifier types are used for animals and whether they differ from the human classifiers. Subjects were asked to describe how the various

animals – a horse, a worm, a cat, a frog, a cow, a snake and a spider - would pass through the course.

In this study, the Flathand, Hooked V-handshape, Index finger, Hooked Extended Flathand and Bent Flathand were used as limb classifiers, as well as the Flathand, the index finger and the closed V-handshape (TİD 7-handshape) for whole body classifiers (See Table 15). Legged object classifiers are signed with the hooked V-handshape, V-handshape, the Hooked extended Flathand, Closed Hooked V-handshape, 8-handshape and HFE-4 handshape.

Table-15 Classification of classifier in terms of handshapes used in the study.

	Limb	**Legged object**	**Whole Body**
Flat Hand	**x**	**-**	**x**
Hooked V-handshape	**x**	**x**	**-**
V-handshape	**-**	**x**	**-**
Index Finger	**x**	**-**	**x**
Closed V-handshape	**-**	**-**	**x**
Hooked Flat Extended	**x**	**x**	**-**
Bent Flat Hand	**x**	**-**	**-**
Closed Hooked V-handshape	**-**	**x**	**-**
8-handshape	**-**	**x**	**-**
HFE-4 handshape	**-**	**x**	**-**

The frequency of handshapes as they are used in classifiers in the TİD corpus can be seen in Table-16. Both the Hooked V-handshape (together with the V-handshape) and the Flathand are used most frequently as limb, legged object and whole body classifiers. However, various strategies observed in KSL such as using the 4-Closed V and the 4- V-handshape for four-legged animals (horse, cat, frog, and cow) were not observed in TİD. In TİD, animals with four legs do not have specific legged object classifiers. What is more, for animals without legs (worm, snake), humans,

two-legged animals (chicken) and animals with many legs (spider) similar classifiers are used. Worm and Snake are represented by the index finger as a whole body classifier. However, when the participants wanted to express that the snakes and worms were jumping and bouncing, they used the general classifiers for these actions, e.g. the V-handshape. Moreover, classifiers used for humans and chicken are similar, which is probably due to the same movements made in order to overcome the obstacles. Spiders are represented with the 5-handshape, the Hooked extended Flathand, the 4-handshape and the 8-handshape.

There have been observed some switches between limb classifiers and whole body classifiers or legged object classifiers. TİD has flexible zooming in and out of the actions from wider to closer perspective and vice versa. In closer perspective, TİD native signers prefer limb classifiers, whereas in wider perspective they use whole body classifiers. For example, one TİD signer used both a whole body classifier and a limb classifier for showing how a cow zigzagged through a course of obstacles, as in Figure-76. He started with V-handshape indicating that the cow is walking towards the flag and passing the first flag (Figure-76-a), then, immediately, he switched to the limb classifiers (Figure-76-b). Afterwards, he used a different kind of classifier with the ASL Y-handshape specifying the horns during the second flag (Figure-76-c). Then he switched to the limb classifiers (Figure-76-d). Apart from zooming in and out, this example shows another property of TİD classification, namely to separate path and manner movements if the path movement is not straight and therefore becomes morphologically more complex. This property is shown by the signer indicating the zigzagging of the cow by three different points between which the movement took place and to use internal hand movements indicating the cow's stamping. Thus, manner and path are signed separately, i.e. the points (locations) refer to the path and the hand-internal movements to the manner.

Figure-76 a-d COW zigzagging through a course with flags
(a) COW-CL: LEGGED-OBJECT
(b) COW-CL: LIMB: (with zigzagging movement)
(c) COW-CL: BODY PART CL
(d) COW-Cl-LIMB.

Another good example in TİD for zooming in and out in the use of TİD classifiers can be seen in Figure-77, in which the signer shows how the cat is jumping on a wall. Unlike in Figure-77, there is a zooming out in order to show how the cat is jumping on the wall. The signer firstly used the limb classifier, in playing the role of the cat, looking upwards to the wall (zooming in). When it came to jumping on it, he stopped the role of the cat and signed the jumping movement with a legged-object classifier (zooming out.) Hence, we can say that limb classifiers are preferred for zooming-in actions, whereas legged-object classifiers and whole-body classifiers are good for zooming-out actions, to capture whole actions from a wider perspective.

Figure 77 CAT Obstacle: jumping on the wall, Animal: Cat:
KEDİ ATLAMAKCL: LİMB ATLAMAKCL: LEGGED-OBJECT
(Flat Hand:2-h) (V-shape)

Cogill-Koez's (2000) explanation of a continuum between "melted" and "lexicalized" classifiers is also applicable to the data obtained in this elicitation task. In Figure-78, the signed action is a worm jumping on a trampoline: the dominant hand refers to the worm and the non-dominant one to the trampoline. First, the signer's dominant hand was the Index finger (Figure-78-a) which is generally used for long/thin objects. When it came to bouncing he immediately switched to the V-handshape (Figure-78-b). In other words, the CL of the bouncing sign was so strong that it dominated the regular use of the index finger as a CL for the worm. This situation indicates that TİD may have many strong frozen CLs which result from a lexicalization process during which classifiers lost their transparency (Cogill-Koez, 2000). Hence, from Table-17, which will be discussed later, it becomes clear that animals generally did not behave distinctively in terms of the number of legs they have; rather, frozen classifier verbs are applied to the animals. In terms of classifiers, the animals are not treated differently from human beings.

Figure-78 WORM Obstacle: Trampoline, Animal: Worm:
SOLUCAN ATLAMAKCL: WHOLE-BODY ATLAMAKCL: LEGGED-OBJECT
(Index finger) (V-handshape)

Table-16 Frequency of Classifiers for each animal.

	worm	chicken	horse	cat	frog	spider	cow	snake	human	total
Flat Hand	10	8	17	13	18	8	10	8	4	96
Hooked V-shape	8	18	11	15	7	2	12	-	16	89
V-shape	6	2	2	5	1	3	3	1	8	31
Index Finger	9	4	-	-	-	-	-	13	-	26
Closed V-shape	1	2	-	3	1	2	4	1	7	21
Hooked Flat Extended	-	-	-	-	-	12	-	-	-	12
Bent Flat Hand	-	1	1	1	1	1	1	-	-	6
Closed Hooked Vshape	-	-	-	2	-	-	1	-	-	3
8-shape	-	-	-	-	-	2	-	-	-	2
HFE-4shape	-	-	-	-	-	1	-	-	-	1

Table-17 Frequency of Classifiers for each obstacle/manner of movement.

	upstairs	slipping	swimming	climbing	jumping	standing	zigzagging	bouncing	walking	others
Hooked V-shape	11	14	-	6	17	7	3	17	6	-
Flat Hand	17	15	10	2	5	5	16	1	17	11
Index Finger	2	2	-	-	1	1	7	-	10	1
Baby-O handshape	-	-	-	-	-	-	-	-	-	6
Closed V-shape	-	3	-	-	1	-	7	-	6	6
V-shape	4	1	-	1	2	-	-	9	6	16
Hooked Flat Extended	2	-	-	2	-	1	2	1	2	-
8-shape	-	-	-	-	-	-	7	-	1	1
HFE-4shape	-	-	-	-	1	-	-	-	-	-
S-shape	-	-	-	7	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	2
Bent Flat Hand	2	-	-	-	-	1	-	-	-	3

Table-16 shows a cross-classification of animals and used handshapes. When the frequencies are analyzed, some categorizations can be made, as in Table-18. It is obvious that some animals may have specific handshapes, as in legged, limb and whole-body classifiers (For more details, see APPENDIX-5.) However, as can be seen in Table-16, the animals may be signed with different handshapes even though this is observed rarely. In order to explain this, it is necessary to look at the dimension between the obstacles and handshape usage in Table 17. It is obvious that some obstacles have a strong effect on the use of the animal classifiers. For example, the handshape group used by TİD native signers in the trampoline obstacle, which involves bouncing, is the V-handshape group. As shown in Figure 78, even worms may be signed with the V-handshape.

Table-18 Handshape & Animal Type Dimension:

	V-shape Group	Flat Hand Group	Index Finger	Hooked Flat Extended
Worm	-	x	x	-
Chicken	x	-	-	-
Horse	x	x	-	-
Cat	x	x	-	-
Frog	-	x	-	-
Spider	-	x	-	x
Cow	x	x	-	-
Snake	-	-	x	-
Human	x	-	-	-

Table-19 Motion & Handshape dimensions

	V-shape Group	Flat Hand Group	Index Finger
Upstair	x	x	-
Slipping	x	x	-
Swimming	-	x	-
Climbing	x	-	-
Jumping	x	-	-
Zigzagging	-	x	x
Bouncing	x	-	-
Walking	-	x	x

Moreover, contrary to KSL, in TİD each obstacle has its own characteristic frozen classifier. As can be seen in Table-17 and Table-19, which generalize the handshapes with respect to the obstacles, “climbing the ladder” triggers mostly the Hooked V-handshape (and V-handshape) with internal movement and the Flat hand (mostly two-handed, where each hand represents one foot and the feet move upwards step by step). “Slipping” is similar in manner with “going upstairs”, i.e. if one participant used the Flat Hand for “going upstairs” with a movement of the two hands, the flat hand is also used for slipping. “Swimming” is only applied for some

animals and even though animals' swimming behaviors are different, they are all signed with the Flat Hand, as characteristic of human swimming. Again, this is arguably a frozen classifier. “Jumping” and “bouncing” are represented by the Hooked V-handshape or the V-handshape. According to the obstacles, we can categorize the verbs as follows: (i) frozen verbs: swimming, jumping, bouncing, going upstairs, slipping, climbing; and (ii) verbs varying in terms of the kind of animal: zigzagging, walking.

Analyzing both Table-16 and Table-17, classifiers in TİD encode the following aspects: (1) kind of animal, (2) kind of obstacle /kind of manner (3) Size and Shape of the animal. The animals can be grouped as animals without legs, animals with legs and animals with more than 4 legs, in terms of whole body classifiers and limb classifiers. According to Table-19, various obstacles affording a certain manner of movement are signed similarly, especially with frozen verbs like “going upstairs”, “slipping”, “climbing”, “jumping” and “bouncing”. Finally, the size and shape of the animal also affect the classifier use, for example snakes and worms are identified by the index finger, and frogs are signed by flat hand classifiers.

Even though some animals can be indicated with their specific entity classifiers during overcoming obstacles, native TİD signers preferred to use frozen classifier verbs. For example, snakes, crawling over the ladders, can be signed with the Index finger, which is generally used for snakes as entity classifiers; however, TİD native signers rather used the V-handshape or the hooked V-handshape for overcoming the obstacle by “going upstairs”. I argue that TİD may be a less iconic and more lexicalized language. Some classifiers used for some obstacles have become fully lexicalized so that these classifiers can be applied to any objects even if they have different entity classifiers. This suggests that there are many frozen classifier verbs in TİD which have evolved from iconic bases and became lexicalized.

Summing up, three dimensions of classifiers (kind of animals, kinds of obstacles / manner of movement and handshapes of classifiers including all three kinds of classifiers) were investigated in TİD. It can be said that, contrary to KSL, TİD

signers prefer to use frozen CL verbs. In KSL, the number of legs is important for signers, as when the 4-V or 4-U handshape is signed with two hands. Use of two hands in CLs is fairly iconic. As has been observed, initially signs are used that are more iconic, however, throughout the historical process they convert into more abstract ones, i.e., the use of one hand instead of two hands is fostered because it is easier to sign that way.

5.5 Plural strategies in TİD

TİD seems to have strong relations between classifiers and plurals. Therefore, plural strategies of TİD will be discussed in the classifier chapter.

