

EFFECTS OF AGE OF ACQUISITION  
ON MORPHOSYNTACTIC STRUCTURES IN TURKISH SIGN LANGUAGE:  
EVIDENCE FROM CLASSIFIERS

HANDE SEVGİ

BOĞAZİÇİ UNIVERSITY

2019

EFFECTS OF AGE OF ACQUISITION  
ON MORPHOSYNTACTIC STRUCTURES IN TURKISH SIGN LANGUAGE:  
EVIDENCE FROM CLASSIFIERS

Thesis submitted to the  
Institute for Graduate Studies in Social Sciences  
in partial fulfillment of the requirements for the degree of

Master of Arts

in

Linguistics

by

Hande Sevgi

Boğaziçi University

2019

## DECLARATION OF ORIGINALITY

I, Hande Sevgi, certify that

- I am the sole author of this thesis and that I have fully acknowledged and documented in my thesis all sources of ideas and words, including digital resources, which have been produced or published by another person or institution;
- this thesis contains no material that has been submitted or accepted for a degree or diploma in any other educational institution;
- this is a true copy of the thesis approved by my advisor and thesis committee at Boğaziçi University, including final revisions required by them.

Signature.....

Date .....12.07.2019.....

## ABSTRACT

### Effects of Age of Acquisition on Morphosyntactic Structures in Turkish Sign Language: Evidence from Classifiers

This study investigates the differences in language production and comprehension of early learner and late learner Turkish Sign Language (TİD) signers. For this purpose, I focus on the complex structures such as classifiers and coordination to find out:

- (i) whether we observe any differences in the production of classifiers by early learner and late learner TİD signers with respect to morphological encoding as well as overt expression of the arguments on syntax-discourse level,
- (ii) whether we see any differences in the comprehension of coordinated clauses between two groups regarding the interpretation of the missing argument.

I conducted two tasks, a production study with classifier constructions and a comprehension study with coordinated structures. The results of the production study indicate that early learner ( $M_{age} = 30$ ) and late learner ( $M_{age} = 38$ ) TİD signers encode the thematic role of the argument morphologically in an accurate way; therefore, this aspect of TİD grammar is not age-sensitive. However, the findings on the overt expression of the arguments in classifier construction show two groups utilize different alignment systems, which indicates that this aspect of the language is age-sensitive. The findings of the comprehension task conducted with 20 TİD signers (10 early and 10 late learners;  $M_{age} = 31,9$  and  $M_{age} = 39,3$ , respectively) confirm the findings of the production study which claims early and late learner TİD signers use different alignment systems. However, no significant effect of thematic roles of the arguments is observed in this task unlike the production study. This finding may indicate the differences between the nature of classifier predicates and plain verbs.



## ÖZET

Edinim Yaşının Türk İşaret Dilindeki Biçimsözdizimsel Yapılar Üzerindeki Etkileri:

### Sınıflandırıcılardan Kanıtlar

Bu çalışma, Türk İşaret Dilini (TİD) erken ve geç yaşta edinen sağır bireylerin dili üretim ve anlamaları arasındaki farklılıkları araştırmaktadır. Bu amaçla, sınıflandırıcı ve eşbağımlılık gibi karmaşık yapılara odaklanarak;

- (i) sınıflandırıcı üretiminde ve sözdizim-söylem düzeyinde temel üyelerin açık ifade edilmesinde TİD’i erken ve geç yaşta edinen sağır bireyler arasındaki farklılıkları ortaya koymak;
- (ii) eşbağımlı tümceciklerde örtük ifade edilen temel üyelerin yorumlanmasında bu iki grup arasındaki farklılıkları araştırmak amaçlanmaktadır.

Tez kapsamında, sınıflandırıcı yapıları içeren bir üretim çalışması ve eşbağımlı yapıları içeren bir anlama çalışması yürütülmüştür. Üretim çalışmasının sonuçları, TİD’i erken ( $Ort_{yaş} = 30$ ) ve geç yaşta ( $Ort_{yaş} = 38$ ) edinen sağır bireylerin, temel üyelerin tematik rolünü biçimbilimsel olarak doğru bir şekilde işaretlediğini göstermektedir. Dolayısıyla, edinim yaşı dilin bu özelliğini etkilememektedir. Ancak sınıflandırıcı yapılarında temel üyelerin açık ifade edilmesine ilişkin bulgular, bu iki grubun değişik hizalanma dizgeleri kullandıklarını ve edinim yaşının dilin bu özelliğini etkilediğini göstermektedir. 20 katılımcı (TİD’i 10 erken;  $Ort_{yaş} = 31,9$  ve 10 geç yaşta edinen;  $Ort_{yaş} = 39,3$ ) ile gerçekleştirilen anlama çalışmasının bulguları da iki grubun farklı hizalanma dizgesi kullandığı savını güçlendirmektedir. Ne var ki, üretim çalışmasının aksine, bu çalışmada temel üyelerin tematik rollerinin dilin bu özelliği üzerinde anlamlı bir etkisi gözlenmemiştir. Bu bulgu, sınıflandırıcı yüklem ve uyum göstermeyen fiiller arasındaki farklılıklara da ışık tutacaktır.

## ACKNOWLEDGEMENTS

My first and greatest thanks are for my thesis advisor Assist. Prof. Kadir Gökğöz to whom I am truly indebted. I remember the day when we, all of a sudden, decided to work together. He is the person who encouraged me to work on this amazing field. He supported me anytime I felt lost in this new and unfamiliar world. Had it not been his support, enthusiastic encouragement, and eternal patience, this thesis could not have been completed. I am really grateful to him for helping me throughout this research with continuous support.

I would like to thank my thesis committee members, Assoc. Prof. Balkız Öztürk and Assoc. Prof. Nihan Ketrez, for their valuable comments and feedbacks which enabled me to improve my study. It was their positive energy and support that turned my thesis defense into an enjoyable event for me.

I would like to express my gratitude to Prof. Sumru Özsoy who was my very first linguistics professor and introduced this fantastic world to me. I still remember how amazed I was during those classes in my first year in the undergraduate program. I am also grateful to her since she was the one who gave me the encouragement to study in this program at Boğaziçi University. I am also grateful to Prof. Aslı Göksel who has been a role model for me in every aspect. I have already missed our discussions and the random ideas we came up with during the lectures. I would like to thank Assist. Prof. Pavel Logačev for his endless patience and invaluable friendship. Without his support, this chaotic year would have been a real disaster.

I also want to thank my professors in our beautiful department for their limitless support and encouragement. They have been not only professors but friends

to me. We shared our ideas, our conversation, and our food -much food-. I have enjoyed my every moment in this department.

My wholehearted thanks go to my dear friends whose names I will not write down by one by one since they know who I am talking about. I really love you and I know that I am the luckiest person to meet you and have you in my life. Thank you for being there for me any time I need.

My endless thanks go for the Deaf community for whom I would love to do and produce more. I am grateful for their understanding and kindness.

I also want to express my gratitude to anyone who has been in my life in any way in any time, who has changed my ideas, who has changed me and helped me to become the current me. Sad or happy memories, it does not matter, thank you all.

And finally, I would like to thank to my dear family who has been there for me all the time. They have been making any thing possible and available for me and never stop believing in me even if I, myself, stop believing in me. Their support is the most important thing for me and I will do my best not to let them down any time.

This thesis has been possible thanks to two projects: the SIGN-HUB project, which has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 693349 and the 'Supporting Sign Language Development of Deaf Children with Hearing Parents through Linguistically Informed Preschool Stories' project by Boğaziçi University Research Fund Grant Number 14458.

## TABLE OF CONTENTS

|                                                                    |    |
|--------------------------------------------------------------------|----|
| CHAPTER 1: INTRODUCTION.....                                       | 1  |
| 1.1 The aim of the thesis.....                                     | 1  |
| 1.2 The outline of the thesis.....                                 | 3  |
| CHAPTER 2: CLASSIFIER PRODUCTIONS.....                             | 4  |
| 2.1 Classifiers.....                                               | 4  |
| 2.2 Classifier types.....                                          | 11 |
| 2.3 Acquisition of classifier constructions in sign languages..... | 15 |
| CHAPTER 3: PRODUCTION STUDY.....                                   | 17 |
| 3.1 Theoretical background.....                                    | 17 |
| 3.2 Research question.....                                         | 21 |
| 3.3 Methodology.....                                               | 22 |
| 3.4 Results and discussion.....                                    | 30 |
| CHAPTER 4: COMPREHENSION STUDY.....                                | 48 |
| 4.1 Theoretical background.....                                    | 48 |
| 4.2 Research question.....                                         | 52 |
| 4.3 Methodology.....                                               | 52 |
| 4.4 Results and discussion.....                                    | 64 |
| CHAPTER 5: CONCLUSIONS .....                                       | 71 |
| CHAPTER 6: FURTHER STUDIES AND LIMITATIONS.....                    | 75 |
| APPENDIX: CLASSIFIER HANDSHAPES IN TİD.....                        | 77 |
| REFERENCES.....                                                    | 78 |

## LIST OF TABLES

|                                                                                |    |
|--------------------------------------------------------------------------------|----|
| Table 1. Fusion of Case and Number in Latin.....                               | 9  |
| Table 2. Proposal of Benedicto and Brentari (2004).....                        | 20 |
| Table 3. Controlled Vocabulary Items for the Tier Argument Structure of V..... | 28 |
| Table 4. Controlled Vocabulary Items for the tier Classifier Type.....         | 29 |
| Table 5. Distribution of Body Part Classifiers.....                            | 32 |
| Table 6. Distribution of Whole Entity Classifiers.....                         | 34 |
| Table 7. Distribution of Handling Classifiers.....                             | 36 |
| Table 8. Expression of Arguments in Unergative Clauses with Classifier.....    | 41 |
| Table 9. Expression of Arguments in Unaccusative Clauses with Classifier.....  | 42 |
| Table 10. Results of statistical analysis.....                                 | 44 |
| Table 11. Expression of Arguments in Transitive Clauses with Classifier.....   | 45 |
| Table 12. Conditions Utilized in the Comprehension Task.....                   | 54 |
| Table 13. Verbs Used in the Comprehension Task.....                            | 54 |
| Table 14. Sentences Used in the Comprehension Task.....                        | 53 |
| Table 15. Independent Variables of the Design.....                             | 63 |
| Table 16. Ratio of Nominative–Accusative Alignment System Driven Responses...  | 64 |
| Table 17. Results of the Generalized Linear Model.....                         | 67 |

## LIST OF FIGURES

|                                                                                                                                                 |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1. Syntactic representation of the account by B&B (2004).....                                                                            | 20 |
| Figure 2. Stimuli including an unaccusative event.....                                                                                          | 24 |
| Figure 3. Stimuli including a transitive event.....                                                                                             | 25 |
| Figure 4. Stimuli including an unergative event.....                                                                                            | 25 |
| Figure 5. Setting for the production task.....                                                                                                  | 27 |
| Figure 6. Sample annotation for the production task.....                                                                                        | 30 |
| Figure 7. Alignment types.....                                                                                                                  | 39 |
| Figure 8. Results of overt expression of arguments in UE and UA structures.....                                                                 | 43 |
| Figure 9. Conjunctive coordinator “and” in T1D.....                                                                                             | 49 |
| Figure 10. Stimulus which targets the fixed SOV (here MAN WOMAN FOLLOW<br>‘A man follows a woman.’) interpretation in reversible sentences..... | 58 |
| Figure 11. Setting for the comprehension task.....                                                                                              | 60 |
| Figure 12(a). The representation of the first clause in the sentence “Man follows<br>woman, __ falls.” .....                                    | 61 |
| Figure 12(b). The representation of the question which targets the dropped argument<br>in the sentence “Man follows woman, __ falls.” .....     | 61 |
| Figure 13. Pointing moment of a signer for the related question.....                                                                            | 62 |
| Figure 14. Results of the effect of the thematic role of the argument of an<br>intransitive verb on responses .....                             | 65 |
| Figure 15. Results of the effect of position of an intransitive verb on responses.....                                                          | 66 |

## ABBREVIATIONS

|       |                                          |
|-------|------------------------------------------|
| A     | agent                                    |
| ACC   | accusative                               |
| ASL   | American Sign Language                   |
| BEN   | benefactive                              |
| BPCL  | body part classifier                     |
| CL    | classifier                               |
| DH    | dominant hand                            |
| EL    | early learner signer                     |
| FinSL | Finnish Sign Language                    |
| HCL   | handling classifier                      |
| IMP   | imperative                               |
| INT   | intransitive verb                        |
| LL    | late learner signer                      |
| NDH   | nondominant hand                         |
| NOM   | nominative                               |
| PST   | past tense                               |
| S     | subject                                  |
| T     | theme                                    |
| TİD   | Türk İşaret Dili (Turkish Sign Language) |
| TR    | transitive verb                          |
| UA    | unaccusative verb                        |
| UE    | unergative verb                          |
| WECL  | whole entity classifier                  |

## CHAPTER 1

### INTRODUCTION

#### 1.1. The aim of the thesis

Deafness is a heterogeneous situation since the degree of hearing loss of Deaf people differs across individuals and may result from different sources. Only about 5% of Deaf people are born into Deaf families throughout the world (Moore, 2001; Marschark et al., 2002) and they are exposed to sign language input from birth onwards. Those who are in this group are referred to as early learner signers of Turkish Sign Language (TİD) in this study. In contrast, the rest are not equally exposed to any linguistic input before schooling starts (provided the Deaf child goes to a Deaf school) since their hearing parents cannot provide the primary sign language input for these children. This situation results in late exposure to sign language. Those who are in this group are referred to as late learner signers of TİD in this study. It is important to note that the signers who belong to the latter group still use sign language as their functional language and TİD is their first language and their main form of communication.