In the plural elicitation experiment, signers signed some pictures with four different types of plurality properties (i.e. singular, dual, paucal, plural). TİD native signers preferred to use quantors, adjectives with plural properties and classifiers over nouns with plural properties. 77 pictures were shown to five native signers. They preferred to use quantors (31% for mostly singular, dual and paucal nouns), adjectival plurals (12% for mostly dual, paucal and plural nouns), and classifers (41% for mostly dual, paucal and plural nouns). In the analysis, 9% of signs are undefined, i.e. signers did not use any quantor, adjectival or classifier use for plural marking. However, I observed 7% of recursive use of plural marking (i.e. using both location and movement to indicate plural nouns).

The strategies for indicating plural in TİD can be classified in three groups: (1) nouns with plural property, (2) adjective phrases (quantors, adjectives and adjectives taking plural property) and (3) classifiers.

5.5.1. Noun with plural property

Even though this strategy has been used rarely (2 out of 385 sign), reduplication and sideward reduplication of noun is one way to indicate plural in TİD. This strategy has been discussed in Plural part in morphology chapter (see section 4.2.2 Pluralization).

5.5.2. Adjective Phrases

Nouns in adjective phrases never take the –lar (-ler) suffix in Turkish. For example, while in English adjective phrases nouns take a plural suffix, as in "three books", nouns in Turkish adjective phrases do not take any plural suffix, as in "üç kitap". Similarly, TİD native signers can use quantors, or adjectives which have plural meaning to indicate the plurality of nouns. Moreover, adjectives in TİD, surprisingly, can be marked with plural properties, too.

(i) Use of Quantors: If the objects can be counted easily (if the quantity is up to 7, more or less), native TİD signers can use a quantifying phrase to define the quantity of nouns like KİTAP BİR (a book) , ARABA KIRMIZI İKİ (two red cars), KALEM ÜÇ (three pencils), BEŞ YILDIZ (five stars). It is fairly common to use quantors for singular objects, i.e. utilization of quantors: 89% for singular, 47% for dual, 30% for paucal and 3% for plural nouns. It is obvious that the higher the rate of utilization of a quantor the easier to count the objects.

(ii) Use of Adjective: Some adjectives have plural meaning, like ÇOK (many), FAZLA (too many), KALABALIK (crowded), KARIŞIK (mixed), SIRA (lined up) and SAYI (counted). These adjectives have been used to indicate the plurality of nouns, e.g., KİTAP KARIŞIK (the books are spread) and KADIN FAZLA (many women). Unlike quantors, the use of adjectives is common for objects in great quantity, i.e. no adjectives were observed among singular and dual nouns, 3% for paucal and 13% for plural nouns. It is obvious that the higher the rate of utilization of adjectives, the harder to count the objects.

(iii) Adjectives with plural property: Some adjectives can take on plural property, which may happen in three ways: reduplicating the same adjective, using different adjectives (i.e. colors) for each noun and using a generalized adjective. The adjective can have a locative reduplication, as in BEBEK İKİ GİYSİ AYNI AYNI / BABY TWO CLOTHES SAME SAME (Two babies with the same clothes). Indicating different properties of the objects can be used as a strategy for pluralization of a noun, as in YILDIZ MAVİ SARI MOR / STAR BLUE YELLOW

PURPLE (three stars: blue, yellow, and purple). Here, the different colors allow us to understand that there is more than one star (see Figure-79):

(a) STIMULI- 3 stars in different color

(b) YILDIZ / STAR

(b) MAVİ / BLUE

(d) SARI / YELLOW

(e) MOR / PURPLE

Figure-79 (a) the stimuli: three stars in different colors (b) STAR (c) BLUE (d) YELLOW (e) PURPLE: use adjective as a plural strategy

Another strategy is the use of a generalizing adjective. The specific adjectives can be modified as in ÜÇ YEŞİL AGAÇ AYNI$_S$ (dairesel hareket) / THREE GREEN

TREE $SAME_{CL}$ (circular movement) (see Figure-80). The adjective AYNI is generalized for the three trees and has a circular movement.

Figure-80 generalizing adjective: ÜÇ YEŞİL AGAÇ $AYNI_S$ (dairesel hareket) / THREE GREEN TREE $SAME_{CL}$ (circular movement)

Not only circular movement, but also locative reduplications, or adding a path movement is observed in adjectives. Therefore, it can be concluded that adjectives can be modified for plural properties.

5.5.3. Using Classifiers for Plural

The quantity of some nouns can be identified by classifiers. These are CLASS classifiers (e.g. Zwitserlood, 2003), some of which are one-handed, some of which are two handed (see Table-20). Most one-handed classifiers can be expressed with both hands to show their plurality ($ARABA_{CL}$, $ELMA_{CL}$ ... etc.). Some two-handed classifiers can be separated and both hands may behave like one object ($AĞAÇ_{CL}$, $KİTAP_{CL}$).

However, some classifiers, which are not related to the object, were also used to indicate their plurality as seen in the Table 21. 5-shape was used for cats, and people to indicate location or movement of these objects. The Hooked Flat Extended hand-shape is sometimes used to show the object's location. I call these classifiers "general classifiers.

Table-20 List of Classifiers found in the data elicitation

Classifiers	One/Two handed	Handshape
SANDALYE / CHAIR	Two handed	Hooked V shape
AĞAÇ / TREE	Two handed	5 hand
ÇOCUK / CHILD	One handed	Baby-O Shape
KEDİ / CAT	One handed	Baby-O Shape
ARABA / CAR	One Handed	Flat Hand
ELMA /APPLE	One Handed	Hooked Flat Extended
YILDIZ / STAR	Two Handed	Closed V shape
EV / HOUSE	Two Handed	Flat Hand
KİTAP / BOOK	Two Handed	Flat Hand
KALEM / PENCIL	One Handed	Index Finger
BISIKLET/ BICYCLE	One Handed	Flat Hand
BARDAK / GLASS	One Handed	C-Shape/Hooked Flat Extended

Table-21 General Classifiers observed in the data elicitation

General Classifiers	One-/Two-handed	Objects
5-shape	Two handed	ARABA, EV, BISIKLET, YILDIZ, AĞAÇ
Hooked Flat Extended	Two handed	KEDİ, KADIN, ÇOCUK, BARDAK

The use of classifiers as a plural strategy is analyzed into one- and two-handedness of classifiers. For plurality of one-handed classifiers, the use of locative reduplications was observed or alternatively adding path movements. A strategy for two-handed classifiers can be to use “dual classifiers”, locative reduplication, or adding path movement.

a) One Handed Classifiers

The use of one-handed Classifiers is more frequently observed in paucal nouns (23%) than in plural nouns (12%). One handed classifiers can be marked by locative

reduplication, straight movement, circular movement, or both locative reduplication and circular movement.

(i) Locative Reduplication

Locative reduplications can be either serial as in $ARABA_{CL}$ (x3) or random locations can be used as in $KEDİ_{CL}$ (x6). Reduplications occur at most 6 times. No more than 6 reduplications have been observed.

1) Serial locations

Serial locations are usually signed with sideward reduplication from left to right. These reduplications with one-handed classifiers occur at most 6 times. Serial locative classifiers are used for paucal nouns (22%) more than for plural nouns (10%). Series are preferred to define objects whose quantity is up to 6 and whose locations are well ordered. In ÜÇ ARABA $ARABA_{CL}$ (x3) (Figure-81), the native TİD signer reduplicates $ARABA_{CL}$ three times, after signing the quantor and ARABA. Note that by adding CLs to the quantified noun a full locative phrase results: “Three cars are standing $there_{1,2,3}$”.

(a) STIMULI

(b)ÜÇ/THREE

(c) ARABA/CAR

(d)ARABA$_{CL-1}$

(e)ARABA$_{CL-2}$

(f)ARABA$_{CL-3}$

Figure-81 ÜÇ ARABA ARABACL (x3)

2) Random Locations

There have been observed reduplications in random location as in KEDİ KEDİ$_{CL}$ (x6 rasgele) / CAT CAT$_{CL}$ (x6 randomly) (Figure 82). Random reduplications have been rarely observed in the data, and it is mainly used for paucals which do not have a sequential order. In the picture to be signed by the participants, there were twelve cats; however, the signer reduplicated the classifiers 6 times. It can be concluded that reduplication may occur up to 6 times at most.

Figure-82 KEDİ KEDİCL (x6 rasgele) / CAT CATCL (x6 randomly)

3) Adding path movement

Aside from reduplication, one-handed classifiers may be modified by adding a path movement to indicate the plurality of nouns. For instance, as in $ARABA_{CL}$ /CAR_{CL} (straight movement) in Figure-83, one participant moved the CL $ARABA_{CL}$ from left to right with her dominant hand while on her non-dominant hand she used a classifier for the road.

Figure-83 (a) dom: $ARABA_{CL}/CAR_{CL}$ (b)dom: $ARABA_{CL}/CAR_{CL}$ (movement)
non-dom: $SOKAK_{CL}$ /$ROAD_{CL}$ non-dom: $SOKAK_{CL}$ /$ROAD_{CL}$
$ARABA_{CL}$ (düz hareket) /CARCL (straight movement)

b) Use of Two-Handed Classifiers

Two-handed classifiers behave similar to one-handed ones. As mentioned in the introduction to the plural strategies for TİD, some classifiers are actually two-handed, such as $AĞAÇ_{CL,}$ EV_{CL}, $KİTAP_{CL}$, $SANDALYE_{CL}$ and $YILDIZ_{CL}$. While all one-handed classifiers can also be signed with both hands as a plural strategy, this is not possible for two handed classifiers.

Two handed classifiers can be marked by locative reduplication, straight movement, circular movement, or both locative reduplication and circular movement. The use of two-handed Classifiers is observed more frequently in plural nouns (46%) than in paucal nouns (12%).

(i) Dual Classifiers

Sign Languages have the advantage over spoken language of having two hands at their disposal. One-handed classifiers can be signed with two hands indicating that there are two objects, as in $ARABA_{CL\text{-}2H}$ /$CAR_{CL\text{-}2H,}$ $ELMA_{CL\text{-}2H}$/$APPLE_{CL\text{-}2H}$ (Figure-84).

Figure-84 (a) stimuli for two apples (b) $ELMA_{CL\text{-}2H}$/$APPLE_{CL\text{-}2H}$

(ii) Locative Reduplication

Locative reduplication can occur in either serial or random locations. When one-handed classifiers are modified for plural with both hands, they can be signed either symmetrically or alternately. Two-handed reduplications occur at most 3 times, presumably since the use of two hands increases the morphological complexity.

a) Serial Locative Reduplication

Serial reduplications are mainly observed with paucal nouns and have at most three sideward repetitions from left to right. As in KİTAP $KİTAP_{CL}$ (x3) in Figure-85, the native signer wanted to explain there are a few books put side by side from left to right.

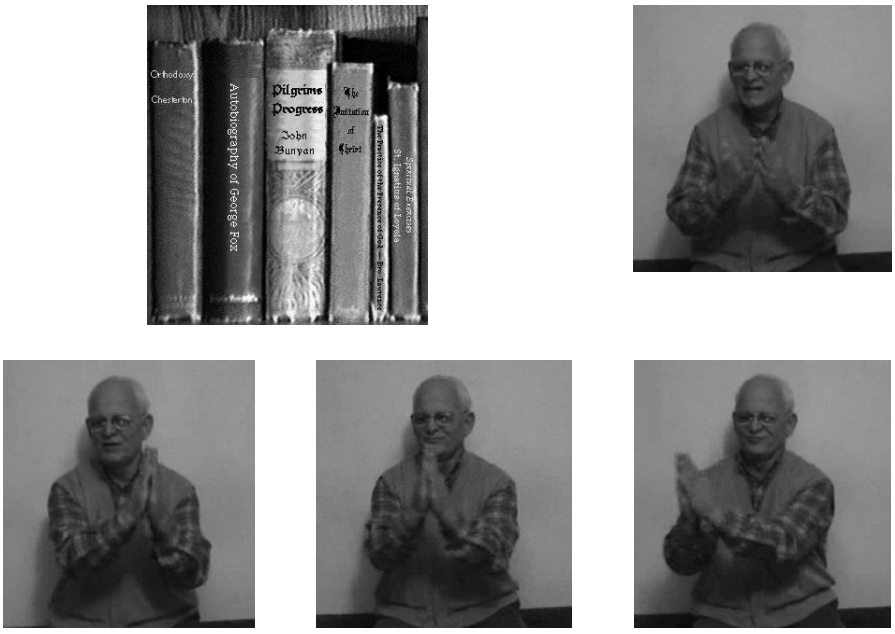


Figure-85 KİTAP $KİTAP_{CL}$ (x3)

a-1) One hand static / one hand moving

In one of the plural strategies in TİD, the dominant hand performs sideward reduplication while the non-dominant hand is static, indicating the beginning of the series of locations. The dominant hand can perform reduplications vertically (bottom-up) or horizontally (from left to right), at most 6 times. In this case, the dominant hand behaves like a one-handed classifier; therefore it may have more than three reduplications.

In Figure-86, when a native TİD signer intended to explain that some books were located on top each other, the non-dominant hand referred to the first book and with a few upward reduplications, she showed how many books there were.

(a) STIMULI

(b) KİTAP / BOOK

dom:KİTAP$_{CL-1}$
non-dom: KİTAP$_{CL}$

dom:KİTAP$_{CL-2}$
non-dom: KİTAP$_{CL}$

dom:KİTAP$_{CL-3}$
non-dom:KİTAP$_{CL}$

Figure-86 KİTAP KİTAP$_{CL}$ (x3) (vertically locative reduplication)

a-2) Both Hands Moving

Two-handed classifiers, in which both hands are used, can be reduplicated by both hands moving symmetrically or alternately. As in Figure-87, $ELMA_{CL}$ (2H x 3-alternating), the participant alternately located the apples and showed how many apples there were.

(a) STIMULI

(b)ELMA/APPLE

(c)$ELMA_{CL\text{-}2H\text{-}1}$

(d)$ELMA_{CL\text{-}2H\text{-}2}$

(e)$ELMA_{CL\text{-}2H\text{-}3}$

Figure-87 $ELMA_{CL}$ (2H x 3-alternating)

As in Figure-88, for $SANDALYE_{CL}$ /$CHAIR_{CL}$ (2H x 3 - symmetrical), the participant symmetrically located the chairs and showed there were a few chairs in a row. Symmetrical movements are also a strategy to show the quantity of objects.

Figure-88 SANDALYE$_{CL}$ /CHAIR$_{CL}$(2H x 3 - symmetrical)

a-3) Adding Movement

Two-handed classifiers also take a plural morpheme by (i) adding path or (ii) circular movements:

(i) *Adding Straight Movement*: Path movements as a plural morpheme refer to more than six objects, located on a straight line.

(a) *One hand Static / One hand moving*: Like in Reduplication of Location where the dominant hand is moving and the non-dominant hand is static, the strategy of adding movement to the sign shows a similar behavior. The difference is that it refers to more than six items. As can be seen in Figure-89, when a native TİD signer was intending to explain that many books are located on top of each other, the non-dominant hand refers to the first book and with upward movements the dominant hand expresses how many books there may be.

Figure 89 dom: KİTAP$_{CL}$ (movement)
non-dom: KİTAP$_{CL}$

(*b) Both hands moving*: Another plural strategy in TİD is to add a path movement to both hands. For instance, for signing AĞAÇ$_{CL}$ (straight movement) /TREE$_{CL}$ as in Figure-90, the two hands move contra-laterally, starting from the location nearest to the chest (see Figure-90). Thus, the notion of an "alley" is conveyed by a CL construction.

Figure 90 AĞAÇ$_{CL}$ (straight movement) /TREE$_{CL}$ =alley

(ii) Adding Circular Movement: Adding circular movements is applied for objects whose locations are random. As in Figure-91, the native TİD signers, trying to describe the many stars in the sky, used circular movement with the star classifier: YILDIZ$_S$ (dairesel hareket) / STAR$_{CL}$ (circular movement).

Figure-91 YILDIZ$_S$ (dairesel hareket) / STAR$_{CL}$ (circular movement)

5.5.4. Recursion (Location & Movement)

Unlike in paucals (which are most frequently expressed with a locative) and plurals (which are most frequently expressed with a movement), both locative reduplication and adding path or circular movement can be used for "big plurals". Plural objects neatly arranged in two-dimensions can be expressed by (i) multiple curved line CLs (as in Figure-92-a), (ii) multiple straight line CLs (as in Figure 92-b), (iii) simultaneous number classifiers on fingers from "2" to "5" along with a straight line CL (as in Figure-92-c) and (iv) CLs indicating different horizontal and vertical locations (as in Figure 92-d).

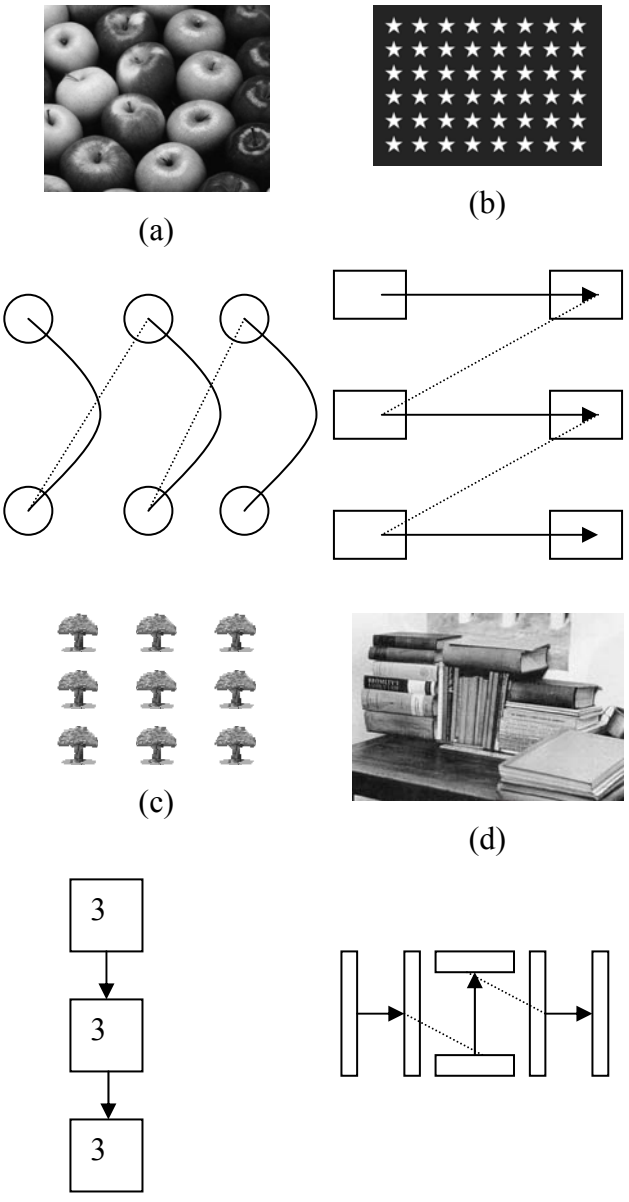


Figure-92 a-d Recursion types in TİD plural

5.5.5. Discussion

Four sets for plural markings have been observed in TİD: singular, dual, paucal (small plurals), and plural (see Figure-93). Skipping through the various sets, native signers utilize different strategies of adding plural morphemes.

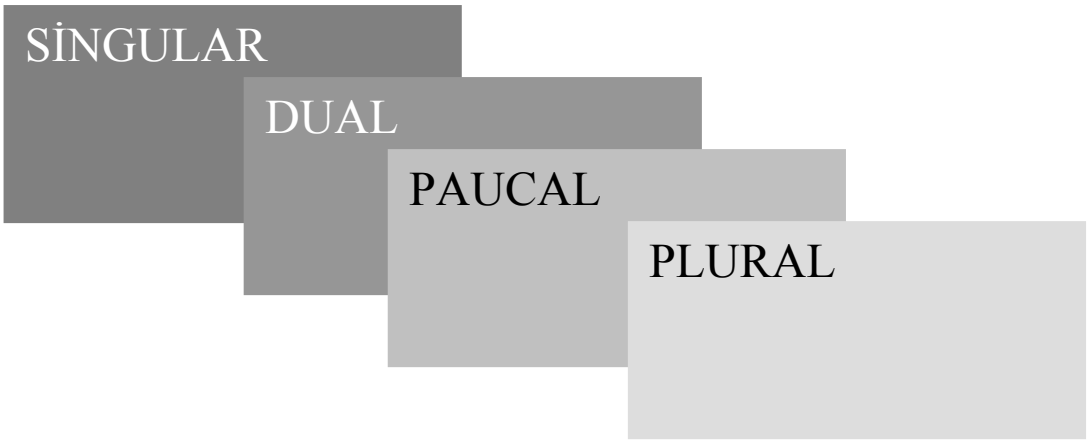


Figure 93 Constraint skipping: Singular < Dual < Paucal < Plural

Singular objects are identified with the word itself or with a quantor (BİR / ONE). As can be seen in Table-22, the use of quantors is observed most frequently in the singular set (89%). The use of quantors starts to decrease when the quantity of objects increases: for the dual set (47%), paucal set (30%) and plural (3%). We can thus state an interaction between these strategies: quantors are mainly used within the singular set.

For stimuli with two objects, either quantors or classifiers can be used. The use of dual classifiers (14%) is only seen in the dual set. Classifiers with locative reduplication are also observed in this set (20%).

In the paucal set, the use of locative reduplication is more frequently observed than in other sets (dual set (20%), paucal set (42%), and plural set (31%)). Adding path (3%) or circular (1%) movements is not observed as frequently as the use of locative reduplication.

Movement as plural strategy is more frequently seen in the plural set (26%), and the recursive use (15%) is seen only in this set. The usage of movement and recursion is more related to the plural set.

Table-22 the frequencies of the strategies for each four sets

	Quantor	**Dual Classifiers**	**Locative Reduplications**	**Path Movement**	**Circular Movement**	**Recursion**
Singular	89%	-	-	-	-	-
Dual	47%	14%	20%	-	-	-
Paucal	30%	-	42%	3%	1%	-
Plural	3%	-	31%	26%	2%	15%

Table-22 summarizes the percentage of the various plural strategies for the various number sets. As we skip through the sets in Figure 93; the following strategy changes can be derived from this table: [Quantors < Dual Classifier < Locative Reduplication < Straight Movement < Circular movement < Recursion]. The number sets can be thought of as constraining the use of plural strategies, not in a deterministic but in a probabilistic way.