The aim of this thesis is to investigate the age-sensitive properties of complex linguistic structures by focusing on the major differences between early learner Deaf and late learner Deaf signers of Turkish Sign Language (TİD). Previous studies have shown that age of acquisition has a crucial impact on the language performance and comprehension of a child (Penfield & Roberts, 1959; Lenneberg, 1967; Emmorey, 2002). It is crucial to highlight that L1 acquisition is different from L2 acquisition since any late exposure to L1 results in incomplete competence of the language despite the length of exposure to a language (Mayberry and Kluender, 2017),



whereas even if L2 learners with a functional first language start to learn a second language after puberty, it is still possible for them to achieve near native competence (Hartshorne et al. 2018). Moreover, exposure to linguistic input at a late age is not adequate for some aspects of language to fully develop regardless of the duration an individual continues to receive relevant linguistic data; therefore, we observe linguistic differences between the production of early learner and late learner Deaf individuals of a sign language in adulthood, as well (Mayberry & Eichen, 1991). Such differences, which depend on age of acquisition, have been observed to become more pronounced in some complex morphosyntactic structures such as classifier constructions which have been found to develop in late childhood even in children who are exposed to sign language from birth (Newport, 1990; Newport & Supalla, 1990; Schick, 1990; Slobin et al., 2003).

There are several linguistic studies on American Sign Language (ASL) starting as early as the 1960s (Stokoe, 1960); however, linguistic research on TİD started only 18 years ago (Açan, 2001). Since then, remarkable progress has been achieved in the field (Zeshan, 2002; Arık, 2003; Sevinç, 2006; Kubus, 2008; Özkul, 2013; among others). Nonetheless, to my knowledge, the issue of variation or the absence of a morphosyntactic structure across Deaf adult TİD signers who were exposed to sign language at different ages has not been investigated yet. Such information is necessary to determine the age-sensitive structures within TİD grammar in order to develop the necessary diagnostic materials and intervention strategies to make sure that Deaf children at the risk of language deprivation are provided with the required primary linguistic input as early as possible. Therefore, this study aims to point out the differences in the production and comprehension of clauses with complex morphosyntactic structures by early learner and late learner

adult Deaf TİD signers and to reveal any age-sensitive aspects of TİD<sup>1</sup>. These aspects may present themselves in the deficiency or lack of production and comprehension along with other observable differences. This is crucial since these differences between the two groups may enable us to point out the missing and problematic aspects of the morphosyntactic structures of TİD and establish the basic criteria to distinguish between early learner and late learner Deaf TİD signers. Within the scope of this study, I will focus on classifier constructions which are iconically motivated and morphologically complex (Schick et al., 2005) to investigate the differences between these two groups.

## 1.2 Outline of the thesis

The thesis is structured as follows. Chapter 1 presents the aim of the study as well as the outline of the thesis. Chapter 2 covers theoretical background on classifiers and introduces previous studies conducted on the structure of these constructions as well as reviewing the studies related to their acquisition. Chapter 3 and Chapter 4 describe two studies which are conducted within the scope of this thesis, the production study and the comprehension study, respectively. Each chapter provides the background to the reader and introduces the methodology applied in the studies, such as informant profiles, stimuli, procedure, etc. and ends with the results of each study. Chapter 5 presents a summary of the studies while Chapter 6 points out possible future studies which will contribute to linguistic research and the limitations of the current study.

---

<sup>1</sup> This study is a part of the project ‘Supporting Sign Language Development of Deaf Children with Hearing Parents through Linguistically Informed Preschool Stories’ which aims to compare the production and comprehension of four morphosyntactic domains by adult early and late learner deaf TİD signers. The aim of this project is to reveal any age-sensitive morphosyntactic aspects of TİD to provide early sign language input and to prepare educational materials appropriate for early childhood for deaf children in Turkey. The findings will help us establish criteria to distinguish between early learner and late learner TİD signers while the educational materials will focus on these specific structures to facilitate sign language development for preschool deaf children.

## CHAPTER 2

### CLASSIFIER CONSTRUCTIONS

In this chapter, I will provide general information on classifier constructions in spoken and sign languages. After introducing the classifier constructions especially in sign languages in Section 2.1, I will present the relevant classifier types in sign languages in Section 2.2. Finally, I will touch upon the crucial issues regarding the acquisition of classifiers in Section 2.3.

#### 2.1 Classifiers

Allan (1977) defines classifiers in spoken languages as bound morphemes which have the function of grouping, subcategorizing, and classifying nouns (p. 285). For instance, in Caddo, a Native American language, classifier morphemes encode the semantic properties of the object morphologically on the verbal stem as exemplified below:

- |                                                                                                                     |                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| (1)    kapí:    kan-čâ:ni'ah<br>coffee CL:liquid-buy.past<br>'He bought (liquid) coffee.'<br>(Mithun, 1986, p. 386) | (2)    kapí:    dân:-čâ:ni'ah<br>coffee CL:powder-buy.past<br>'He bought (ground) coffee.'<br>(Mithun, 1986, p. 386) |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|

The only difference between sentences in (1) and (2) is the classifier morpheme which encodes the property of the object in the clause. The prefixes {kan-} and {dân:-} occur on the verbal root and indicate the property of the object kapí: 'coffee' which is interpreted as liquid or powder, respectively. These examples show that the presence of a specific classifier morpheme contributes a semantic property to the object of the clause.

In a similar way, Waris, a Papuan language, encodes the physical property of the object on the verbal root as follows:

- (3) sa ka-m put-ra-ho-o  
coconut I-DAT CL:round-get-BEN-IMP  
'Give me a coconut.'

(Adapted from Brown, 1981:96)

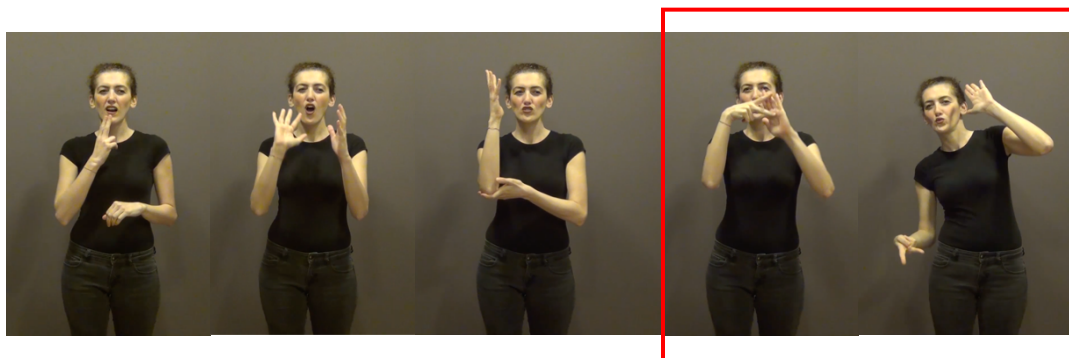
- (4) nelus ka-m ninge-ra-ho-o  
greens I-DAT CL:wrapped.in.leaf-get-BEN-IMP  
'Give me green (cooked in their leaf wrapper).'

(Adapted from Brown, 1981:97)

These sentences show that the object agrees with the verb with respect to semantic properties such as being round and being wrapped in a leaf, respectively.

Previous studies on sign languages show that almost all sign languages utilize classifier constructions<sup>2</sup> which express the salient semantic properties of the referent by handshape (Zwitserlood, 2012; among others) as exemplified below:

- (5) Turkish Sign Language (TİD)



DH: WOMAN

TREE

FALL.WECL:two-legged.entity

NDH:

TREE

STAND.WECL:tall.entity

'The woman falls from the tree.'

<sup>2</sup> Nyst (2007) reports that Adamorobe Sign Language (AdaSL) is an exception to this generalization.

The signer introduces the argument WOMAN in the first frame with a lexical sign. Afterwards, the oblique object TREE, which is a compound consisting of two sequential signs in TID, appears in the second and third frames. The frames marked with the red square include two classifiers which are encoded on the underspecified verbal root: one on the dominant hand (DH), which is the right hand for this signer, and one on the nondominant hand (NDH), which is the left hand of the signer<sup>3</sup>. The classifier on the dominant hand has the V-handshape () which refers to an entity with two legs, the WOMAN in this sentence, while the classifier on the nondominant hand has the 5-handshape () which refers to a tall entity with branches and it refers to the oblique object TREE.

Based on the similarity to the classifier constructions in spoken languages, the term ‘classifier’ started to be used in sign language linguistics for the first time by Frishberg (1975, p. 715) for these grammatical categories. However, there have been many studies which indicate that the morphological organization of classifier constructions in sign languages differ from classifiers in spoken languages and such organization is unique to sign language (Supalla, 1986; Schick, 1987; Engberg-Pedersen, 1993; Glück & Pfau, 1998; Schembri, 2003; Zwitserlood, 2003; Benedicto & Brentari, 2004; among others). As sentences in (1) – (4) exemplify, classifier morphemes in spoken languages, which are discrete units, attach to the verb sequentially and denote the properties of the related referent with respect to size, shape, substance, etc. In contrast, classifier morphemes in sign languages are mainly the handshapes (Aronoff et al., 2003, p. 63) which are incorporated into verbs simultaneously (Supalla, 1982; Wilbur, 1987) as can be observed in (5) above.

---

<sup>3</sup> Dominant hand is the active hand which realizes the movement in two-handed signs while nondominant hand is the passive hand which usually refers to the ground for the dominant hand to establish spatial relations (Crasborn, 2011).

As is observed in both spoken and sign languages, classifiers serve various functions in discourse, i.e. backgrounding, referent tracking, modifying, etc. (Aronoff et al., 2003) in addition to denoting the semantic properties of the referents. For instance, classifier constructions bear referential properties since they establish a link to the referent which has been previously introduced in the discourse (Kegl & Wilbur, 1976; Supalla, 1986). Moreover, overt pronominal expressions can be omitted if a classifier is used for reference tracking due to the presence of such a referential link.

Although some researchers label these constructions in sign languages as polymorphemic verbs (Engberg-Pedersen, 1993), polymorphemic predicates (Wallin, 1990), and classifier predicates (Corazza, 1990; Schick 1987; Valli & Lucas, 1995) besides other labels in literature, I will adopt the term classifier constructions within the scope of this study in order to be consistent with the general literature.

There have been debates about the grammatical nature and structure of classifier constructions. Supalla (1982) decomposes classifier constructions into discrete morphemes such as movement, location, and handshape. Due to the fact that the grammatical categories encoded by these classifier constructions may show phonological similarity across sign languages, Aronoff et al. (2005) suggest these constructions are iconic. Some researchers concentrate on this iconic origin and the similarities in classifier constructions across sign languages; thus, they conclude that classifier constructions are not linguistic units which do not have any constraints on their production. However, Singleton et al. (1993) show that the classifier handshapes used by ASL signers do not overlap with the iconic handshapes used by hearing nonsigners while there is a similarity between the classifier handshapes of ASL and other sign languages. This finding offers evidence for the presence of

linguistic organization of classifier constructions in natural sign languages. Based on the similarities of these constructions across sign languages, some researchers claim that sign languages have some common aspects with gestures; therefore, they argue that classifier constructions are a mixture of gestural elements and sign (Liddell, 2003; among others). Even if this were the case, it would not mean that classifier constructions are not linguistic units since gesture is not an extralinguistic feature but a systematic linguistic property according to at least some models of language (Özyürek, 2017). Moreover, the similarities in classifier constructions across sign languages can be explained on the basis of the visual-manual modality of the sign languages and on the basis of the fact that signers utilize similar resources in similar ways (Schembri, 2003; Woll, 1990). As Kimmelman et al. (2019) indicate, classifier constructions are linguistic units with linguistic characteristics since they have their argument structure as well as showing selectional restrictions with respect to the number of arguments and their thematic roles. Since sign languages are structured in a similar way to spoken languages as previous studies suggest, it is plausible to use the frameworks established for spoken languages while analyzing sign languages.