In the following, I will give an example for how each number set constrains the plural strategy, using the sign ARABA/CAR (see Figure 94):

(i) The Singular selects mostly the quantor strategy ARABA BİR / CAR ONE (Figure 94-a)

(ii) The Dual selects mostly dual classifiers $ARABA_{CL\text{-}2H}$ (Figure 94-b)

(iii) The Paucal selects mostly locative reduplication, as in $ARABA_{CL\text{-}2H}$ (Figure 94-c)

(iv) The Plural selects mostly movement, as in $ARABA_{CL\text{-}2H}$ (straight movement)

(v) The Big Plural selects mostly recursion, as in $ARABA_{CL}$ (recursion)

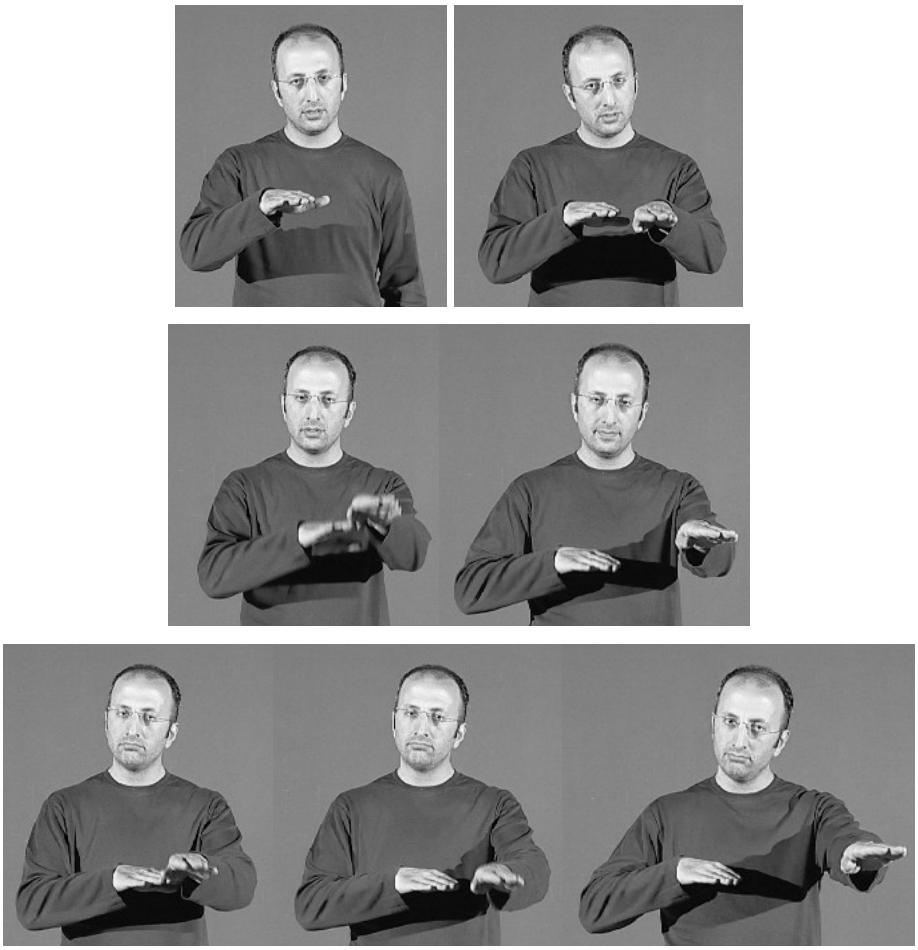


Figure-94 Singular, Plural and Paucal steps

Overall, we can derive two conclusions: (i) there is a (probabilistic) relation between number sets and number strategy and (ii) strategies are somewhat overlapping for adjacent sets.

Another point is that comparing the four sets, two-handed classifiers precede one-handed classifiers in the bigger set. As can be seen in Table-23, only if absolutely necessary, is the second hand added. “Just” plural does not trigger the addition of the second hand, however, the second hand is added if the locative feature is important or if the plural set is really big and cannot be expressed with a single hand easily.

Table-23 Handedness in the plural strategy

	One-Handed	Two-handed
Dual	15%	7%
Paucal	46%	20%
Plural	39%	73%

Locative reduplication can be either serial or random, considering the locations of objects (especially in paucals). If the objects are lined up orderly, the participants use serial reduplication; however, if there is no order, they prefer random reduplication. The same is also observed in the plural set: serial object arrays evoke addition of the straight movement strategy, whereas, the random ones prefer the circular movement strategy.

The "rule of three" in pluralization: If one hand is used in reduplication, the hand can have at most 6 reduplications. However, if two hands are used, the reduplication can be at most 3 times, since the second hand adds morphological complexity. In recursion, the "rule of three" is also observed: recursions can have at most (and generally have) 3 movements.

The use of classifiers as a strategy of plural marking seems to be predicative. Note that in the data elicitation task, the objects in the pictures were specified for quantity and location. In their responses, the signers seemed to encode both properties and answered in full sentences, e.g., they uttered sentences like ÜÇ ARABA $\text{ARABA}_{\text{CL-2H}}$ (locative reduplication) VAR / THREE CAR $\text{CAR}_{\text{CL-2H}}$ THERE 'there are three cars.' The function of the classifiers in such sentences is predicative rather than attributive. However, plurals may look different in sentences like BEN ÜÇ ARABA SATMAK / I THREE CAR SELL 'I sold three cars.' Therefore, classifiers may not be required in attributive adjective phrases because quantors and/or adjectives or the inflection of the nouns with plural marking will be enough to indicate the plurality in such sentences. The predicative use of classifiers in the elicitation task, however, shows that plurality in TİD (and in sign languages in general) can be distributed within a clause and that (optional) agreement relations between the pluralized noun,

e.g., ÜÇ ARABA, and the classifier predicate, $ARABA_{CL\text{-}2H}$, can hold. This relation certainly needs to be studied in more detail in the future.

CHAPTER 6

SUMMARY, CONCLUSION AND FUTURE WORK

6.1 Main Findings

In this thesis, the phonology and morphology of TİD have been investigated. There have been some remarkable findings in TİD phonology, morphology and classifiers. In this part, the main findings will be summarized and some crucial points of the thesis will be discussed. There are approximately 34 handshapes and one special feature, "finger snapping", in the TİD Handshape Inventory (Table-6); for pictures and definitions of handshapes, see APPENDIX-1). However, some handshapes like the ASL T-, K-, N-, M-, and E-handshape, are not found in the Handshape list (see also Figure-30). Also, some handshapes which are used in other sign languages may not be found in the TİD handshape inventory. The fact that some handshapes, which exist in different sign languages, do not exist in TİD, shows that TİD has a unique handshape inventory. Moreover, the ASL-A- and S-handshapes, which are distinctly different handshapes in ASL, are allophones in Turkish Sign Language. The behavior of the thumb in both ASL A- and S-handshape is not important for TİD, rather both handshapes are considered as a fist handshape. Furthermore, whether the unselected fingers in the TID O-handshape (ASL F-handshape) are closed or open, is not distinctive in TİD, unlike in DGS and ASL. Even though the size of the handshape inventory in sign languages varies between 30 and 45, the handshapes in the list do not have to be the same as across sign languages. This fact strongly indicates that every sign language has its own handshape inventory.

The TİD Manual Alphabet is two-handed like that of BSL, whereas ASL and DGS have one-handed manual alphabets. The handshape inventory in sign languages with one-handed manual alphabets shows commonalities between handshapes and manual alphabet signs. TİD has some one-handed manual alphabet signs like C, I, L, O, P, V which are also in the TİD handshape inventory list. Among these one-handed letters, the P-handshape in the handshape inventory list is different from the P non-manual alphabet sign (see Figure-37). This phenomenon is a good example for the fact that phonetics has to obey phonological rules; I argued that the P-letter is optimized according to the phonological rules of TİD if it is used as a handshape.

Finger snapping refers for umlauts and diacritics in the TİD manual alphabet and also exists in the TİD handshape inventory. There are alternative expressions of umlauts in other sign languages. The umlauts in DGS (ä, ö and ü) are shown with a downward movement and thus differ from the "snapping" movement used in TİD. Finger snapping differs from other handshapes in having internal movement. This handshape with internal movement is used in some signs like UNUTMAK / FORGET and HIZLI-GITMEK / GOING-FAST and does not exist in ASL and DGS. Hence, finger snapping may be special for TİD.

Signs may be either one-handed or two-handed in TİD, as in other sign languages. Two-handed signs can be symmetrical, or alternating, or else one hand is dominant and one hand is non-dominant. Such two-handed signs where one hand is non-dominant generally have handshapes drawn from a set of unmarked handshapes. The unmarked handshapes in TİD are the Fist, the 5-handshape, the Index Finger and the TİD O-handshape. The set of unmarked handshapes in ASL slightly differs: it consists of the 5-handshape, the Index Finger, the Fist and the ASL O-handshape. The TİD O-handshape (ASL F-handshape) is a fairly specific, that is, marked handshape for ASL and DGS and the non-selected fingers in this handshape are distinctive for both sign languages, whereas they are not for TİD. Hence, the TİD O-handshape is in the unmarked set.

Both one-handed and two-handed TİD non-manual alphabet signs are observed in some TİD signs, for example, one-handed letter signs may undergo initialization with a small movement like up-down, arc, or wrist movements. Two-handed letter signs, which become lexical signs by adding epenthetic and path movements, can be observed in TİD signs, too.

TİD verbs are classified into three groups: plain, spatial and agreeing verbs a classification which is common among sign languages. An agreeing verb can be marked with a reciprocal morpheme, whereas plain verbs cannot. In both DGS and TİD, the use of movement reduplication and copying the second hand are common strategies for rendering an agreeing verb reciprocal. However, unlike in DGS, a Person Agreement Marker (PAM, Rathmann 2001) is not observed in TİD. However, DGS does not seem to use reciprocal neutral space use in reciprocal verbs. Some one-handed agreement verbs in TİD use this strategy, which aims at reducing the morphological complexity of the reciprocals (which had been increased through adding the second hand. Instead of having full agreement marking for both hands, the length of the path movement indicating agreement may be shortened or, alternatively, a path movement may be substituted by an orientation change. The use of reciprocal neutral space indicates that morpho-phonological complexity may only be expressed phonetically to the extent that vital properties such as agreement are still conveyed. This kind of adaptive process between phonetics and morpho-phonology indicates that TİD has a rich morphological structure that evolved throughout its history.

There are mainly three kinds of negation in TİD: with “DEĞİL” compounding, “ZERO” suffixation and with the sign HAYIR / NO. The negative construction “DEĞİL” is generally supported with a non-manual element, namely a backward head tilt. However, in both the ZERO suffixes and the HAYIR sign, a head-shake is used.

TİD has rich morphology in terms of inflection and derivation, as other sign languages, too. Compounding, fused signs and numerical incorporation are also observed in TİD morphological processes. Sign languages are known not to use suffixes, in general (Aronoff, Meir and Sandler 2005); however, TİD uses the suffixes -cı and –lı. In Turkish –cı is equivalent to the –er suffix in English and –lı adds the meaning of "belonging to something". TİD uses these suffixes by finger-spelling "C-I" and "L-I" and adding a slight path movement between the letter signs.

TİD, like other sign languages, has a rich classifier system of SASSes, handling and entity classifiers. TİD has whole-person (index finger) and leg (V-handshape) entity classifiers. According to Zeshan (2002), honorific classifiers as whole-body classifiers with the A-bar handshape are observed in TİD. However, I think the use of honorific classifiers is not common; instead these kinds of entity classifiers mainly occur as lexicalized classifiers. Besides, according to the data elicitation study of animal classifiers, specific handshapes are used for different kinds of animals: worms and snakes are signed with the index finger; chickens with the V-handshape; horses, cows and cats with both the V-handshape and the flat hand; frogs with the flat hand and spiders with the hooked extended flat hand. Moreover, this study also showed that TİD uses strongly lexicalized classifiers for the manner of movement used for overcoming the obstacles. This may also indicate that TİD has a long history during which the classifiers became lexicalized.

Pfau and Steinbach's (2005) classification of plural nouns in DGS consisting of B-nouns, C- nouns, M-nouns, and L-nouns is valid for TİD, too. M-nouns are reduplicated and L-nouns are reduplicated sideward in both sign languages. However, TİD does not seem to use this kind strategy for plurals frequently, rather TİD prefers classifiers to indicate the plurality of the objects. TİD uses different kinds of strategies for four different types of number sets: singular, dual, paucal, and plural. Singular objects are identified with the word itself or with a quantor. For two objects, either quantors or dual classifiers can be used. In the paucal set, the use of locative reduplication is observed. Movement as plural strategy is observed in the

plural set. Recursion (by use of movement and locative reduplication) is observed in the plural set. The rich system of classifiers which are used for indicating plural shows that TİD is particularly strong in terms of classification.