A widely accepted definition of classifier constructions is that classifiers in sign languages are bound morphemes which attach to an underspecified verbal root of location, movement, or manipulation and they convey information about the shape, size, handling of an entity that is involved in an event and/or present in a location. (Supalla, 1982; Zwitserlood, 2003; Sandler & Lillo-Martin, 2006, among others). Since bound morphemes have to attach to another unit, these constructions consist of more than one morpheme and are polymorphemic. These non-linear incorporations (Wilbur, 1987, p. 97) show a nonconcatenative morphological process. The handshape, which is the meaningful unit in these constructions, is

described as a classifier morpheme since the choice of handshape varies according to the salient property of the referents within the structure (Schembri, 1996; Benedicto & Brentari, 2004; among others). The classifier morphemes are incorporated into verbs, thus creating complex simultaneous morphemes in monosyllabic verbs (Brentari, 1996; Aronoff et al., 2003). This property of classifiers resembles fusional morphemes which bear more than one grammatical encoding as observed in Latin and even in English as shown in Table 1:

Table 1. Fusion of Case and Number in Latin (Adapted from Ayer, 2014)

| servus, <i>slave</i> (mas.) |          |     |          |
|-----------------------------|----------|-----|----------|
|                             | Singular |     | Plural   |
| NOM                         | servus   | NOM | servī    |
| GEN                         | servī    | GEN | servōrum |
| DAT                         | servō    | DAT | servīs   |
| ACC                         | servum   | ACC | servōs   |

Number and case marker fuse into one single morpheme in which these functions are simultaneously encoded in the structure, instead of two distinct morphemes which indicate these properties separately. In a similar way, classifiers enter into a syntagmatic relationship with other morphemes to form complex predicates as in (6):

(6) Turkish Sign Language



DH: MAN                      PILLOW      CARRY.HCL:bulky.entity

NDH:                          PILLOW      CARRY.HCL:bulky.entity

‘The man carries the pillow.’



As shown in the third frame, the semantic property of the object, i.e. shape, as well as the agency of the subject is encoded on the underspecified verbal root CARRY simultaneously.

Classifier constructions differ from lexical predicates with respect to the fact that the former group denotes more specific and iconic meaning than the latter group. Nonetheless, these two groups share similarities, as well (Wolford, 2009). Classifier constructions, similar to lexical predicates, are constrained by certain linguistic properties, namely handshape, movement, orientation, location, and nonmanuals. On the other hand, classifiers tend to use a larger set of morphological features than lexical predicates (Eccarius & Brentari, 2007; Cogill-Koez, 2000; among others). Moreover, Özyürek and Perniss (2011) argue that classifier constructions have more specific meaning than lexical predicates since lexical predicates have well-specified parameters which do not change according to the specifications of the referents in the clause while classifier constructions denote size, shape, and/or handling of the referent in a more specific way.

As in other sign languages, we observe classifier constructions in TİD (Arık, 2003, 2013; Kubus, 2008; Perniss & Özyürek, 2008; Özyürek & Perniss, 2011; Özkul, 2013; among others). Kubus (2008) focuses on classifier handshapes with respect to their phonology and he presents a list of the classifier handshapes used in TİD (see Appendix for the complete list). Özyürek and Perniss (2011) investigate the differences in the use of classifier constructions in a discourse context while Özkul (2013) presents the morphological and phonological properties of instrumental nouns and verbs, thus focusing on handling classifiers and instrumental classifiers. In the next section, I will provide information about classifier types which are relevant to the current study.

## 2.2 Classifier types

Classifier constructions convey information by using handshape, movement, and location in a productive way; however, this does not mean that classifier constructions are purely iconic, as there are constraints on their form and structure (Quer et al., 2017). Similar to spoken languages, classifier handshapes are selected from a specific set.

There have been different approaches to the classification of these grammatical constructions in the literature (Supalla, 1982; Liddell & Johnson, 1987; Zwitserlood, 2003; among others). In order to gain a deeper understanding of the properties of this construction in TİD, I investigate classifiers under four categories following Engberg-Pedersen's work (1993). These four categories consist of whole entity classifiers (WECL), body part classifiers (BPCL), handling classifiers (HCL), and extension classifiers (ExtCL). In the next section, I will present information on these classifier types by presenting examples from TİD.

### 2.2.1 Whole entity classifiers

Motivated by the shape of its referent, a whole entity classifier (WECL) represents an inanimate or animate object in its entirety. This classifier type occurs with verbs which express the existence or position of a referent in space and its motion. WECLs convey information about the features of the referent by combining with the motion/location component of the verb (Özkul, forthcoming) and depict their referents which can be animate entities such as upright human beings or animals as well as inanimate objects such as vehicles, and books as the sentence in (7) illustrates:

### (7) Whole entity classifier in TİD



DH: TABLE PLATE FALL.WECL:flat.entity

NDH: TABLE PLATE LIE.WECL:flat.entity

‘The plate falls from the table.’

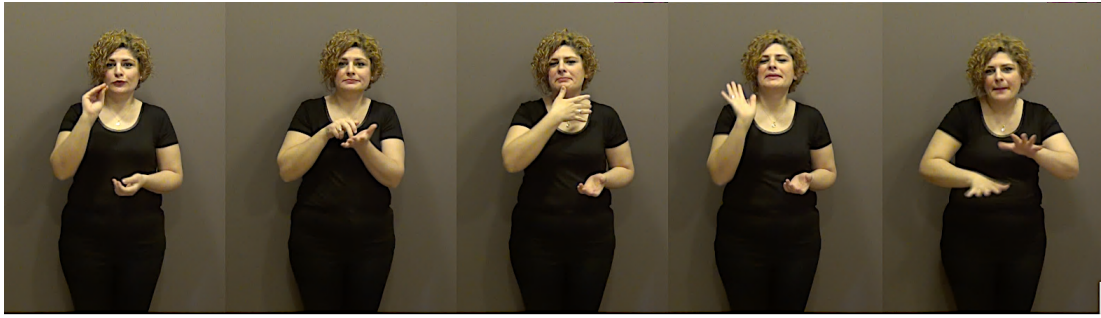
The flat-B handshape (✋) formed by the dominant hand of the signer in the third and fourth frames refers to the whole entity PLATE which takes place in the event FALL. Moreover, the whole entity classifier on the nondominant hand which occurs with the same handshape refers to the ground TABLE which specifies the location of the referent PLATE in the space.

#### 2.2.2 Body part classifiers

Body part classifiers (BPCL) refer to a specific part of the referent. This classifier type can refer to the limbs, head, or mouth of an animate entity; in other words, a BPCL does not refer to entities as a whole, but it refers to the parts of its referent.

Similar to WECLs, this classifier type may express the motion and/or the location of the entities as exemplified below:

## (8) Body part classifier in TĪD



DH: [CHILD WALK.BPCL:feet KNOW NOT] [CRAWL.BPCL:hands]

NDH: [ WALK.BPCL:feet ] [CRAWL.BPCL:hands]

‘The child does not know how to walk, s/he crawls.’

In sentence (8), the signer produces the V-handshape (✎) in the second frame which refers to the event WALK related to the legs of the referent CHILD in the first clause. Moreover, the signer produces the 5-handshape (✋) in the last frame with her two hands which refer to the body part of the referent CHILD as in the first clause.

As Wolford (2009) points out, WECLs and BPCLs are not easy to differentiate in some instances, especially in the case of V-handshape (✎). Wolford (2009) proposes a criterion to determine whether a classifier is a WECL or a BPCL: If there is an internal movement of the handshape, the classifier is a BPCL whereas if there is a movement of the entire handshape, the classifier is a WECL (p. 34). Moreover, he argues that if the signer describes an event which is related to a part of an entity but not the whole entity, the classifier refers to the body part. In this study, I use his criterion to differentiate between WECLs and BPCLs in order to capture the differences between these structures.

### 2.2.3 Handling classifiers

Handling classifiers (HCL) describe how an object is handled by another entity. This classifier type does not represent the whole object, but it represents the object

indirectly by describing how it is used or manipulated. This classifier type does not fully reflect the properties of the object; however, the classifier handshape differs depending on the size and/or shape of its referent as exemplified in (9):

(9) Handling classifier in T1D



DH: [THREE PERSON CHILD THERE][BALL THROW.HCL.round.entity]

NDH: [BALL THROW.HCL.round.entity]

‘There are three children. They throw the ball (to each other).’

In the second clause of the sentence in (9), the signer uses the 5-C handshape (🖐️) in the last frame which refers to the event THROW realized by the referent CHILDREN on the object referent BALL. As can be seen, this classifier supplies information not only about the undergoer with respect to its physical properties such as size and shape but also about the presence of an agent in the event.

#### 2.2.4 Extension classifiers

Extension classifiers (ExtCL) do not refer to the whole object but instead refer to a physical property of the object (Engberg-Pedersen, 1993). This classifier type typically either traces the perimeter or the surface of an object and expresses the size and shape of entities. They combine only with a certain type of movement morpheme, which does not represent real world movement but contours the extent of an entity. They are used to specify nouns of different shapes, such as a table, a book, and a ball as well as nouns of different sizes, such as small or large.

#### (10) Extension classifier in TİD



DH: RUNNER    EXTEND.ExtCL:HURDLE

JUMP.BPCL:legs

NDH:            EXTEND.ExtCL:HURDLE

HURDLE.WECL:thin.entity

‘The sportsman jumps over the hurdle.’

The signer introduces the argument RUNNER with a lexical sign, afterwards she uses the 1-handshape (☞) on both her hands to trace the shape of a hurdle on the second and third frames, which is an extension classifier. She holds the handshape of her nondominant hand intact while she signs the event JUMP with her dominant hand in order to depict the event jumping over the extending hurdle.

After introducing the classifier types, I will now give brief information on the acquisition of classifier constructions.

### 2.3 Acquisition of classifier constructions in sign languages

Previous studies on age of sign language acquisition show that morphology is the most fragile part of language; therefore, it is possible to observe significant differences between early learner and late learner Deaf signers in this domain of the language (Newport, 1990). Late learner signers are as analytic as early learner signers with respect to morphological structures; however, early learner signers use more morphological units in their production than late learners (Mayberry & Eichen, 1991). Moreover, Mayberry et al. (2018) show that late learner signers pass through

a language development process in which they do not acquire complex morphosyntactic structures completely; therefore, their grammar might be limited to simple structures (Mayberry et al., 2018). In a similar way, Mayberry and Kluender (2017) claim that age of acquisition also has a crucial impact on morphosyntactic processing. They reveal that late learner signers do not use inflectional morphology and complex sentences as much as early learner signers do.

The accurate use of these morphological structures differs in a systematic way depending on the age of language acquisition of signers. Such differences may become more pronounced in some morphosyntactic structures such as classifiers which are structurally complex (Supalla, 1982; Zwitserlood, 2003; Benedicto & Brentari, 2004; among others). Classifiers are observed to develop in late childhood even in children who have access to primary linguistic data from the day they are born; they acquire these structures at the age of 7-8 (Supalla, 1982; Schick 1990; Slobin et al. 2003). Boudreault and Mayberry (2006) also investigate the processing of sentences with different structures and they reveal that there is a direct relation between the competent use of classifier constructions in adults and age of exposure to ASL. Moreover, Singleton and Newport (2004) show that despite exposure to sign language for a long time, late learner Deaf signers produce movement and location morphemes similar to hearing nonsigners rather than producing those morphemes similar to early learner signers.

Considering this information, in the next chapter, I investigate whether T1D signers show such differences in their production of complex morphosyntactic structures, i.e. classifier constructions, depending on their age of acquisition.

## CHAPTER 3

### PRODUCTION STUDY

In light of previous studies, I investigate whether there are any differences between early learner and late learner Deaf TID signers with respect to their productions of clauses with classifier constructions. In this chapter, I will present a brief theoretical background on the structure of classifiers in sign languages in Section 3.1, which will lead us to the research questions in Section 3.2. Then, I will discuss the methodology in Section 3.3 and the results of this production study in Section 3.4.

#### 3.1 Theoretical background

Classifier constructions are complex predicates which give information about the movement, location, and physical properties of a referent (Supalla, 1986). The internal structure and function of these complex structures have been the focus of discussion in literature. Classifiers have been argued to function as reference markers (Edmondson, 2000), as pronouns (Klima & Bellugi, 1979, p. 13), as agreement markers (Zwitserslood, 2003; p. 6), and as valency changers (Benedicto & Brentari, 2004). Focusing on the morphosyntactic structure of these constructions, in this section, I will present theoretical background on classifiers as agreement markers and valency changers as well as indicating their polymorphemic structure.

Having been the first to analyze these constructions within a structural framework, Supalla (1982) carries out a detailed analysis of classifiers in ASL. In his analysis, he considers each component of these constructions such as movement, handshape, and location as separate morphemes, hence considering classifier constructions as polymorphemic units. He proposes that the root of the verb, which is



underspecified, is the movement and the handshape is the affix which attaches to this root. In his later work, Supalla (1990) shows the constraints on the affixation of certain groups of classifiers with specific movement morphemes (p. 41) which further proves the linguistic status of classifier constructions in sign languages rather than being iconic and gestural elements.

Similarly, Glück and Pfau (1998) argue that each component of classifier constructions (movement, handshape, and location) bears meaningful morphological status. Moreover, they propose that classifier morphemes in sign languages, i.e. the handshapes, are agreement morphemes which select a specific set of entities to attach. They claim that classifier constructions, as well as agreeing verbs, license dropped arguments: HCLs license dropped objects while WECLs license dropped subjects. They argue that such argument omission occurs due to the agreement which is morphologically encoded on the verbal root by a classifier morpheme.

On the other hand, Benedicto and Brentari (2004) investigate the syntactic structure of ASL classifiers in order to solve the complexity of clauses with these constructions. They propose that classifiers project functional heads which are associated with the internal and external arguments of the clause. In other words, these functional heads determine the argument structure of the clause in which they occur. This analysis is based on the fact that a change in the classifier handshape results in a change in the syntactic behavior of the predicate which can be transitive, unergative, or unaccusative. For instance, the difference in the classifier type which can be WECL, BPCL, or HCL results in a different syntactic structure, even though the movement and the referent(s) of a verb is the same in each case. Primarily, an HCL handshape licenses a transitive structure while a WECL and a BPCL license an intransitive structure. WECLs and BPCLs are further argued to be differentiated with

respect to the thematic role of their single argument. A WECL licenses a theme argument while a BPCL licenses an agent argument. This differentiation shows parallelism with the Unaccusative Hypothesis of Perlmutter (1978) which posits that unergative and unaccusative structures have different internal structures even though they have a single argument as represented below:

- (11) Unergative :  $[_{VP} DP [_{VP} V \quad ]]$   
 Unaccusative :  $[ \quad [_{VP} DP V]]$   
 Transitive :  $[_{VP} DP [_{VP} DP V]]$

In their formal analysis, Benedicto and Brentari (2004) argue that there are two functional heads projected via classifiers;  $f1^4$  introduces the external argument while  $f2$  introduces the internal argument. These syntactic heads are positioned immediately above VP. The arguments land on their specifier positions and establish structural agreement which is a specifier-head relationship. A structure which involves only the  $f1$  head results in an intransitive structure with an agent argument, i.e. an unergative structure, while a structure with only the  $f2$  head results in an intransitive structure with a theme argument, i.e. an unaccusative structure. A structure that contains both  $f1$  and  $f2$ , which license the external and internal arguments respectively, results in a transitive structure as illustrated in Figure 1 and Table 2:

---

<sup>4</sup> The functional head  $f1$  is similar to the function of the voice head in the voice phrase ( $vP$ ) proposed by Kratzer (1994). Both heads which occur above VP introduce the external argument which has agent role in the structure.

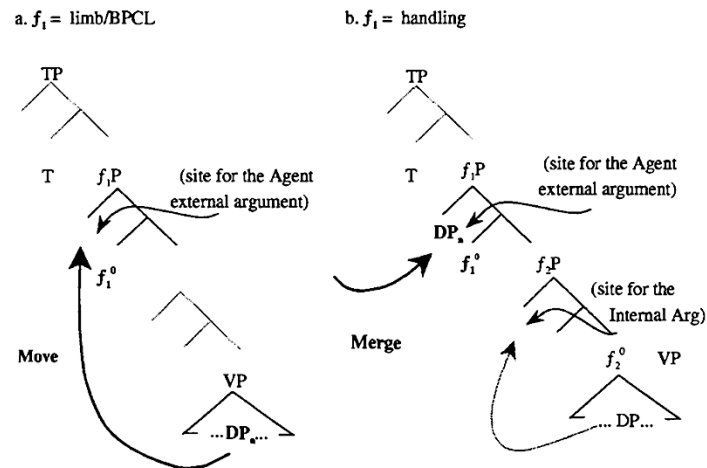


Figure 1. Syntactic representation of the account by Benedicto and Brentari (2004)

Table 2. Proposal of Benedicto and Brentari (2004)

| <i>Classifier type</i> | <i>Argument encoded</i> | <i>Via</i>                       |
|------------------------|-------------------------|----------------------------------|
| <i>BPCL</i>            | Agent                   | Higher functional head (f1)      |
| <i>WECL</i>            | Theme                   | Lower functional head (f2)       |
| <i>HCL</i>             | Agent   Theme           | Two functional heads (f1 and f2) |

According to this analysis, the underspecified verbal root does not provide information about the number and the nature of the arguments it takes; however, a classifier morpheme determines this information.

In order to clarify the differences between the classifier types and syntactic structures, Benedicto and Brentari (2004) conduct four tests. They used distributive morpheme, WILLING, NOTHING, and FINISH to detect whether the classifier type correlates with the argument structure of the clause. According to their analysis, NOTHING and the distributive morpheme can occur only with the sentences which include a theme argument while FINISH and WILLING can occur only with the sentences which include an agent argument. For example, a sentence with BPCL as in 12(a) and HCL as in 12(b) can cooccur with WILLING since there is an agent

argument while a sentence with WECL as in 12(c) cannot cooccur with WILLING since there is no agent argument:

(12) a. ROSIE WILLING CL:S+BOW

Rosie willingly head<sub>BPCL</sub>+bow

“Rosie bowed willingly.”

b. [Ø] BOOK WILLING CL:C+MOVE

*pro* book willingly obj\_grab<sub>HCL</sub>+move

“S/he put the book down (on its side) willingly.”

c. \*ROSIE WILLING CL:1+BOW

Rosie willingly upright\_being<sub>WECL</sub>+bow

“#Rosie bowed willingly.”

(Adapted from Benedicto & Brentari, 2004; p. 763)

Moreover, this model seems to indicate that there is Active Alignment in American Sign Language (ASL) since the single argument of an unergative verb and the agent subject of a transitive verb are introduced via the same functional head, f1, while the single argument of an unaccusative verb and the theme object of a transitive verb are introduced via the same functional head, f2.

### 3.2. Research question

Bearing the previous studies and accounts in mind, I formulated my research question on the basis of Benedicto and Brentari’s proposal (2004): Do we observe a similar pattern in T1D as well with respect to the licensing of the thematic roles of the arguments by classifier types? Furthermore, considering the aforementioned

difficulties in the acquisition of these morphological structures, I investigated whether the morphosyntactic expression of the classifiers shows any differences between early learner and late learner adult TİD signers.

In order to answer these questions, I conducted a production task which aimed to elicit classifier constructions. After analyzing this aspect of the language, I focused on the syntax-discourse level in which I investigated the presence or absence of grammatical arguments in a structure with these constructions.

### 3.3 Methodology

In this section, I will present information about the informants who took part in this production study in addition to information about the stimuli and the procedure used for collecting data.

#### 3.3.1 Informant profile

I consulted a Deaf signer colleague who has access to a wide network of individuals in the Deaf community to make a list of eligible informants out of the participant pool of Boğaziçi University's Sign Lab. We invited sixteen informants to participate in the classifier elicitation task.

Previous studies demonstrate that young children show better performance when acquiring a language due to neuroplasticity (Penfield & Roberts, 1959). The situation of children who are born deaf is different from children who do not have any significant hearing problems. Since Deaf children whose parents are hearing and do not use sign language as a form of communication cannot receive the primary linguistic input for the acquisition of their first language, the age of first exposure to a systematic functional first language is highly variable for deaf children (Mayberry,

1998). Those children are mostly able to acquire sign language at older ages when they enroll in a Deaf School where sign language is used as the primary means of communication. Due to the potential effect of the variation in the age of sign language acquisition, I grouped the informants as early learner TİD signers (eight informants) and late learner TİD signers (eight informants) based on the criteria below:

- Was the informant born deaf?
- If so, was s/he born to at least one Deaf parent or elder siblings so that exposure to systematic linguist input started at an early age?

We considered informants who responded to both questions affirmatively as early learner TİD signers while we considered the rest who do not have any Deaf relatives in their immediate family as late learner TİD signers.

The age range for the early learner TİD signers is 26-37 (mean age; 30) while it is 31-49 (mean age; 38) for the late learner TİD signers. The late learner TİD signers stated that they started to learn TİD at a Deaf School at roughly the age of six. The background data showed that the age range for late learner TİD signers to start to learn TİD is 5-10 (mean age of acquisition; 7). This means that the total duration of exposure to sign language of both groups is close to each other, 30 years in total for early learner signers and 31 years in total for late learner signers.

There were four female and four male informants in each group. Although their birthplaces vary, all informants currently live in Istanbul. Six early learner signers are graduates of various high schools for the Deaf. Two early learner signers are graduates of universities; however, these universities are not specialized for the education of Deaf students. Five late learner TİD signers are graduates of various high schools for the Deaf. Similar to the early learner group, two late learner signers

are graduates of universities which are not specialized for the education of Deaf students. One late learner signer, on the other hand, is a graduate of a secondary school for the Deaf. It is important to note that educational institutes specialized for Deaf students in Turkey do not exhaustively provide classes in sign language. The informants stated that reading and writing Turkish during the courses were inevitable while there was almost no educational setting which embraced the use of sign language as a main method of communication. Nonetheless, students in these schools use sign language among each other, and this is the main source of linguistic input for late learner signers.

### 3.3.2 Stimuli

To obtain classifier constructions, I used the elicitation materials of Inge Zwitserlood (2003) with her permission. This material includes a wide range of events and situations with various referents which differ in the degree of animacy as shown in Figure 2:

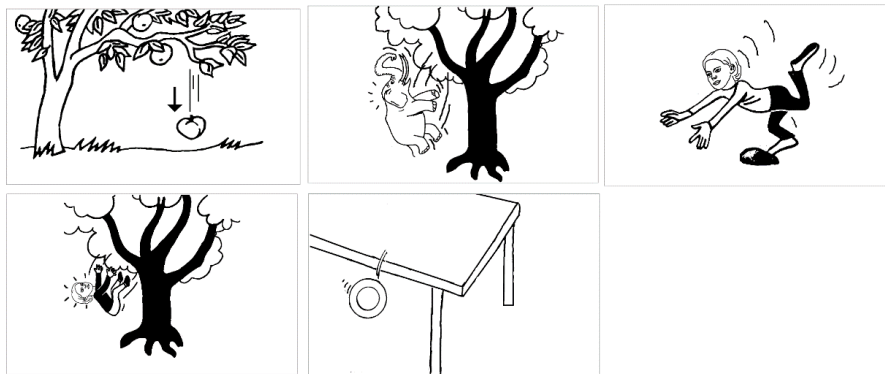


Figure 2. Stimuli including an unaccusative event (used with permission of Inge Zwitserlood)

The stimuli above depict the same event which targets the same unaccusative verb FALL. For these pictures, a single theme argument is required while the referent of each picture varies with respect to animacy and the visual shape of the referent.

The material also includes stimuli which aim to elicit classifier constructions with a transitive event as shown in Figure 3:



Figure 3. Stimuli including a transitive event (used with permission of Inge Zwitserlood)

The transitive event CARRY, which is commonly targeted by all the stimuli in Figure 3, has an animate external argument which can be either a human or an animal. On the other hand, the internal argument of the transitive event, i.e. the theme argument, can be either animate or inanimate. I aimed to find out the effects of animacy on the production of classifier constructions with this agency manipulation.

Lastly, the material includes events that target unergative verbs such as JUMP as shown in Figure 4:



Figure 4. Stimuli including an unergative action (used with permission of Inge Zwitserlood)



I investigated Zwitterlood's entire material which includes 152 items in total. I listed the potential classifier types following Engberg-Pedersen's classification (1993) and handshapes that may be elicited by using the specific items. I eliminated those which might result in the repetition of targeted classifier constructions. Through this process, I selected eighty-nine pictures which I printed on A4-sized paper. I put the pictures in a particular order so that no very similar item followed any other and each participant saw the stimuli in the same order.

### 3.3.3 Procedure

I conducted a pilot study with my Deaf colleague. I placed one SONY Handycam camera which recorded in HD format right across the signer. I asked her to consider the camera to be her deaf friend and describe each picture in everyday conversation style to "this deaf friend" who did not have any information about the event depicted in the pictures. I conducted the task by adopting the picture signing method since I aimed to avoid any influence of spoken or written form of Turkish, the language of the hearing community in Turkey.

After the pilot study, I repeated the task with sixteen informants with the help of my Deaf colleague. Before recording, we asked our informants to fill out a consent form to obtain their informed consent for the data to be recorded, analyzed, and used for academic purposes. Furthermore, through a comprehensive background questionnaire, we gathered information about their age, educational background, severity of their hearing deficit, and their language preference in their daily lives as well as their age of acquisition of TİD and whether they had any family members who is a TİD signer. Based on this information we obtained through the questionnaire, we confirmed the reliability of our labelling of groups as early learner

and late learner TĪD signers. Obtaining such information is crucial with respect to understanding the dynamics of the deaf community and the language competence of deaf individuals since each mentioned factor may play an important role in the language development and use.