6.2 Brief History of TİD

TİD, which is used by the Turkish Deaf community, has a rich phonology and morphology which proves that it is a fully-fledged language. TİD is assumed to go back at least 500 years. As Miles (2000) reports many deaf ("mutes") were hired at the Sultan's court and endowed with important missions from 1500 to 1700. Even though it is not known whether the sign language they used was related to TİD or not, there is some evidence that TİD may be older than other sign languages currently used over the world. Zeshan (2003) states the number system from 6 to 9 resembles the Arabic written numbers. Since Arabic was commonly used in the Ottoman Empire, these numbers may indicate that TİD derives from Ottoman Sign Language. However, it is not clear whether Ottoman Sign Language had been taught to the deaf children. Therefore, it cannot be said that TİD is a continuation of Ottoman Sign Language. Deringil (2002, as cited in Ozyurek et al., 2004) reports that the first School for the Deaf was established in 1902. TİD language development and education may thus have started at the beginnings of the 1900s. However, the historical manual alphabet was different from the contemporary TİD manual alphabet; therefore, we cannot say that TİD entirely stems from the sign language taught in the first School for the Deaf in the Ottoman Empire. In 1928, the Arabic script was abolished and the new Turkish Alphabet with Latin characters was started to being used. Acceptance of the new Turkish Alphabet may have led to changes in the usage of the TİD manual alphabet. However, signed languages do not have strong commonalities with their ambient spoken languages in terms of lexical and grammatical usage. Still, we may use some words from the old sign language. Unfortunately, since 1953, it was forbidden to teach sign language in Schools for the Deaf (Ozyurek et al. 2004), and up to now TİD is not taught in Schools for the Deaf. Throughout half a century, between 1950 and 2000, TİD was being passed on to the young Turks in the deaf communities outside school. With the Act of Disability in July, 2005, awareness for TİD began to rise and research on TİD started.

Some sign languages are derived from and/or influenced by other sign languages. For example, Johnston and Schembri (2007) state that Australian Sign Language (AUSLAN) may be connected to British Sign Language (BSL). Other sign languages, such as ASL and Old French Sign Language are related, too (for further information, see Zeshan 2006b, p.361). TİD seems to have developed without any influence from any other sign languages. However, Zeshan (2003) notices that the backward head tilt in negations is also observed in Greek Sign Language and in some Arab regions. It remains to be seen whether TİD and Greek Sign Language share other linguistic commonalities.

The findings from this thesis strongly suggest that TİD has strong phonological and morphological processes and well developed lexicalized classifier predicates. The distinctive neutral space used in reciprocals, the highly frequent use of classifiers as a plural strategy and the frequently observed frozen classifier verbs are a clue that TİD has had a long history through which it evolved into its contemporary form.

6.3 Modality Difference between Turkish and Turkish Sign Language

After examining TİD phonology and morphology, in this section some comparisons between Turkish (as a spoken language) and TİD (as a sign language) will be made. With this modality comparison, I want to show that TİD is not based on Turkish and both languages have a different grammar, most obviously a different phonology and morphology. Table-24 summarizes the differences between the two modalities, and Table-27 outlines the commonalities between them.

Table-24 Modality difference between Turkish and Turkish Sign Language (TİD)

Modality difference	
Turkish (Spoken Language)	**TİD (Sign Language)**
Audio-vocal (aural-oral)	Visio-spatial
Sounds (consonant – vowel)	Signs (Handshape, Hand Orientation, Movement and Location)
No use of space	Signing space
Mainly sequential	Simultaneous & Sequential
Arbitrary lexicon (with rare exceptions)	Arbitrary lexical (but also some iconicity)
No classifier use	Rich use of classifiers
Poly-morphemic and poly-syllabic	Poly-morphemic but monosyllabic
Many suffixes among them morphological case	No suffixes (some exceptions) but rich morphological processes
Tense suffixes	No tense, instead use of aspect and use of temporal adverbs
S-V agreement	S & O –V agreement

First of all, the main distinction between Turkish and TİD is the way of transmission: TİD is a visual-gestural language whereas Turkish is a vocal-auditory language. TİD, like other sign languages, uses the two hands, together with non-manual parameters for producing language in signing space. However, Turkish, as other spoken languages, is restricted to producing language sounds and perceiving them (mainly) through the auditory system. As discussed in the phonology chapter, sign languages have four main phonological parameters, which differ from spoken languages: handshape, hand orientation, location and movement. As a change of a sound in a word may lead to a different but meaningful word in spoken languages (minimal pairs), a change in one phonological parameter in TİD may also lead to another meaningful sign (see the section 3.1.1 on minimal Pairs).

TİD, being a visuo-spatial language, has a signing space where the signs are articulated (see the section 4.2 on Signing Space). Since the signing space is three-dimensional, TİD is considered as a three dimensional spatial akin to other sign languages. Time can e considered a fourth dimension in TİD. However, Turkish, like all other spoken languages, has just one temporal dimension.

In the literature, there is broad agreement that in spoken languages the form-meaning relation is arbitrary and not iconic, except for some onomatopoeic words. However, some think that we cannot say the same for sign languages using the visual-gestural modality. Taub (2001) claims that since sign languages use signing space, hands and gestures, are less arbitrary than spoken languages. However, this does not mean that all signs are iconic and nearly equal to pantomimes. As Emmorey (2002, p.2) points out:

> *Pantomime differs from a linguistic system of signs in other important and systematic ways as well. For example, pantomime is always transparent and iconic, but signs can be opaque and arbitrary.*

For example, the sign KİTAP / BOOK is fairly iconic: the movements of the hands mimic the opening of the book which represents a salient aspect of the way the object is handled. Indeed, classifiers are considered the most iconic part of sign languages. However, there is nothing iconic in the sign DAYI / UNCLE (Figure-24) and this is true for many other signs. Arbitrariness is a clue that sign languages are not universal.

Phonemes and morphemes in spoken languages are mainly organized sequentially. However, we cannot observe sequentiality to the same extent in sign languages. In phonology, the phonological parameters are arranged simultaneously. Hence minimal pairs in sign languages and spoken languages differ quite substantially (Sandler and Lillo-Martin, 2006). For example, “gül” (rose) and “kül” (ash) are minimal pairs in Turkish: [g] is a voiced velar stop sound, whereas [k] is a voiceless velar stop sound. Hence [g] and [k] differ in terms of the feature “voice”. However,

Stokoe (1960 as cited in Sandler Lillo-Martin 2006 p.120) showed that minimal pairs in sign language differ because "*the minimal pairs co-occur simultaneously with other features in the sign.*" On the level of morphemes, Turkish is an agglutinating language like Finnish, Hungarian, or Japanese and a suffixing language except for some affixes like bi- and na-. Suffixes are added to the root sequentially. However, in TİD morphemes are organized more simultaneously than sequentially. The reciprocals are a good example for simultaneous morphemes, as in the reciprocal form of the sign GÖNDERMEK (Figure-45). The use of the second hand relates to the simultaneous property and agreement between subject and object relates to the sequential property of TİD (i.e., agreement is conveyed by the linear order of "the starting point, the movement and the end-point" (Sandler and Lillo-Martin, 2006 p.121.)) Such a phenomenon is not observed in Turkish. Coulter (1982, as cited in Sandler and Lillo-Martin 2006, p. 489) points out that sign languages are mainly "mono-syllabic," which further explains why simultaneous morphemes are constructed so frequently.

Turkish is known to serialize suffixes as mentioned above, which makes Turkish words poly-morphemic and also polysyllabic, as in many other languages (except for, e.g., Chinese). Brentari (2002) defined the characteristics of words in different languages in terms of number of syllables and morphemes, as in Table-25. She concludes that sign languages are monosyllabic but poly-morphemic, unlike spoken languages. In sign languages, locations (holds) are considered as consonants and movements are considered as vowels (Liddell 1984; Sandler and Lillo-Martin 2006). A syllable may include one movement between two locations. One sign in TİD can have at most two locations and a movement except for some compound signs in TİD and complex signs with several morphemes. Hence, TİD differs from Turkish in terms of being monosyllabic.

Table-25 Canoncical wordshape according to the number of syllables and morphemes per word (Brentari, 2002, p.57)

Word shape	**Monosyllabic**	**Polysyllabic**
Mono-morphemic	Chinese	English
Poly-morphemic	Sign Languages	Turkish

Languages show evidence of various word forms based on various morphological processes. Morphological inflection or derivation can occur in various ways: prefixing, suffixing, infixing or formation of new roots (root changes) which are unrelated to the base roots. However, it is hard to define what the morphemes are and which linguistic parts are considered as morphemes in sign languages. In Charles Hockett's (1954) seminal study, "Two models of grammatical description", two paradigms on morphological processing are defined: 'item and arrangement' (IA) and 'item and process' (IP). In the IA paradigm, the smallest meaningful units are morphemes, but in IP they are lexemes. Another model is 'word and paradigm', WP, in which morphology is based on words (i.e. fusional words). Suffixes in agglunating languages are good examples for IA and IP can explain the compounding phenomena well. Interestingly, sign languages can be explained by all these models: Some sign inflections operate like IP, e.g., verb agreements and pluralization; some operate like IA, e.g., some compound signs, and some operate like WP; e.g., numerical incorporation and fusional signs. This situation suggests that sign languages show the same kind of morphological processes as spoken languages do, however, have different preferences. In sign language the optimal (prosodic) form of a sign is a single syllable, as suggested by the "tendency of monosyllabicity" of sign languages (Brentari 1998,2002, among many others; see Table-25). Being poly-morphemic and at the same time mono-syllabic creates a unique typological class under which all sign language can be comprised, as it seems. Any morphological model of sign language will benefit from acknowledging this typological uniqueness.

TİD, like other sign languages, has no overt verbal tense markers; rather it is rich in terms of aspectual markers (for more detail see the section 4.2.4 on aspect). Therefore, another modality difference is observed here since Turkish has a rich system of tense and also some aspectual suffixes. However, the absence of overt verbal tense in TİD cannot be considered as a weakness because temporal adverbs (i.e. DÜN / YESTERDAY, BUGÜN / TODAY), location use, and prosody compensate this deficit very well.

Subject-verb agreement is another property of Turkish. This agreement system is fairly strong, as can be seen in Table-26. For all persons, the verb is inflected in agreement with the subject.

Table-26 the inflection of the verb "yap-"(do)
in present tense with several person

Person	Singular	Plural
1st	yap-ar-ım	yap-ar-ız
2nd	yap-ar-sın	yap-ar-sınız
3rd	yap-ar-Ø	yap-ar-lar

However, Turkish does not have any object-verb agreement. Here TİD, having both subject and object verb agreement, differs from Turkish. In general, sign languages differ from spoken languages (with some exceptions) in terms of verb agreement:

> *One characteristics common to all types of spoken languages showing overt agreement is that they show subject agreement. In rare cases, the verb may agree with the object- e.g. Huichol (Comrie 1982 [pp. 68-70]) and Itelmen (Bobaljik and Wurmbrand 1997) - but these languages usually show subject agreement too, which suggest that object agreement is more marked than*

subject agreement in spoken languages. (Rathmann and Mathur, 2003 p.371)

Up to now the modality difference between Turkish and TİD has been discussed. However, all languages share commonalities even if they differ in terms of modality (see Table-27). It is clear that both TİD (representing sign languages) and Turkish (representing spoken languages) classify words in terms of grammatical category, such as noun, adjective and verb, have words that can be divided into meaningless units such as phonemes, and have similar morphological processes like inflection, derivation and compounding (van der Hulst and Mills, 1996). Other main commonalities are similar milestones in language acquisition, similar effects in language processing, as evidenced by Working Memory effects and Slips of Tongue/ Hand (see also section 3.1.2 Slips of the hand in sign language), and the presence of dialects/variants. However, except for Kubus and Hohenberger's (2007) investigation of the effect of "phonological similarity" and "irrelevant visual input" on serial recall of word lists in TİD, no empirical evidence derived from scientific research yet exists for the common milestones in language acquisition in TİD and Turkish, for Slips of the Hand in TİD (except for an observation in TİD mentioned in section 3.1.2 Slips of the hand in sign language) and for any socio-linguistic variation such as dialects of TİD. However, experiments, investigations and research in ASL, DGS and many other sign languages clearly predict that TİD should also have similar processes and similar effects.