As a further step, my Deaf colleague explained the task to the informants in TĪD before the task. Their task was to explain the event in each picture to a deaf friend. She did not give any explicit instructions which would lead the informants to use classifier predicates or any other way of description. The informants looked at the presented pictures one by one and they turned to the camera to sign the event in each. All signers viewed the stimuli in the same order. The recording setting is shown in Figure 5:

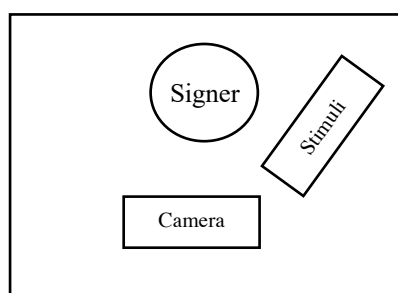


Figure 5. Setting for the production task

#### 3.3.4 Coding

Some stimuli elicited single sentences while some elicited more than one sentence forming a discourse<sup>5</sup>. I converted the collected data via Adobe Premiere CS6 to be able to work with it on the free annotation software program, ELAN, which displays audio-visual material and makes it possible to align the visual data with annotations in tiers which can be created from scratch (Crasborn & Sloetjes, 2008). Due to time

---

<sup>5</sup> One could also argue that even a single sentence obtained in this task includes a nonlinguistic discourse since the pictures are complex.

restrictions, we annotated the data of only eight informants - four early learner and four late learner adult TID signers.

As a first step, I specified the boundaries of the clauses produced for each picture. To detect clausal boundaries, I focused on the predications which express a single event, activity, or state following Berman and Slobin (1994) as well as the pauses between the signs. Moreover, I paid attention to nonmanual markers such as eyeblinks, head tilts, and the mouth in addition to an overall change in nonmanuals to ensure my assumptions were accurate (Wilbur, 1994; Nespor & Sandler, 1999; Crasborn 2007). I had the opportunity to consult my Deaf colleagues who work in the Linguistics Department at Boğaziçi University in detecting clausal boundaries when I had any doubt about the annotations.

Due to the manipulations of the verb type in the material, I annotated the argument structure of the verbs in a tier I named ‘Argument Structure of V’. I defined a controlled vocabulary list in ELAN for this tier to ensure the consistency in annotations as listed below with accompanying descriptions:

Table 3. Controlled Vocabulary Items for the Tier Argument Structure of V

|                                 |                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------|
| Transitive_Sub+Obj              | A transitive clause which includes an overt subject and an overt object         |
| Transitive_Sub                  | A transitive clause which includes an overt subject; the object is dropped      |
| Transitive_Obj                  | A transitive clause which includes an overt object; the subject is dropped      |
| Transitive_NullArg              | A transitive clause where both arguments are dropped                            |
| Intransitive_AgentiveSub        | An intransitive clause which has an overt subject whose thematic role is agent  |
| Intransitive_NonAgentiveSub     | An intransitive clause which has an overt subject whose thematic role is theme  |
| Intransitive_NullAgentiveSub    | An intransitive clause which has a dropped subject whose thematic role is agent |
| Intransitive_NullNonAgentiveSub | An intransitive clause which has a dropped subject whose thematic role is theme |

This controlled vocabulary list facilitated the annotation of not only verb types (transitive, unaccusative, unergative), but also the presence or absence of argument(s) in a clause which had an important role for the following analysis which focused on the presence/absence of an overt argument in clauses with classifier constructions.

Moreover, I annotated the classifier types by using a controlled vocabulary list as shown in Table 4:

Table 4. Controlled Vocabulary Items for the tier Classifier Type

|       |                         |
|-------|-------------------------|
| BPCL  | Body part classifier    |
| WECL  | Whole entity classifier |
| HCL   | Handling classifier     |
| ExtCL | Extension classifier    |

I further annotated the classifier handshapes by using the ‘Handshape palette for annotations’<sup>6</sup> developed by Joan Nash, Donna Diggle, and Ashwin Thangali for use in the linguistic annotations carried out as part of the American Sign Language Linguistic Research Project in order to have a coherent system within my data. Similar to the previous steps, I created a controlled vocabulary list which was useful in accelerating the coding process. The tiers used in ELAN during the annotation process are shown in Figure 6:

---

<sup>6</sup> The list is accessible via the link: <http://www.bu.edu/asllrp/cslgr/pages/handshape-palette.html>

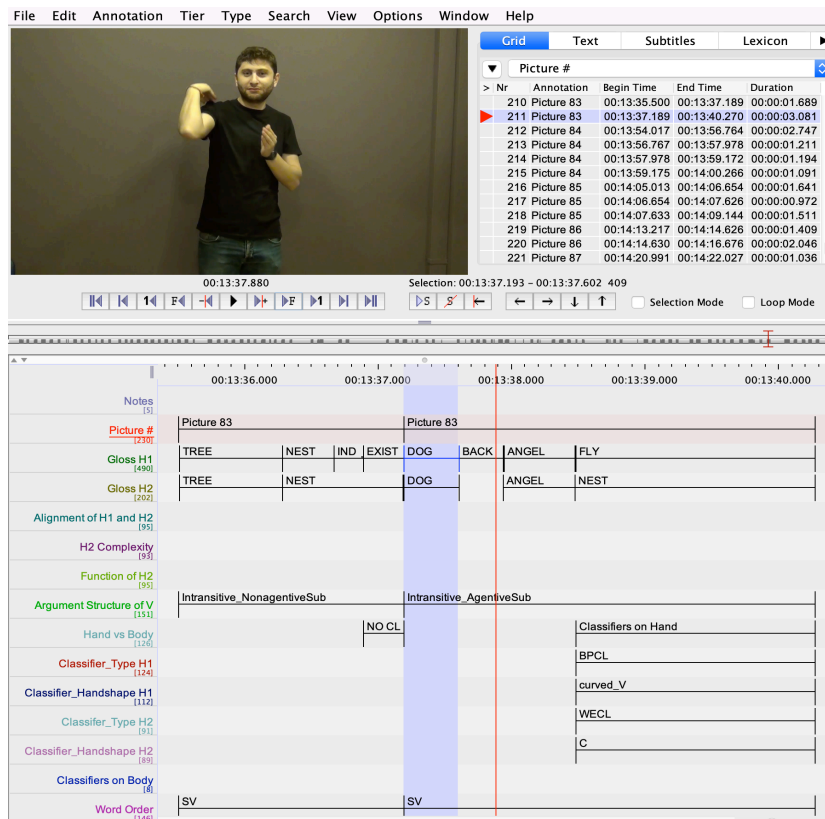


Figure 6. Sample annotation for the production task

### 3.3.5 Process

After the H2 annotation process, I exported the data into Excel, and I analyzed and compared the data obtained from eight of sixteen informants with respect to the correspondence between verb type and classifier type.

## 3.4 Results and discussion

In light of previous studies conducted on age of acquisition and classifiers in sign languages, I questioned whether TID presents a similar pattern with respect to the licensing of the thematic roles of the arguments by focusing on the use of classifier types. If the morphosyntactic analysis of Benedicto and Brentari (2004) holds, I expected to observe the correspondence between the classifier type, which is the handshape in a classifier construction, and the thematic role of the argument in

addition to the valency of clauses. In the following section, I will discuss the results of the production study with respect to the correspondence between the thematic role of an argument and the classifier type that refers to that argument.

### 3.4.1 Classifier type – thematic role correspondence

For this analysis, I focused on the classifier types produced by early learner and late learner T1D signers in clauses with classifier constructions and compared their productions for each stimulus. Following Benedicto and Brentari (2004), I investigated whether the argument structure shows correspondence with the classifier type in the productions of early learner and late learner T1D signers. In other words, I analyzed whether unergative, unaccusative, and transitive structures are consistently marked by the expected classifier type; BPCL, WECL, and HCL, respectively.

#### 3.4.1.1 Unergative predicates

The elicitation material included 15 stimuli which targets an event which can be described by using an unergative verb. I annotated 15 clauses with unergative verbs for the early learner signers (EL\_1, EL\_2, EL\_3, and EL\_4, henceforth) and three late learner signers (LL\_1, LL\_3, and EL\_4 henceforth) while 14 clauses with unergative verbs for one late learner signer (LL\_2, henceforth). Not all stimuli which describes an unergative event elicited clauses with a BPCL; LL\_2 used a lexical unergative predicate instead of a classifier predicate for one stimulus. Table 5 shows the distribution of BPCLs in the obtained data.

Table 5. Distribution of Body Part Classifiers

| Informant | BPCL | Unergatives in total | Proportion of BPCL in UE | Other (lexical or numeral) |
|-----------|------|----------------------|--------------------------|----------------------------|
| EL_1      | 15   | 15                   | 100%                     | 0%                         |
| EL_2      | 15   | 15                   | 100%                     | 0%                         |
| EL_3      | 15   | 15                   | 100%                     | 0%                         |
| EL_4      | 15   | 15                   | 100%                     | 0%                         |
| LL_1      | 12+3 | 15                   | 100%                     | 0%                         |
| LL_2      | 10+3 | 14                   | 93%                      | 7%                         |
| LL_3      | 11+4 | 15                   | 100%                     | 0%                         |
| LL_4      | 12+3 | 15                   | 100%                     | 0%                         |

The results show that TID signers consistently produce BPCLs in unergative structures<sup>7</sup>. This shows that TID signers accurately encode the thematic role of the argument on the verbal root which is in compliance with the analysis of Benedicto and Brentari (2004).

Interestingly, late learner signers tend to use their body as the argument instead of using manual signs as shown in (12):

(12)



SPRINT



SPRINT

These two examples show the difference between early learner and late learner signers with respect to the use of body in a clear way. For the same stimulus, an early learner signer (on the left) signs the event SPRINT only on his hands using a lexical predicate, while late learner signer (on the right) signs the same event on her body

<sup>7</sup> It is important to note that for cases in which signers do not use a BPCL, they do not use any other classifier type but a lexical predicate.

including her actual arms, torso, and legs. This shows the difference in the use of space between early learner and late learner signers as well.

These findings have been also attested in the serial verb constructions in TİD (Çiçek & Gökgöz, 2018). Since the same result is observed in two different structures of the language, it is reasonable to argue that this difference can be utilized as a diagnostic tool to distinguish between early learner and late learner TİD signers.

#### 3.4.1.2 Unaccusative predicates

The elicitation material included 16 stimuli which targets an event expected to be described by an unaccusative verb. Similar to the case of unergative structures, not all stimuli which describes an unaccusative event elicited clauses with a WECL; signers also produced unaccusative sentences with lexical predicates. EL\_1 signed 13 clauses with a WECL out of 14 unaccusative clauses in the data. The remaining one clause included a numeral predicate without a classifier handshape. EL\_2, on the other hand, signed 16 unaccusative clauses with a WECL. EL\_3 signed 11 clauses with a WECL out of 13 unaccusative clauses. The remaining two clauses did not include any classifiers. EL\_4 signed 8 clauses with WECL out of 10 unaccusative clauses while he did not use classifier morphemes in two clauses.

On the other hand, LL\_1 signed 14 unaccusative clauses in total. She signed 12 unaccusative clauses with a predicate that includes a WECL handshape. She signed one unaccusative clause with a lexical predicate and one accusative clause with a numeral predicate. The other late learner signer, LL\_2, signed 12 unaccusative clauses in total. He signed 11 clauses with a predicate that has a WECL, and 1 unaccusative clause with a numeral predicate. LL\_3 signed 10 clauses with a WECL out of 12 unaccusative clauses, the remaining two clauses did not involve any



classifiers. LL\_4 used only 8 unaccusative clauses and 6 of these clauses included WECL. The remaining two clauses did not involve any classifiers. Table 6 shows the distribution of WECLs in the data.

Table 6. Distribution of Whole Entity Classifiers

| Informant | WECL | Unaccusative in total | Proportion of WECL in UA | Other (lexical or numeral) |
|-----------|------|-----------------------|--------------------------|----------------------------|
| EL_1      | 13   | 14                    | 93%                      | 7%                         |
| EL_2      | 16   | 16                    | 100%                     | 0%                         |
| EL_3      | 11   | 13                    | 85%                      | 15%                        |
| EL_4      | 8    | 10                    | 80%                      | 20%                        |
| LL_1      | 12   | 14                    | 86%                      | 14%                        |
| LL_2      | 11   | 12                    | 92%                      | 8%                         |
| LL_3      | 11   | 12                    | 92%                      | 8%                         |
| LL_4      | 6    | 8                     | 75%                      | 25%                        |

The results show that early learner and late learner TID signers consistently produce WECLs in unaccusative structures. Similar to the unergative structures, they do not use any other classifier type but a lexical predicate and/or a numeral predicate for cases in which signers do not use a WECL. This shows that TID signers accurately encode the thematic role of the argument on the verbal root which is in compliance with the analysis of Benedicto and Brentari (2004).

### 3.4.1.3 Transitive predicates

There are more variations in the use of classifier types and handshapes for transitive verbs compared to unergative and unaccusative verbs. Since this could be the result of the differences in animacy of the arguments, I annotated the data according to three different sets: reversibles which include an animate subject and an animate object as the arguments, nonreversibles which include an animate subject and inanimate object, and instrumentals<sup>8</sup>.

---

<sup>8</sup> The variation of the classifier type in transitive clauses is mostly observed in the nonreversible sentences. This issue should be investigated in a further study.

EL\_1 produced 11 reversible and 24 nonreversible structures with HCLs out of a total of 49 transitive structures. The remaining 4 clauses included a lexical predicate without a classifier handshake while 5 clauses included BPCLs. EL\_2 produced 11 reversible and 28 nonreversible structures with HCLs out of a total of 50 transitive structures. Similar to EL\_1, EL\_2 produced 5 clauses which included BPCLs. EL\_3 produced 11 reversible and 29 nonreversible with HCLs out of a total of 48 transitive structures. The remaining 3 clauses included BPCL. EL\_4 produced 11 reversible and 28 HCL out of total 47 transitive clauses. The remaining 3 clauses included BPCLs. It is important to note that all early learner signers use WECL handshapes for the instrumental structures in the data (5 sentences in total).

On the other hand, LL\_1 produced 10 reversible and 28 nonreversible clauses with HCLs out of a total of 48 transitive structure. The remaining 2 clauses included lexical predicate without a classifier handshake while 2 clauses included the use of body instead of hands. Moreover, one transitive clause included BPCL. LL\_2 produced 10 reversible and 30 nonreversible structures with HCLs out of a total of 49 transitive structures. The remaining 1 clause included a lexical predicate without a classifier handshake while 2 clauses included the use of body instead of hands. One transitive clause included a BPCL. In a similar way, LL\_3 produced 10 reversible and 30 nonreversible structures with HCLs out of a total of 49 transitive structures. The remaining 1 clause included a lexical predicate without a classifier handshake while 2 clauses included the use of body instead of hands. One transitive clause included a BPCL. Lastly, LL\_4 produced 10 reversible and 24 nonreversible structures with HCLs out of 49 transitive structures. The remaining 4 clauses included lexical classifier while 3 clauses included WECL unlike any other signers in the data. Moreover, 3 clauses included BPCL. Similar to early learner signers, all late

learner signers use WECL handshapes for the instrumental structures (5 clauses in total). Table 7 provides the distribution of handling classifiers in transitive clauses.

Table 7. Distribution of Handling Classifiers

| Informant | HCL | Transitives in total | Proportion of HCL in TR | Other (BPCL + WECL or lexical) |
|-----------|-----|----------------------|-------------------------|--------------------------------|
| EL_1      | 35  | 49                   | 71%                     | 29%                            |
| EL_2      | 39  | 50                   | 78%                     | 22%                            |
| EL_3      | 40  | 48                   | 83%                     | 17%                            |
| EL_4      | 39  | 47                   | 83%                     | 17%                            |
| LL_1      | 38  | 48                   | 80%                     | 20%                            |
| LL_2      | 40  | 49                   | 82%                     | 18%                            |
| LL_3      | 40  | 49                   | 82%                     | 18%                            |
| LL_4      | 34  | 49                   | 70%                     | 30%                            |

The results show that early learner and late learner TlD signers produce HCLs in transitive structures in most cases. As in unergative and unaccusative predicates, the morphological encoding on the verbal root generally shows correspondence with the argument structure of the clause. However, not only HCL but also BPCL and WECL handshapes are observed in the production of the clauses with transitive verbs. For instance, instrumentals are realized as WECLs instead of HCLs in the data<sup>9</sup>.

However, such realization of the arguments in a clause with an instrumental unit is expected and accounted by the analyses of Benedicto and Brentari (2004).

Moreover, the data shows that transitive events which are realized by the use of a body part in the realization of the action in real world may include a BPCL and a WECL on the dominant hand and nondominant hand, respectively:

---

<sup>9</sup> Interestingly, one late learner signer (LL\_4) used WECL consistently in transitive clauses especially with the event OPEN which should be analyzed in further studies.

(13)



‘(to) kick a ball’

In (13), the dominant hand of the signer represents the event KICK by referring the foot (BPCL) of the agent argument while his nondominant hand represents the theme argument BALL (WECL). This structure would have been ruled out according to the analysis of Benedicto and Brentari (2004) since a transitive structure is licensed via HCL handshape which requires the presence of f1 and f2 in the structure unlike this example. However, this issue may be related to the objecthood analysis of Levin (1999) which argues that the complex event structures which have at least two subevents (i.e. break, open, melt) are the canonical transitive verbs whereas the simple event structures with one subevent are noncanonical transitive verbs (i.e. help, kick, bite). According to her analysis, the predicates which denote an activity, a state, or an achievement have simple event structures while the predicates which denotes causation have complex event structure. Parallel with this explanation, the current data shows that “noncanonical transitive verbs” can be realized with a BPCL and a WECL as in the example (13).

Overall, these results show that TĪD signers differentiate between arguments based on their thematic properties so that they select different classifier types accordingly as proposed by Benedicto and Brentari (2004). Moreover, there are not any differences between early learner and late learner adult TĪD signers with respect to the production of classifier types in accordance with the thematic role of

arguments. The only significant difference is found in the use of an actual body part as agreement with an argument which has also been attested in other studies regarding the difference between these groups.

This analysis indicates that TID signers are able to produce the accurate classifier type no matter which group they belong to. This shows that acquisition of classifier types in TID is not age-sensitive and cues for thematic roles is interpretable for signers from either group.

### 3.4.2 Presence or absence of overt arguments in clauses with classifiers

Previous studies show that in addition better known grammatical tools such as cross-referencing on a verb and case marking on an argument, the overt expression or dropping of an argument can also indicate the alignment of a language. For Acehnese, Durie (1988) found that the agent argument of a transitive clause is dropped in 81% of time which parallels the percentage of the drop of the agent argument of an intransitive-unergative clause (73%). This fact contrasts with the percentage of the dropping of the theme argument of an intransitive-unaccusative clause (34%), which in turn parallels the rarity of the dropping of the theme argument of a transitive clause (36%). Thus, Durie proposes that discourse structuring of a language might also contribute to understanding the alignment of a language. Therefore, I expanded my question and investigated if TID signers display any patterns that would be helpful to understand the alignment of the language and whether there are any differences between early learner and late learner TID signers in terms of overt or covert arguments in clauses with classifier constructions.

The marking of arguments as discussed in the previous section reveals an Active Alignment system where the single argument of an intransitive structure

behaves like the agent of a transitive structure with some verbs or the theme of a transitive structure with some other verbs (Dixon, 1994; Deal, 2016; among others). According to the analysis of Benedicto and Brentari (2004), the single agent argument and the subject of the transitive clause are introduced via the functional head f1 while the single theme argument and the object of the transitive clause are introduced via the functional head f2. Such an asymmetry between agent and theme arguments may be informative in terms of the syntactic properties of the classifier constructions and more importantly in terms of contributing to our understanding of the difference between early learner and late learner T1D signers. The Active Alignment pattern is shown in Figure 7a alongside the Nominative–Accusative alignment in Figure 7b, and the Absolutive-Ergative alignment in Figure 7c:

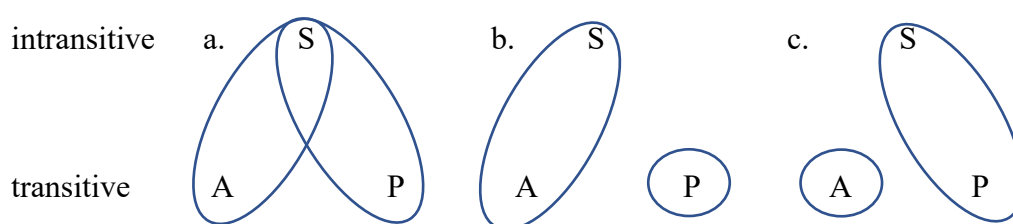


Figure 7. Alignment types

Arguments are encoded with respect to their thematic roles in languages which have Active Alignment while grammatical functions are the determinants of the morphological marking in languages with Nominative–Accusative system. As Figure 7 shows, the subject of a transitive clause has the same grammatical behavior with the single agent argument of an unergative clause. The object of a transitive clause which is a theme argument has the same grammatical behavior with single theme argument of an unaccusative clause. On the other hand, the subject of an intransitive clause, regardless of its thematic role, has the same grammatical behavior with the subject of a transitive clause in a Nominative–Accusative system.

After having deduced that the morphological encoding of thematic roles via classifier types is not an age-sensitive aspect of Turkish Sign Language, I raised the main question again: Do we observe any differences between early learner and late learner TİD signers with respect to the production of clauses with classifier predicates? During the data annotation process, the most striking case was the difference in the overt expression of arguments in the clauses with classifier constructions. Some informants tended to drop some arguments in a clause while some informants did not. Based on Durie's findings on Acehnese and my observations on TİD, I questioned whether there is any pattern in the overt expression of arguments in clauses with classifier construction based on the argument structure of the predicates.

#### 3.4.1.1 Unergative structures with classifier constructions

The results of this analysis suggest that there is a tendency to drop the subject of the unergative structure. EL\_1 tends to overtly express the single external argument by the ratio of 27% while the ratio is 40% for EL\_2. EL\_3 tends to express the external argument by the ratio of 36% while EL\_4 tends to express the external argument overtly by the ratio of 53%. The ratios become more meaningful when we consider the tendency of the late learner TİD signers. LL\_1 tends to overtly express the single external argument by the ratio of 73% while the ratio is 92% for LL\_2. LL\_3 tends to express the external argument by the ratio of 87% while it is 60% for the LL\_4. Table 8 shows the results of unergative clauses with classifiers:

Table 8. Expression of Arguments in Unergative Clauses with Classifier

| Informants        | SV | V  | Total | SV/Total   |
|-------------------|----|----|-------|------------|
| EL_1              | 4  | 11 | 15    | 27%        |
| EL_2              | 6  | 9  | 15    | 40%        |
| EL_3              | 5  | 9  | 14    | 36%        |
| EL_4              | 8  | 7  | 15    | 53%        |
| <b>Mean of EL</b> |    |    |       | <b>39%</b> |
| LL_1              | 11 | 4  | 15    | 73%        |
| LL_2              | 12 | 1  | 13    | 92%        |
| LL_3              | 13 | 2  | 15    | 87%        |
| LL_4              | 9  | 6  | 15    | 60%        |
| <b>Mean of LL</b> |    |    |       | <b>78%</b> |

Table 8 indicates a difference between early learner and late learner T1D signers with respect to the presence or absence of an overt argument in an unergative clause.

#### 3.4.2.2 Unaccusative predicates with classifier constructions

The results of the analysis suggest that there is a tendency not to drop the subject of the unaccusative structure for early learner T1D signers in clauses with classifier constructions. EL\_1 tends to overtly express the single internal argument by the ratio of 77% while the ratio is 87,5% for EL\_2. EL\_3 tends to express the external argument overtly by the ratio of 73%. EL\_4 produces the overt single argument by the ratio of 87,5%. LL\_1, in a similar way, tends to overtly express the single internal argument by the ratio of 77% while the ratio is 82% for LL\_2. LL\_3 tends to express the internal argument by the ratio of 70% while the ratio for LL\_4 is 67%.

Table 9 shows the results of unaccusative clauses with classifiers:



Table 9. Expression of Arguments in Unaccusative Clauses with Classifier

| Informants        | SV | V | Total | SV/Total      |
|-------------------|----|---|-------|---------------|
| EL_1              | 10 | 3 | 13    | 77%           |
| EL_2              | 14 | 2 | 16    | 87,5%         |
| EL_3              | 8  | 3 | 11    | 73%           |
| EL_4              | 7  | 1 | 8     | 87,5%         |
| <b>Mean of EL</b> |    |   |       | <b>81,25%</b> |
| LL_1              | 10 | 3 | 13    | 77%           |
| LL_2              | 9  | 2 | 11    | 82%           |
| LL_3              | 7  | 3 | 10    | 70%           |
| LL_4              | 4  | 2 | 6     | 67%           |
| <b>Mean of LL</b> |    |   |       | <b>74%</b>    |

There is no significant difference between early learner and late learner T1D signers with respect to the presence or absence of an overt argument in an unaccusative clause. Both groups tended to keep the single internal argument in most of the cases.

The results of the two analyses indicate that early learner T1D signers not only encode the syntactic configuration of a clause based on thematic role of the argument(s) but also this difference in the encoding of thematic roles surfaces as presence or absence of overt arguments. Early learners tend to drop the single agent argument while the dropping rate significantly decreases when the single argument of the clause is a theme. As for late learners, while the thematic roles are equally well expressed by the use of appropriate classifier handshape types, crucially, we do not observe any differences between the expression of the single arguments in unergative vs. unaccusative structures in their production contra early learner signers.