Language use may differ in terms of regions and age groups. Sign languages have dialects like spoken languages, too. In TİD some dialectal differences between Ankara and İstanbul have also been observed. However, this variation seems to be mainly located in the lexicon, i.e. there exist lexical differences among dialects. In this thesis mainly the Ankara dialect of TİD has been investigated.

Table-27 commonalities observed so far between sign languages and spoken languages.

Commonalities
-Language acquisition: similar level of acquisition, similar milestones (however, signs may be acquired a bit earlier)
-Slips of tongue and slips of the hand
-Similar effects observed on working memory
-Classification in terms of grammatical category: Noun, adjective, verb
-Similar meaningless units: phonology
-Three kinds of morphological processes: inflection, derivation and compounding.
-Dialects, variants
-Similar syntactic structures and constraints

6.4 Future Work

The TİD handshape inventory, investigated in this thesis, covers mostly phonologically different handshapes. Since this thesis did not investigate the phonetics of TİD, it still lacks a longer list of TİD handshapes in which phonetic variants of handshapes are differentiated in more detail. A bigger corpus study is required to provide such a detailed list of handshapes and the phonetic differences between them. Also, in the scope of such a broader corpus study, the set of unmarked handshapes of TİD would become distinctively clearer.

It is obvious that research on TİD phonology and morphology is not limited to the scope of the present thesis. There may be different morphemes and morphological structures, waiting to be analyzed. Research on sentences in TİD and morphological relations between the signs in a sentence may reveal different behaviors of TİD morphology and syntax. Although TİD has specific syntactic properties and a great

variety of sentence types, there are only few studies on sentence types and prosody in Turkish Sign Language up to now (Zeshan 2002, 2004 and 2006a; Sevinç 2006). In the literature, sign languages have been shown to have declarative, interrogative (wh-questions and y/n questions), negative, topicalized, conditional, and embedded sentences. The same is true for TİD.

In order to understand that sign languages may have different syntactic properties, TİD sentential negation and its non-manual markings may serve as a good example. In ASL and DGS, negated declarative sentences can be signed without an overt manual negative marker, only with the negative non-manual marking as in (1) and (2) (Liddell, 1980; Pfau & Quer, 2007).

neg
(1) WOMAN FORGET PURSE (Liddell 1980, p.4)

neg
(2) MUTTER BUCH KAUF (Pfau & Quer, 2007 p.132)

This kind of negation, however, is not observed in TİD. In TİD, there always has to be an overt manual negative marker, along with which a non-manual negative marking goes.

However, for TİD it is not clear where the non-manual negation markings start and end. Negative sentences in different word orders (i.e. SOV-not, SV-notO, V-notSO…) need to be investigated in order to understand the effects of non-manual negation markings in negation sentences. TİD seems to differ from DGS in that it has no independent non-manual negative marker but rather requires any non-manual marking to be bound to a lexical negative sign which does not spread onto the sentence. Also the form of the negative non-manual marking is different: a backwards head-tilt is used in verbal negation, whereas a slight headshake is used in adjectival negation. Zeshan (2002) also thinks that "head tilt" refers to the lexical sign "DEĞİL", and that it cannot spread over the sentence in TİD. The reason why the non-manual negation marking cannot spread over the sentence may be due to the

fact that the head tilt cannot be carried out repetitively. Its temporal character (a single slow upward movement) does not allow for rapid repetition. This physical limitation of this non-manual negation marking can be considered as a phonetic reason.

Not only negative sentences in TİD, but also interrogative, conditional and topicalized sentences in TİD need to be investigated. Since prosodic properties are undeniably important for sign languages, studying the relation between prosody and syntax in TİD and comparing TİD prosodic properties with those of other sign languages like ASL and DGS will give more important information about TİD. Hence, we need further research on non-manual prosodic features and their relation to morphology as well as to syntactic properties in TİD.

TİD is not well explored in the area of language acquisition and language production either. Systematical observation of deaf infants and children with deaf parents may give important clues as to when and how TİD phonological and morphological milestones are mastered, including questions like which handshapes are easily acquired in TİD and which morphological properties are acquired late. It is clear that with some psycholinguistics studies more grammatical properties will eventually be revealed and we will better understand whether the milestones in language acquisition are similar in both TİD and Turkish.

TİD also requires sociolinguistic research on dialects and/or variants. Since TİD may be (one of) the oldest sign languages used in Europe, some future studies may focus on specific areas in Turkey with a specific age range of TİD native signers. The difference of TİD usage in different regions and age-groups will help us understand the historical development of TİD. We also need to understand whether the dialects of TİD differ in terms of their basic grammar.

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APPENDICES

APPENDIX -A: Definitions of handshapes in TİD handshape inventory

Table-28 TID Handshape Inventory (Modelled from Sutton-Spence and Woll, 1999 pp. xiv – xvii)

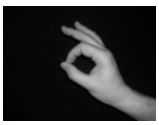
Figures	Hand shape name and examples
 **C**	**C-handshape**: Thumb and index fingers are open, making a half open circle.
 **L**	**L-handshape**: Index and thumb fingers are open and extended. Both fingers are perpendicular to each other.
 **O**	**O-handshape**: Thumb and index finger form circle and the other fingers are non-selected. Non-selected fingers can be either open or closed.
 **P**	**P-handshape**: Index finger is on the middle of the middle finger, forming "P" shape.
 **U**	**U-handshape**: The narrower shape of C-handshape. Orientation is upwards.
 **Å**	**ASL A-bar**: Fist with thumb extended.

Table-28 TID Handshape Inventory (cont.)

Figures	Hand shape name and examples
	**ASL B-handshape**: fingers are extended and closed jointly, howeveri thumb is opposed and closed.
□	
	**Flat Hand**: Fingers are extended and aperture is closed.
B	
	**Hooked Flat Extended**: All fingers are extended, and curved.
5¨	
	**Bent Flat**: Curved hand and thumb is open.
B¨	
	**ASL C-handshape**: Thumb and other fingers shaping “C”, the fingers except for thumb are curved and aperture is closed.
Ĉ	
	**Bent Flat Bar**: Curved hand and thumb is open. the fingers except for thumb are bent and aperture is closed
B^	
	**ASL Q-handshape**: Narrower shape of U-handshape. Only index and thumb are selected.
Q	
	**Middle selected ASL (open 8)**: Middle finger is bent, others are open and extended.
8¨	
	**ASL O-handshape**: Fingers circle with thumbs and finger tips are touching to the thumb.
Ô	

Table-28 TID Handshape Inventory (cont.)

Figures	Hand shape name and examples
 ö	**Narrowed O**: Index finger is bent and makes a narrower circle with thumb.
 o	**Baby-O handshape**: All fingertips are joined.
 8	**ASL 8-handshape**: Thumb and ring ringer make a circle form, the others are extended and open.
 R	**12 handshape /ASL R-handshape**: Index and middle fingers are crossed.
 Â	**Covered T-handshape**: Fist shape with hat on the thumb.
 H	**Horn / Combined ASL I and H**: Index and little finger are open while the others make a fist (closed).
 i	**Little finger / ASL I-handshape:** Only little finger is open, others make a fist.
 Y	**Little + Thumb / ASL (Y-handshape)**: Little finger and thumb are open, others make a fist.
 3	**ASL 3-handshape**: Thumb, middle and index fingers are open, others are closed.

Table-28 TID Handshape Inventory (cont.)

Figures	Hand shape name and examples
 **4̈**	**4-claw**: Thumb is open and others are flexed, aperture closed.
 **2**	**V/2-handshape**: Index and middle fingers are open and extended, also aperture open.
 **5**	**5-handshape**: All fingers are extended and spread.
 **7**	**7-handshape / V-closed**: Index and middle fingers are open but aperture closed.
 **8**	**8-handshape / V-hooked**: Index and middle fingers are bent and aperture is open.
 **9**	**9-handshape / ASL X-handshape:** Index finger is open but bent.
 **A**	**ASL A-handshape**: Fist, All fingers are closed. Note that: ASL-S and ASL-A are not phonologically differed in TİD.
 *****	**Finger Snapping**

APPENDIX -B: List of verbs

Table-29 List of verbs in TiD and classifications

VERB	verb type
ACIKMAK / BE HUNGRY	plain
ACIMAK /BE HURT	plain
AÇIKLAMAK /EXPLAIN	plain
AÇMAK / OPEN	spatial
AĞLAMAK /CRY	plain
AKMAK / FLOW	spatial
ALAY ETMEK/BULLY	agreeing
ALIŞMAK / BE ACCUSTOMED TO	plain
ALMAK/GET-BUY	agreeing
ANLATMAK/TELL	agreeing
ARABA SÜRMEK / DRIVE	spatial
ARAMAK / CALL	agreeing
ARAMAK / SEARCH	plain
AŞIK OLMAK / BE IN LOVE	plain
ATLAMAK / JUMP	spatial
AVANTAJ ALMAK / TAKE SB ADVANTAGE	agreeing
AYRILMAK /BE SEPARATED	agreeing
BAĞIRMAK/YELL	agreeing
BAKMAK / LOOK	agreeing
BAŞLAMAK / START	plain
BAŞVURMAK / APPLY	agreeing
BEKLEMEK / WAIT	plain
BESLEMEK/FEED	agreeing
BIÇAKLAMAK / STAB	agreeing
BIRAKMAK / GIVE UP	plain
BILMEK / KNOW	plain
BIRINDEN HOŞLANMAK/DESIRE SB	agreeing
BORÇ /OWE	agreeing
BOYAMAK / PAINT	plain
BÖLMEK / DIVIDE	plain
BULUŞMAK / MEET	spatial
BÜYÜMEK / GROW UP	plain
CEVAPLAMAK/ANSWER	agreeing
ÇAĞIRMAK / CALL	agreeing
ÇALIŞMAK / WORK	plain
ÇALMAK / STEAL	spatial
ÇÖZMEK / SOLVE	plain
DAVET ETMEK/INVITE	agreeing

Table-29 List of verbs in TiD and classifications (cont.)

VERB	verb type
DERS ÇALIŞMAK / STUDY	plain
DEĞIŞMEK / CHANGE	plain
DEPOLAMAK / STORE	spatial
DESTEKLEMEK/SUPPORT	agreeing
DEVAM ETMEK / CONTINUE	plain
DIKMEK / SEW	plain
DOĞURMAK / GIVE BIRTH	plain
DÖVMEK / HIT SB	agreeing
DURDURMAK /STOP	agreeing
DUŞ ALMAK / TAKE A SHOWER	plain
DÜŞMEK / FALL	spatial
DÜŞÜNMEK / THINK	plain
DÜZELTMEK / CORRECT	agreeing
ELEMEK / SIEVE	plain
EMRETMEK/ORDER	agreeing
ERIMEK / MELT	plain
ERTELEMEK / POSTPONE	plain
ETKILEMEK/AFFECT SB	agreeing
EVLENMEK / MARRY	plain
FAKS GÖNDERMEK/FAX	agreeing
FISILDAMAK / WHISPER	plain
FILM ÇEKMEK / MAKE A MOVIE	plain
GELIŞTIRMEK / DEVELOP	plain
GELMEK / COME	spatial
GETIRMEK / BRING	spatial
GEZMEK / WANDER	plain
GITMEK / GO	spatial
GIYINMEK / DRESS	plain
GIZLEMEK / HIDE	spatial
GÖNDERMEK/SEND	agreeing
GÖRMEK / SEE	agreeing
GÜLMEK / LAUGH	plain
GÜREŞMEK / WRESTLE	plain
HABER VERMEK/GIVE NEWS	agreeing
HATIRLAMAK / REMEMBER	plain
HAYAL ETMEK / DAYDREAM	plain
ISIRMAK/BITE	agreeing
IÇMEK / DRINK	plain
IĞNELEMEK / SPEAK WITH SB SARCASTICALLY	agreeing
ISTEMEK / WANT	plain

Table-29 List of verbs in TiD and classifications (cont.)