I plotted the data focusing on the presence or absence of the overt single argument and its thematic role with respect to the acquisition age of the signers. The plot in Figure 8 shows the mean of the overt single arguments in unergative and unaccusative clauses with classifier constructions produced by early learner and late learner T1D signers:

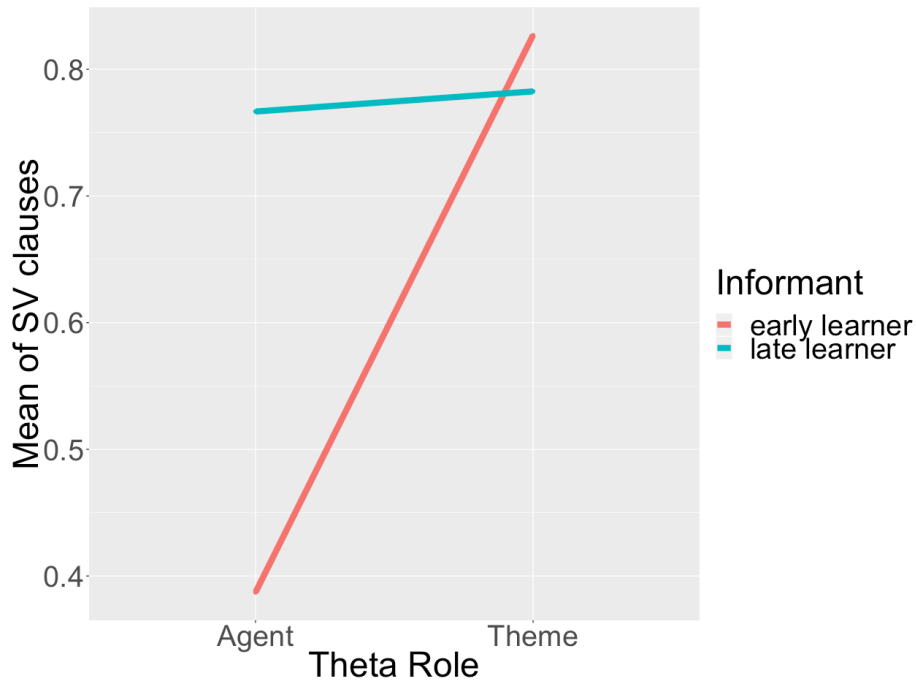


Figure 8. Results of overt expression of arguments in UE and UA structures

The plot shows that late learner TID signers do not tend to drop the single argument of intransitive clauses in any case. This indicates that they do not differentiate between thematic role of the single argument in such clauses. However, early learner TID signers pay attention to the thematic role of the single argument; they tend to drop the single agent argument while they tend not to drop the single theme argument in clauses with classifier constructions.

In order to understand the data better and to see the effect of the independent variables on the dependent variable and to reveal the interaction between these independent variables, I analyzed unergative and unaccusative clauses using the programming language R which is a software for statistical analysis and graphics.

Before running the model, I created sum contrasts for the independent variables of the task to obtain a reliable result. In line with the claim of this study, I used sum contrast value of +0.5 for ‘early learner signer’ and ‘agent argument’ while I used sum contrast value of -0.5 for ‘late learner signer’ and ‘theme argument’. I fit a Bayesian generalized linear model using brms package since this model provides

information not only about the relationship between an independent variable and the outcome but also about the interaction between independent variables and their cumulative impact on the outcome, unlike any computing conditional probabilities would do. This is an important property for the current data since there are more than one factor taken into account. This specific model targets to find out the probability of the production of a clause with an overt argument (Subject Verb) (i) when the signer is early learner, (ii) when the thematic role of the argument is agent, and (iii) the interaction between these independent variables. I analyzed the data coded as binominal units by a logit link function.

The results show that the conditions ‘agent argument’ and ‘early learner signer’ have a negative effect on the overt expression of the single argument. In other words, the probability of the production of an intransitive clause with an overt argument such as full noun phrase or a pronoun significantly decreases when (i) the verb is unergative which has an agent argument and (ii) the signer is early learner. Moreover, these independent variables have an interaction as shown in Table 10:

Table 10. Results of statistical analysis

| <i>comparison</i>            | coef. | 95% credible interval |
|------------------------------|-------|-----------------------|
| Early learner                | -0.70 | [-1.36, -0.06]        |
| Theta_Role_A                 | -1.08 | [-1.74, -0.45]        |
| Early learner X Theta_Role_A | -1.97 | [-3.35, -0.62]        |

The statistical results show that being early learner has a significant negative effect on the overt expression of the single argument as well as an agent argument. Moreover, two variables interact, hence increasing the negative effect on the dependent variable.

### 3.4.2.3 Transitive predicates with classifier constructions

Transitive structures provide further evidence for the difference between the signer groups regarding argument expression. EL\_1 produces SOV structures by a ratio of 13,3%. This ratio is 30% for EL\_2. EL\_3 produces SOV structures by a ratio of 50% and EL\_4 produces SOV structures by the ratio of 27%. However, when we look at the late learner signers LL\_1, LL\_2, LL\_3, and LL\_4, we find that these ratios are 50%, 62,5%, 58%, and 73,3% respectively. On the other hand, EL\_1 expresses only the theme argument of the transitive clauses by the ratio of 42% and EL\_2 expresses the theme argument by the ratio of 18%. EL\_3 expresses the theme argument of the transitive clauses by the ratio of 17% and EL\_4 expresses the theme argument by the ratio of 36%. In a similar pattern to the ratio of agent argument dropping, we observe that LL\_1 expresses only the theme argument by a ratio of 20%, LL\_2 expresses the theme argument only by the ratio of 4% while LL\_3 and LL\_4 express the theme argument by the ratio of 17% and 11%, respectively, as shown in the Table 11.

Table 11. Expression of Arguments in Transitive Clauses with Classifier

| Informants        | SOV | OV | SV | V  | Total | SOV/Total      | OV/Total     |
|-------------------|-----|----|----|----|-------|----------------|--------------|
| EL_1              | 6   | 19 | 2  | 18 | 45    | 13,3%          | 42%          |
| EL_2              | 15  | 9  | 9  | 17 | 50    | 30%            | 18%          |
| EL_3              | 24  | 8  | 3  | 13 | 48    | 50%            | 17%          |
| EL_4              | 13  | 17 | 6  | 11 | 47    | 27%            | 36%          |
| <b>Mean of EL</b> |     |    |    |    |       | <b>30,075%</b> | <b>28,25</b> |
| LL_1              | 23  | 9  | 6  | 8  | 46    | 50%            | 20%          |
| LL_2              | 30  | 2  | 12 | 4  | 48    | 62,5%          | 4%           |
| LL_3              | 28  | 8  | 4  | 8  | 48    | 58%            | 17%          |
| LL_4              | 33  | 5  | 1  | 6  | 45    | 73,3%          | 11%          |
| <b>Mean of LL</b> |     |    |    |    |       | <b>60,95%</b>  | <b>13%</b>   |

The cases of overt expression of the subject of a transitive clause, i.e. the agent argument, are less frequent in early learner signers than late learner signers. In other words, early learner signers tend to drop the agent of a transitive clause parallel to their tendency to drop the agent of an intransitive-unergative clause more frequently

than late learner signers. In a similar way, Ala-Sippola (2012) claims that signers frequently drop the agent argument of transitive clauses in Finnish Sign Language and this is a common form of ellipsis as cited in Jantunen (2013). On the other hand, early learner signers tend to express the object of transitive clause, i.e. the theme, even when they drop the agent which parallels their tendency to express the single argument of an intransitive-unaccusative structure, which has also a theme theta role.

The first analysis on the morphological encoding of argument structure with respect to the expression of thematic roles by classifier types show that TĪD signers utilize the thematic roles of the arguments and encode those accordingly in an accurate way in accordance with Benedicto and Brentari's (2004) model. Moreover, there is no significant difference between the production of the classifier types with different thematic roles across two signer groups. This finding is crucial since previous studies argue that morphology is a complex aspect of a language and it is susceptible to age of acquisition (Newport, 1990; Mayberry & Kluender, 2017; among others). The current data indicate that age of exposure to the first linguistic input does not obstruct the accurate morphological encoding on verbal roots in clauses with classifier constructions for TĪD signers.

However, the difference between early learner and late learner TĪD signers become apparent when we turn to the analysis on the overt expression of arguments in the syntax-discourse level. Early learner signers differentiate between thematic roles with respect to argument dropping while late learner signers do not. Thus, the data indicate that age of exposure to the first linguistic input have an impact on the alignment of the language for TĪD signers in this respect.

Jantunen (2013) argues that there is no constraint on argument dropping in Finnish Sign Language since it does not have any pivot constraint in a similar way to

Mandarin; therefore, it allows any type of argument dropping. However, the data indicates that TìD seems to have a pivot constraint which is  $S_A=A$ ;  $S_T=T$ . Such a morphosyntactic pattern shows that TìD may utilize Active Alignment in clauses with a classifier morpheme. Moreover, the current data indicates that classifier constructions in TìD license dropped arguments on the basis of thematic roles rather than the grammatical functions as proposed by Glück and Pfau (1998).

## CHAPTER 4

### COMPREHENSION STUDY

The findings of the production task indicated that classifier type and the argument structure have an effect on the presence or absence of the argument(s). In order to confirm the findings of this task, I conducted a follow-up comprehension study which also aims to reveal the alignment of TID by focusing on the nature of the dropped arguments in coordinated clauses, following Sevinç (2006). In her work, Sevinç (2006) investigates the alignment system of TID by analyzing coordinated structures with a transitive clause and an intransitive clause in which one of the arguments of the transitive clause or the single argument of the intransitive clause is missing. Before proceeding to the current study, I will present general information on the coordination structures in spoken and sign languages.

#### 4.1 Theoretical background

Coordination involves juxtaposition or conjunction of at least two same-level syntactic categories, which have a sister relation with each other (Haspelmath, 2007; Tang, 2012). Coordination indicates a grammatical dependency (Lehmann, 1988); therefore, this structure is a complex syntactic construction.

Semantic relations between the coordinated units determine the type of coordination. When two or more clauses of the same rank is linked, the result is conjunctive coordination and the overt linker is equivalent of “and”. When the coordinated clauses represent a contrast, the result is adversative coordination and the overt marker is equivalent of “but”. There are also disjunctive (“or”) and clausal coordination (“for”) in languages (Haspelmath, 2007).

Coordination is observed syndetically or asyndetically across the languages (Gast and Diesel, 2012). This distinction is due to the presence or absence of an overt marker of coordination, syndetically and asyndetically, respectively. In her work on coordination in ASL, Padden (1988) indicates that there are lexical conjunctions for “and” and “but”. However, she does not claim the obligatory use of these lexical conjunctions in a sentence. Moreover, she argues that the pause between clauses followed by a head shake is a cue for a syntactic coordination. Similarly, Jantunen (2016) shows that Finnish Sign Language (FinSL) does not have an overt linker for coordination but a prosodic break between clauses which is accompanied by a change in the head and body position. Moreover, Johnston and Schembri (2007) indicate that sign languages favor a strategy for coordination in which juxtaposition is prominently utilized in conjunctive coordination for simultaneous and sequential events instead of using an overt linker.

Parallel to other sign languages, although a lexical sign for the conjunction “and” exists in TİD as shown in Figure 9, its use in daily signing is not commonly attested according to our observations of several video recordings.

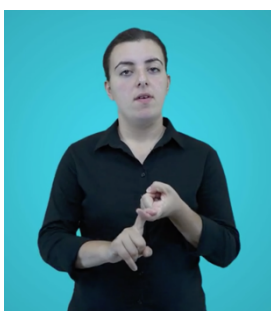


Figure 9. Conjunctive coordinator “and” in TİD  
(<http://tidsozluk.net/tr/Ve?d=0162>)

An important fact related to the coordinated clauses is the syntactic ellipsis which refers to the optional dropping of a constituent in a sentence (Huang, 2000; McShane, 2005; Johnston & Schembri, 2007). In such structures, the referent is



overtly mentioned in the first clause while the position of the same referent in the second clause is empty. This dropped argument is interpreted by means of the dependency between the referent in the first clause and its zero anaphora in the second clause.

Languages vary in the degree to which they allow zero anaphora as well as the interpretation of the dropped arguments. Turkish, which is a Nominative–Accusative language, favors S = A pivot constraint; therefore, the distribution of the zero anaphora is restricted to the following examples:

- (14) Çocuk gel-di ve kedi-yi gör-dü.  
 child.NOM come-PST.3SG and cat-ACC see-PST.3SG  
 “The child came and saw the cat.”
- (15) \*Çocuk gel-di ve kedi gördü.  
 child.NOM come-PST.3SG and cat.NOM see-PST.3SG  
 “The child came and the cat saw.”

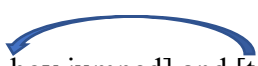
It is important to note that the sentence in (15) is grammatical with the interpretation of “The child came and saw (an indefinite) cat(s)” due to the fact that Turkish allows bare nouns as objects (Öztürk, 2005; among others). However, the subject of the first clause cannot be interpreted as the object of the second clause in this sentence due to the given constraint in Turkish. A structure similar to the sentence in (15) but not the sentence in (14) is acceptable in Dyirbal since the language has Absolutive – Ergative alignment which favors S = P pivot constraint (Dixon, 1994). On the other hand, Mandarin Chinese can have both interpretations since there is no pivot constraint as in Turkish or Dyirbal. The interpretation of the dropped argument in this language depends on world and contextual knowledge (Huang, 2000).