VERB	verb type
KARAR VERMEK / DECIDE	plain
KAR YAĞMAK / SNOW	plain
KAÇMAK / RUN AWAY	plain
KALKMAK / GET UP	plain
KARŞI OLMAK / BE AGAINST	agreeing
KARŞILAŞMAK / RUN ACCROSS	spatial
KAŞIMAK / SCRATCH	plain
KAYBETMEK / LOSE	plain
KAYBOLMAK / GET LOST	plain
KAZANMAK / WIN	plain
KESMEK / CUT	spatial
KIRMAK / BREAK	plain
KISKANMAK / BE JEALOUS	plain
KIZMAK / GET ANGRY	plain
KOKLAMAK / SMELL	plain
KONUŞMAK / SPEAK	plain
KOPMAK / DEATTACH	agreeing
KOPYA ÇEKMEK / COPY	agreeing
KORKMAK / FEAR	plain
KORUMAK / PROTECT	spatial
KOŞMAK / RUN	plain
KÖTÜLEMEK / SLANDER	agreeing
KUMAR OYNAMAK / GAMBLE	plain
KUTLAMAK / CONGRATULATE	agreeing
KÜÇÜLMEK / BECOME SMALL	plain
KÜFÜR ETMEK / SWEAR	agreeing
LAZIM OLMAK / NEED	plain
LEKELEMEK / STAIN	spatial
MAHVOLMAK / BE SPOILED	plain
MECBUR OLMAK / HAVE TO	plain
MERAK ETMEK / WONDER	plain
MORAL BOZMAK / DEMORALIZE	plain
MUTLU OLMAK / BE HAPPY	plain
NEFRET ETMEK / HATE	? plain
OKUMAK / READ	plain
OLMAK / BE OR BECOME	plain
OTURMAK / SIT	spatial
OY VERMEK / VOTE	plain
OYNAMAK / PLAY	plain
ÖLMEK / DIE	plain

Table-29 List of verbs in TiD and classifications (cont.)

VERB	verb type
ÖPMEK/KISS	agreeing
ÖDEMEK /PAY	agreeing
ÖDÜL VERMEK / PRIZE	agreeing
ÖĞRENMEK / LEARN	plain
ÖĞRETMEK / TEACH	agreeing
ÖLDÜRMEK / KILL	agreeing
ÖZLEMEK / MISS	plain
PAYLAŞMAK / SHARE	agreeing
PIŞIRMEK / COOK	plain
PROTESTO ETMEK / PROTEST	plain
RAHATLAMAK / RELAX	plain
REJIM YAPMAK / BE ON A DIET	plain
RESIM YAPMAK / PAINT	plain
RICA ETMEK / REQUEST	agreeing
RÜYA GÖRMEK / DREAM	plain
SAÇMALAMAK / TALK NOSENSE	plain
SATMAK/SELL	agreeing
SEÇMEK/CHOOSE SB	agreeing
SESLENMEK / CALL	agreeing
SEVMEK / LOVE	plain
SIKILMAK / GET BORED	plain
SIGARA IÇMEK / SMOKE	plain
SINIRLENMEK / BE NERVOUS	plain
SOHBET ETMEK / CHAT	agreeing
SOMURTMAK / TURN SOUR	plain
SORGULAMAK/QUESTION	agreeing
SORU SORMAK/ASK SMT TO SB	agreeing
SÖYLEMEK/SAY SB	agreeing
SÖZLEŞMEK / AGREE	agreeing
SPOR YAPMAK / SPORT	plain
SUÇ ATMAK / BLAME	agreeing
SUSTURMAK/MAKE SB SHUT UP	agreeing
ŞAKA YAPMAK / MAKE A JOKE	plain
ŞARKI SÖYLEMEK / SING	plain
ŞAŞIRMAK / SURPRISE	plain
ŞIRINGA ETMEK / INJECT	spatial
ŞIKAYET ETMEK / COMPLAIN	agreeing
TAKIP ETMEK /FOLLOW	agreeing
TANIŞMAK / GET SB KNOW	plain
TAPMAK / WORSHIP	agreeing
TASARRUF ETMEK / SAVE	plain

Table-29 List of verbs in TiD and classifications (cont)

VERB	verb type
UNUTMAK / FORGET	plain
TAŞIMAK / FETCH	spatial
TAYIN OLMAK / ASSIGN	spatial
TEŞEKKÜR ETMEK /THANK	agreeing
TIRMANMAK / CLIMB	plain
TUTMAK / HOLD	plain
UÇMAK / FLY	plain
UÇMAK / FLY (PLANE)	spatial
UTANMAK / BE ASHAMED	plain
UYANMAK / WAKE UP	plain
UYUMAK / SLEEP	plain
ÜŞÜMEK / BE COLD	plain
ÜTÜLEMEK / IRON	plain
ÜYE OLMAK / JOIN	plain
ÜZÜLMEK / BE UPSET	plain
VURMAK / SHOT	agreeing
YAĞMUR YAĞMAK / RAIN	plain
YALAKA YAPMAK / BOOTLICK	plain
YAPILANDIRMAK / BUILD	spatial
YAPMAK / DO OR MAKE	plain
YASAKLAMAK / FORBID	plain
YAŞAMAK / LIVE	plain
YAZMAK / WRITE	plain
YEMEK / EAT	plain
YENMEK / BEAT	agreeing
YORULMAK / BE TIRED	plain
YÖNETMEK / ADMINISTER	agreeing
YÜRÜMEK / WALK	spatial
YÜZMEK / SWIM	plain
ZIPLAMAK / BOUNCE	plain
ZORLAMAK /FORCE SB	agreeing
ZÜLÜM ETMEK / OPPRESS	agreeing

APPENDIX -C: List of agreeing verbs and its classification

Table-30 List of agreeing verbs in TiD

VERB	Category
ALAY ETMEK/BULLY	1
ALMAK/GET-BUY	1
ANLATMAK/TELL	3
ARAMAK / CALL	3
AVANTAJ ALMAK / TAKE SB ADVANTAGE	1
AYRILMAK / BE SEPARATED	1
BAĞIRMAK/YELL	1
BAKMAK / LOOK	1
BAŞVURMAK / APPLY	1
BESLEMEK/FEED	3
BIÇAKLAMAK / STAB	1
BIRINDEN HOŞLANMAK/DESIRE SB	2
BORÇ /OWE	3
CEVAPLAMAK /ANSWER	3
ÇAĞIRMAK / CALL	1
DAVET ETMEK/INVITE	3
DESTEKLEMEK/SUPPORT	1
DÖVMEK / HIT SB	1
DURDURMAK /STOP	1
EMRETMEK/ORDER	1
ETKILEMEK/AFFECT SB	1
E-POSTA ATMAK / E-MAIL	1
FAKS GÖNDERMEK / FAX	1
GÖNDERMEK/SEND	1
GÖRMEK / SEE	1
HABER VERMEK/GIVE NEWS	3
ISIRMAK/BITE	1
IĞNELEMEK / SPEAK WITH SB SARCASTICALLY	1
KARŞI OLMAK / BE AGAINST	1
KOPMAK / DEATTACH	1
KOPYA ÇEKMEK / COPY	1
KOVMAK / FIRE	1
KÖTÜLEMEK / SLANDER	1
KUTLAMAK / CONGRATULATE	3
KÜFÜR ETMEK / SWEAR	1
ÖDEMEK /PAY	1
ÖDÜL VERMEK / PRIZE	3
ÖĞRETMEK / TEACH	2
ÖLDÜRMEK / KILL	1
ÖPMEK/KISS	1

Table-30 List of agreeing verbs in TiD (cont.)

VERB	Category
RICA ETMEK / REQUEST	1
PAYLAŞMAK / SHARE	2
SATMAK / SELL	3
SESLENMEK / CALL	1
SEÇMEK/CHOOSE SB	1
SORGULAMAK/QUESTION	2
SORU SORMAK/ASK SMT TO SB	3
SÖYLEMEK/SAY SB	3
SUÇ ATMAK / BLAME	3
SUSTURMAK/MAKE SB SHUT UP	1
ŞIKAYET ETMEK / COMPLAIN	1
TAKIP ETMEK /FOLLOW	1
TEKLİF ETMEK / OFFER	1
TEŞEKKÜR ETMEK /THANK	3
VERMEK/GIVE	3
VURMAK / SHOT	1
YENMEK / BEAT	1
YÖNETMEK / ADMINISTER	3
ZORLAMAK /FORCE SB	1
ZÜLÜM ETMEK / OPPRESS	3

Category of agreeing verb at phonological level (Mathur and Rathmann, 2004)
(1) Change in orientation and direction of movement (65%)
(2) Change in orientation (7%)
(3) Change in direction of movement (28%)
(4) Orientation, direction of movement and order of hands
(5) Orientation and order of hands)
(Among 60 agreeing verb)

APPENDIX -D: List of verbs and reciprocally markedness

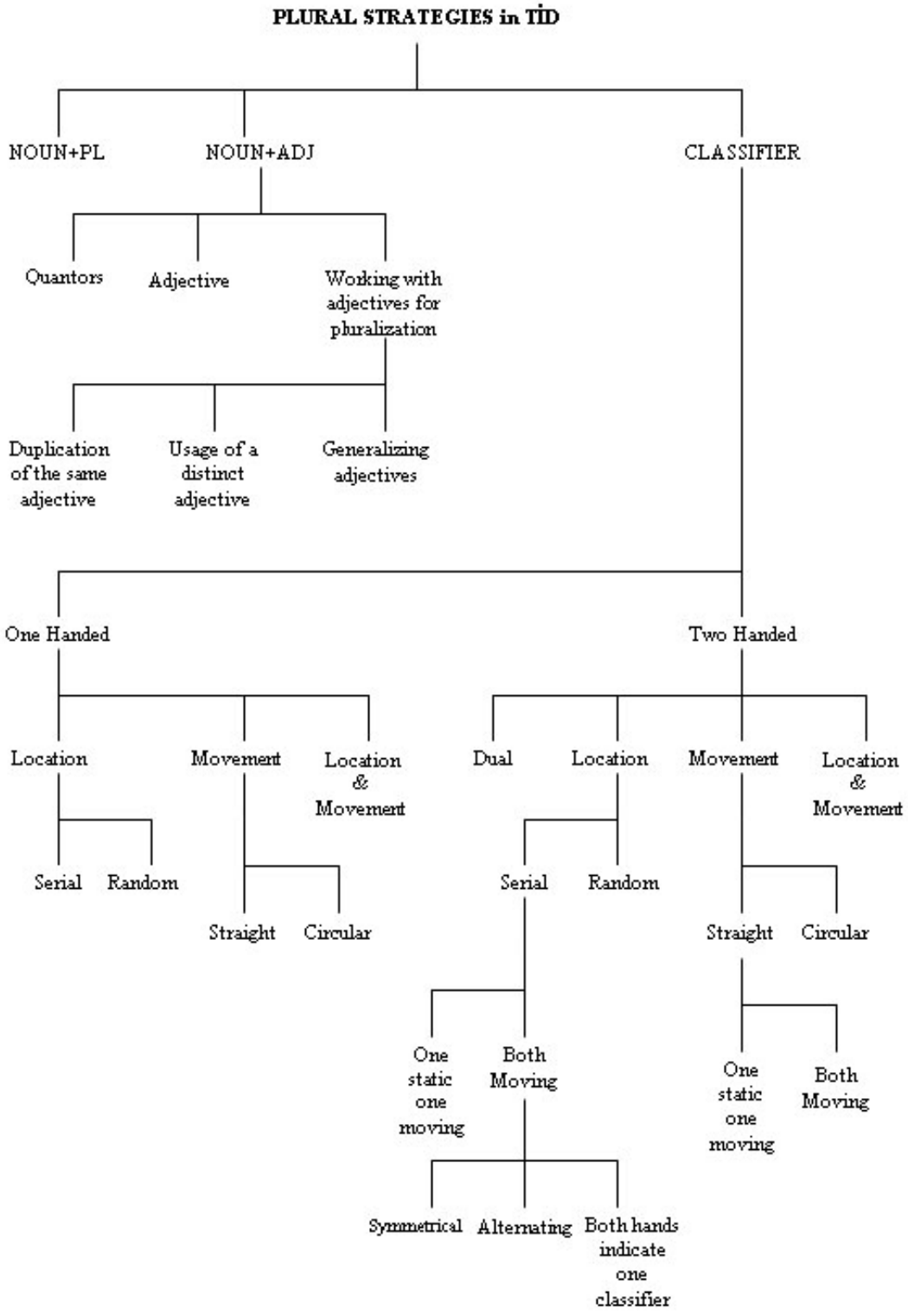
Table-31 TİD verb list and reciprocally markedness

Verb	One/Two Handed	Body Anc.	Agr.	Category	F/B
Bilmek /Know sb	One Handed	Yes	No	3	N/A
Düşünmek/Think sb	One Handed	Yes	No	3	N/A
Tanımak/Know sb	One Handed	Yes	No	3	N/A
Hatırlamak/Remember sb	Two Handed (2)	Yes	No	3	N/A
Gülmek/Laugh	One Handed	Yes	No	3	N/A
Almak/get-buy	One Handed	No	Yes	1	B
Seçmek/Choose sb	One Handed	No	Yes	1	B
Davet etmek/Invite	Two Handed	No	Yes	1	B
Sorgulamak/question	Two Handed (2)	No	Yes	1	B
Etkilemek/Affect sb	One Handed	No	Yes	4	B
Bağırmak/Yell	One Handed	No	Yes	1	F
Cevaplamak/Answer	One Handed	No	Yes	1	F
Satmak/Sell	One Handed	No	Yes	1	F
Alay Etmek/bully	Two Handed (1a)	No	Yes	1	F
Birinden hoşlanmak/Desire sb	Two Handed (1a)	No	Yes	1	F
Zorlamak /Force sb	Two Handed (1a)	No	yes	1	F
Beslemek/Feed	One Handed	Yes	Yes	1	F
Emretmek/Order	One Handed	Yes	Yes	1	F
Söylemek/Say sb	One Handed	Yes	Yes	1	F
Teşekkür Etmek/Thank	One Handed	Yes	Yes	1	F
Anlatmak/Tell	One Handed	Yes?	Yes	1	F
Göndermek/Send	One Handed	No	Yes	2	F
Vermek/give	One Handed	No	Yes	2	F
Suç atmak	Two Handed (1a)	No	Yes	2	F
Susturmak/ Shut up	One Handed	Yes	Yes	2	F
Kötülemek ->Kavga etmek	One Handed	No	yes	4	F
Desteklemek/support	Two Handed(1a)	No	yes	4	F
Görmek	One Handed	Yes	Yes	4	F
Haber vermek/give news	One Handed	Yes	Yes	4	F
Isırmak/Bite	One Handed	Yes	Yes	4	F
Öpmek/Kiss	One Handed	Yes	Yes	4	F
Ödemek/pay	One Handed	No	Yes	1 2	F
Soru sormak/ask smt to sb	One Handed	No	Yes	1 2	F
Faks Göndermek/Fax	One Handed	No	Yes	1 4	F

1. Helfen group
2. Geben group
3. Zero Marking + “Birbirimizi”
4. Neutralized Sign Space

(1) both dominant (a)symetrical (b)nonsymetrical
(2) Nondominant

APPENDIX -E: Plural strategies in Turkish Sign Language



APPENDIX-F: The dimensional analysis between obstacles and handshapes for each animal

Table-32 The dimension between obstacles and handshapes for the animal “worm”

Worm	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzagging	Bouncing	walking	others
Hooked V-shape	1	1	-	1	2	1	-	2	-	-
Flat Hand	1	3	3	-	-	-	1	-	-	2
Index Finger	1	-	-	-	1	-	2	-	5	-
Baby-O	-	-	-	-	-	-	-	-	-	-
Closed V-shape	-	-	-	-	-	-	1	-	-	-
V-shape	1	-	-	1	-	-	-	2	2	-
HFE	-	-	-	-	-	-	-	-	-	-
8-shape	-	-	-	-	-	-	-	-	-	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	2	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	-
Bent FlatHand	-	-	-	-	-	-	-	-	-	-
Closed Hooked Vshape	-	-	-	-	-	-	-	-	-	-
Y-shape	-	-	-	-	-	-	-	-	-	-

Table-33 The dimension between obstacles and handshapes for the animal “horse”

Horse	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzagging	Bouncing	walking	others
Hooked V-shape	1	1	-	-	5	-	-	2	2	-
Flat Hand	3	3	1	-	-	1	3	-	5	1
Index Finger	-	-	-	-	-	-	-	-	-	-
Baby-O	-	-	-	-	-	-	-	-	-	-
Closed V-shape	-	-	-	-	-	-	-	-	-	-
V-shape	-	-	-	-	-	-	-	2	-	-
HFE	-	-	-	-	-	-	-	-	-	-
8-shape	-	-	-	-	-	-	-	-	-	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	-	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	-
Bent FlatHand	-	-	-	-	-	-	-	-	-	-
Closed Hooked Vshape	-	-	-	-	-	-	-	-	-	-
Y-shape	-	-	-	-	-	-	-	-	-	-

Table-34 The dimension between obstacles and handshapes for the animal “chicken”

Chicken	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzagging	Bouncing	walking	others
Hooked V-shape	3	2	-	3	3	1	-	4	2	-
Flat Hand	1	2	1	-	-	-	2	-	1	1
Index Finger	-	-	-	-	-	-	2	-	2	-
Baby-O	-	-	-	-	-	-	-	-	-	1
Closed V-shape	-	-	-	-	-	-	-	-	-	2
V-shape	-	-	-	-	1	-	-	-	1	-
HFE	-	-	-	-	-	-	-	-	-	-
8-shape	-	-	-	-	-	-	-	-	-	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	2	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	2
Bent FlatHand	-	-	-	-	-	1	-	-	-	-
Closed Hooked Vshape	-	-	-	-	-	-	-	-	-	-
Y-shape	-	-	-	-	-	-	-	-	-	-

Table-35 The dimension between obstacles and handshapes for the animal “cat”

Cat	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzagging	Bouncing	walking	others
Hooked V-shape	1	2	-	1	2	3	-	3	1	-
Flat Hand	3	2	1	-	2	1	2	-	4	-
Index Finger	-	-	-	-	-	-	2	-	2	-
Baby-O	-	-	-	-	-	-	-	-	-	1
Closed V-shape	-	-	-	-	-	-	3	-	-	-
V-shape	-	-	-	-	-	-	-	1	-	4
HFE	-	-	-	-	-	-	-	-	-	-
8-shape	-	-	-	-	-	-	-	-	-	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	-	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	-
Bent FlatHand	-	-	-	-	-	-	-	-	-	1
Closed Hooked Vshape	-	-	-	-	1	1	-	-	-	-
Y-shape	-	-	-	-	-	-	-	-	-	-

Table-36 The dimension between obstacles and handshapes for the animal “frog”

Frog	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzagging	Bouncing	walking	others
Hooked V-shape	-	2	-	1	2	-	-	2	-	-
Flat Hand	3	1	-	1	2	1	4	1	4	1
Index Finger	-	-	-	-	-	-	-	-	-	-
Baby-O	-	-	-	-	-	-	-	-	-	1
Closed V-shape	-	-	-	-	-	-	1	-	-	1
V-shape	-	-	-	-	-	-	-	1	-	4
HFE	-	-	-	-	-	-	-	-	-	-
8-shape	-	-	-	-	-	-	-	-	-	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	-	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	-
Bent FlatHand	1	-	-	-	-	-	-	-	-	-
Closed Hooked V-shape	-	-	-	-	-	-	-	-	-	-
Y-shape	-	-	-	-	-	-	-	-	-	-

Table-37 The dimension between obstacles and handshapes for the animal “spider”

Spider	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzagging	Bouncing	walking	others
Hooked V-shape	1	-	-	-	-	-	-	1	-	-
Flat Hand	1	3	-	1	-	-	1	-	2	-
Index Finger	-	-	-	-	-	-	-	-	-	-
Baby-O	-	-	-	-	-	-	-	-	-	-
Closed V-shape	-	1	-	-	1	-	-	-	-	-
V-shape	-	-	-	-	-	-	-	-	-	3
HFE	1	-	-	3	-	2	2	2	2	-
8-shape	-	-	-	-	-	-	1	-	1	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	-	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	-
Bent FlatHand	1	-	-	-	-	-	-	-	-	-
Closed Hooked V-shape	-	-	-	-	-	-	-	-	-	-
Y-shape	-	-	-	-	-	-	-	-	-	-

Table-38 The dimension between obstacles and handshapes for the animal “cow”

Cow	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzagging	Bouncing	walking	others
Hooked V-shape	1	4	-	1	3	1	-	2	-	-
Flat Hand	3	-	-	-	1	2	3	-	-	1
Index Finger	-	-	-	-	-	-	-	-	-	1
Baby-O	-	-	-	-	-	-	1	1	2	-
Closed V-shape	-	-	-	-	-	-	-	1	1	1
V-shape	-	-	-	-	-	-	-	-	-	-
HFE	-	-	-	-	-	-	-	-	-	-
8-shape	-	-	-	-	-	-	-	-	-	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	-	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	-
Bent FlatHand	-	-	-	-	-	-	-	-	-	1
Closed Hooked V-shape	-	-	-	-	-	-	-	-	-	1
Y-shape	-	-	-	-	-	-	1	-	-	-

Table-39 The dimension between obstacles and handshapes for the animal “snake”

Snake	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzagging	Bouncing	walking	others
Hooked V-shape	1	-	-	-	-	-	-	-	-	-
Flat Hand	2	2	-	1	-	-	1	-	1	1
Index Finger	1	2	-	3	-	1	3	-	3	-
Baby-O	-	-	-	-	-	-	-	-	-	-
Closed V-shape	-	-	-	-	-	-	-	-	-	1
V-shape	-	-	-	-	-	-	-	-	-	-
HFE	-	-	-	-	-	-	-	-	-	-
8-shape	-	-	-	-	-	-	-	-	-	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	-	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	-
Bent FlatHand	-	-	-	-	-	-	-	-	-	-
Closed Hooked V-shape	-	-	-	-	-	-	-	-	-	-
Y-shape	-	-	-	-	-	-	-	-	-	-

Table-40 The dimension between obstacles and handshapes for “humanbeings”

Human	Upstairs	Slipping	Swimming	Climbing	Jumping	Standing	Zigzaggin ~	Bouncing	walking	others
Hooked V-shape	2	2	-	2	4	-	3	2	1	-
Flat Hand	-	-	4	-	-	-	-	-	-	-
Index Finger	-	-	-	-	-	-	-	-	-	-
Baby-O	-	-	-	-	-	-	-	-	-	-
Closed V-shape	-	1	-	-	-	-	1	2	3	-
V-shape	2	1	-	-	1	2	-	-	-	2
HFE	-	-	-	-	-	-	-	-	-	-
8-shape	-	-	-	-	-	-	-	-	-	-
HFE-4	-	-	-	-	-	-	-	-	-	-
S-shape	-	-	-	4	-	-	-	-	-	-
L-shape	-	-	-	-	-	-	-	-	-	-
Bent FlatHand	-	-	-	-	-	-	-	-	-	-
Closed Hooked V-shape	-	-	-	-	-	-	-	-	-	-
Y-shape	-	-	-	-	-	-	-	-	-	-