Coordination results in complex structures as in the case of classifier constructions. Furthermore, Friedmann and Costa (2010) show that the complexity of

the coordinated structures differs depending on the presence or absence of crossing dependencies in structures as the following:

- (16)  [The scientist<sub>t<sub>i</sub></sub> tested the boy] and [t<sub>i</sub> smiled].  
(Friedmann & Costa, 2010; 1503)

They claim that crossing dependencies are structures which involve movement of the subject of the second clause across the object of the first clause as in (16); therefore, the comprehension of such coordinated structures are more difficult than the coordinated structures without a crossing dependency. They further claim that coordination structures cannot involve coordination of VPs under a shared subject since it would violate the Uniform Theta-role Assignment Hypothesis (UTAH) proposed by Baker (1988). This hypothesis posits that a theta-role should be assigned in the same structural configuration in all structures and one argument should take one single theta-role. The following structure in which the shared subject needs to carry two different theta-roles due to the argument structure of the verbs, agent and theme thematic role respectively, should be ruled out by this hypothesis:

- (17)  [The boy jumped] and [t<sub>i</sub> fell].
- ```

graph TD
    IP --> NP[NP]
    IP --> VP1[VP]
    NP --> the_boy[the boy]
    VP1 --> VP2[VP]
    VP1 --> and[and]
    VP1 --> VP3[VP]
    VP2 --> V1[V]
    V1 --> jumped[jumped]
    VP3 --> V2[V]
    V2 --> fell[fell]

```

(Friedmann & Costa, 2010; 1512)

Therefore, they claim that similar structures involve coordination at a higher level than VP, since a subject position for each clause is required in order to avoid the

violation of UTAH during theta-assignment. This information bears importance for the design and analysis of the current comprehension study.

#### 4.2 Research question

The findings of the production study indicate a possible alignment difference in the production of clauses with classifier constructions between early learner and late learner Deaf TİD signers. In order to investigate this issue, I conducted a follow-up task with early learner and late learner TİD signers.

#### 4.3 Methodology

I conducted a comprehension study regarding the syntactic alignment of TİD and the difference between early learner and late learner adult TİD signers.

##### 4.3.1 Informant profiles

Twenty informants participated in the comprehension task. Since this study focused on the possible differences between early learner and late learner deaf TİD signers, I invited ten early learner TİD signers (five females, five males) and ten late learner TİD signers (five females, five males) to the Sign Lab at Boğaziçi University. Each informant filled the consent form and the questionnaire used in the production task.

The age range for early learner TİD signers is 23-43 (mean age; 31,9) while the age range for late learner TİD signers is 28-50 (mean age; 39,3). Moreover, the age range for late learner TİD signers to start to learn TİD is 4-17 (mean age of acquisition; 10). It means that the total duration of exposure to sign language of both groups is similar to each other; 31,9 years in total for early learner TİD signers and 31,9 years in total for late learner TİD signers.

Although their birth places vary, all informants live in İstanbul currently. Eight early learner and eight late learner signers attended primary schools for the Deaf while two signers from each group attended primary schools for hearing students. All early learner TİD signers are at least high school graduates while 7 of 10 late learner TİD signers are so. None of our early learner informants attended any university while 3 late learner informants graduated from a university. Regardless of the group which they belong to, all informants indicated that they always use TİD as the main way of communication in their daily lives.

#### 4.3.2 Stimuli

Following Sevinç (2006), I constructed sentences which consisted of two coordinated clauses. Similar to the production study, the material of this task included three verb types, namely transitive, unergative, and unaccusative, in order to understand the effect of the thematic role of an argument (agent vs. non-agent) on its expression on the syntactic level.

Each item in the task included one transitive and one intransitive clause which are coordinated without any overt linker but by juxtaposing. I manipulated the order of these two clauses in order to capture any difference on the possible syntactic alignment in TİD. This is because the position of the clause with an intransitive verb allows different relations between the overt argument and the zero anaphora since the first clause has its argument(s) as overt noun phrase(s) while the second clause has one dropped argument. Therefore, when the first clause has a transitive verb, the second clause with an intransitive verb has a covert single argument. On the other hand, when the first clause has an intransitive verb, the second clause with a transitive verb has only one overt argument which is newly introduced to the

structure. These manipulations resulted in a design with four conditions (2 X 2), namely the position of the clause with the intransitive verb and the thematic role of the argument of the intransitive verb, as shown in Table 12:

Table 12. Conditions Utilized in the Comprehension Task

| Position of INT<br>Agency of subject of INT | INT in the first clause                                                  | INT in the second clause                                             |
|---------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
| Agent subject                               | NP <sub>1</sub> INT   ( ) NP <sub>2</sub> ( ) TR<br><i>Condition IV</i>  | NP <sub>1</sub> NP <sub>2</sub> TR   ____ INT<br><i>Condition I</i>  |
| Theme subject                               | NP <sub>1</sub> INT   ( ) NP <sub>2</sub> ( ) TR<br><i>Condition III</i> | NP <sub>1</sub> NP <sub>2</sub> TR   ____ INT<br><i>Condition II</i> |

Furthermore, I aimed to eliminate any kind of agreement such as directionality, nonmanual markers, or pointing, etc. in the stimuli since such agreement in sign languages is a cue for the resolution of the referent of the dropped arguments (Lillo-Martin, 1986; Bahan et al., 2000; among others). Therefore, I chose plain verbs<sup>10</sup> which do not show any kind of agreement with either the subject or the object to form the task sentences as shown in Table 13:

Table 13. Verbs Used in the Comprehension Task

| Verb types   | Verbs                            |
|--------------|----------------------------------|
| Transitive   | FOLLOW, BITE, HIT                |
| Unergative   | RUN, ESCAPE, DANCE, LAUGH        |
| Unaccusative | FALL, BE _ SAD, DIE, GET _ BORED |

An example of these plain verbs is as follow:

<sup>10</sup> Padden (1988) categorizes verbs in sign languages under three groups: plain verbs, agreement verbs, and spatial verbs. Plain verbs do not show any kind of agreement in space with their arguments. Agreement verbs, on the other hand, encode the number and person features of their arguments and these verbs denote a transfer between the arguments. Spatial verbs encode the arguments with source and goal thematic role in space.

(18)



BE\_SAD

I did not manipulate the animacy degree of the arguments in order to avoid adding more conditions into the design, which would require more participants to obtain reliable results. Instead, I used human referents MAN and/or WOMAN which differ only in gender; therefore, the clauses with transitive verbs were potentially reversible sentences. These reversible sentences functioned as control items since they share the identical conditions but differ only with respect to the doer and the undergoer of the same verb. Hence, I balanced the thematic roles of the referents. In total, I formed twenty-four sentences. These sentences are shown in Table 14.

I recorded short videos of these sentences with the help of a deaf researcher who is an early learner T1D signer. As mentioned above, I avoided any cue which could help the interpretation of the dropped arguments such as classifier morphemes, spatial agreement, and also nonmanual markers as shown in sentence (19):

Table 14. Sentences Used in the Comprehension Task

| Sentences                                                   | Structure of Sentences                          | Conditions |
|-------------------------------------------------------------|-------------------------------------------------|------------|
| KADIN ADAM TAKİP   ___ KOŞ<br>woman man follow run          | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UE     | I          |
| KADIN ADAM TAKİP   ___ DÜŞ<br>woman man follow fall         | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UA     | II         |
| KADIN DÜŞ   ( ) ADAM ( ) TAKİP<br>woman fall man follow     | NP <sub>1</sub> UA   ( ) NP <sub>2</sub> ( ) TR | III        |
| KADIN KOŞ   ( ) ADAM ( ) TAKİP<br>woman run man follow      | NP <sub>1</sub> UE   ( ) NP <sub>2</sub> ( ) TR | IV         |
| KADIN ADAM VUR   ___ KAÇ<br>woman man hit escape            | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UE     | I          |
| KADIN ADAM VUR   ___ ÜZÜL<br>woman man hit be sad           | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UA     | II         |
| KADIN ÜZÜL   ( ) ADAM ( ) VUR<br>woman be sad man hit       | NP <sub>1</sub> UA   ( ) NP <sub>2</sub> ( ) TR | III        |
| KADIN DANS_ET   ( ) ADAM ( ) VUR<br>woman dance man hit     | NP <sub>1</sub> UE   ( ) NP <sub>2</sub> ( ) TR | IV         |
| KADIN ADAM ISIR   ___ GÜL<br>woman man hit laugh            | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UE     | I          |
| KADIN ADAM ISIR   ___ ÖL<br>woman man bite die              | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UA     | II         |
| KADIN SIKIL   ( ) ADAM ( ) ISIR<br>woman get bored man bite | NP <sub>1</sub> UA   ( ) NP <sub>2</sub> ( ) TR | III        |
| KADIN GÜL   ( ) ADAM ( ) ISIR<br>woman laugh man bite       | NP <sub>1</sub> UE   ( ) NP <sub>2</sub> ( ) TR | IV         |
| ADAM KADIN TAKİP   ___ KOŞ<br>man woman follow run          | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UE     | I          |
| ADAM KADIN TAKİP   ___ DÜŞ<br>man woman follow fall         | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UA     | II         |
| ADAM DÜŞ   ( ) KADIN ( ) TAKİP<br>man fall woman follow     | NP <sub>1</sub> UA   ( ) NP <sub>2</sub> ( ) TR | III        |
| ADAM KOŞ   ( ) KADIN ( ) TAKİP<br>man run woman follow      | NP <sub>1</sub> UE   ( ) NP <sub>2</sub> ( ) TR | IV         |
| ADAM KADIN VUR   ___ KAÇ<br>man woman hit escape            | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UE     | I          |
| ADAM KADIN VUR   ___ ÜZÜL<br>man woman hit be sad           | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UA     | II         |
| ADAM ÜZÜL   ( ) KADIN ( ) VUR<br>man be sad woman hit       | NP <sub>1</sub> UA   ( ) NP <sub>2</sub> ( ) TR | III        |
| ADAM DANS_ET   ( ) KADIN ( ) VUR<br>man dance woman hit     | NP <sub>1</sub> UE   ( ) NP <sub>2</sub> ( ) TR | IV         |
| ADAM KADIN ISIR   ___ GÜL<br>man woman bite laugh           | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UE     | I          |
| ADAM KADIN ISIR   ___ ÖL<br>man woman bite die              | NP <sub>1</sub> NP <sub>2</sub> TR   ___ UA     | II         |
| ADAM SIKIL   ( ) KADIN ( ) ISIR<br>man get bored woman bite | NP <sub>1</sub> UA   ( ) NP <sub>2</sub> ( ) TR | III        |
| ADAM GÜL   ( ) KADIN ( ) ISIR<br>man laugh woman bite       | NP <sub>1</sub> UE   ( ) NP <sub>2</sub> ( ) TR | IV         |

(19)

[Clause 1.....]      pause      [Clause 2.....]



ADAM

KADIN

TAKİP

DÜŞ

man

woman

follow

fall

Interpretation: *'A man follows a woman, \_\_falls.'*

As justified in the theoretical background, the sentences did not involve any overt linker “and” since TİD signers do not tend to use conjunctions frequently as far as we could observe. Instead, I added short pauses between the coordinated clauses following Padden (1988) and Jantunen (2016).

Sevinç (2006) indicates animacy may result in an asymmetry in the word order of transitive clauses. In order to avoid any potential misinterpretation which could occur due to the reversibility of the sentences, I introduced a visual image which described the event in the first clause of the sentence in compliance with the SOV order, which is the basic word order in TİD (Sevinç, 2006; Gökgöz 2011; among others). By coercing this, I aimed to ensure a fixed reading for the transitive sentences across the board as represented below in Figure 10 for TİD signers.



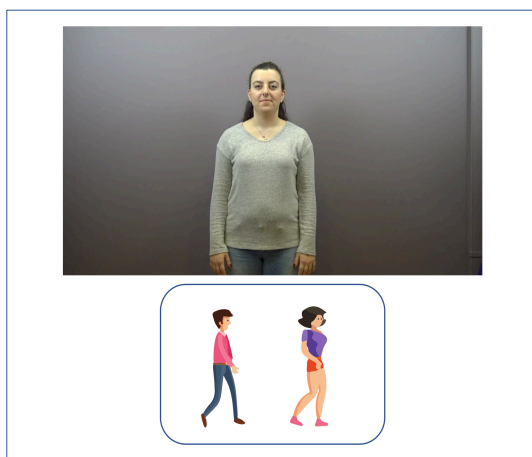


Figure 10. Stimulus which targets the fixed SOV (here MAN WOMAN FOLLOW ‘A man follows a woman.’) interpretation in a reversible sentence

For each video clip of the constructed task sentences, I recorded a short video with the help of the Deaf colleague. The clip questioned the subject of the event in the second clause when the second clause involves an intransitive verb. By doing so, I aimed to question the antecedent of the zero anaphora in the second clause and to investigate whether there is any difference between early learner and late learner TİD signers with respect to the comprehension of the coordinated clauses. A question video which targets intransitive clauses is illustrated in (20):

(20) Question for intransitive continuation

Task item: [ADAM KADIN TAKİP] [ \_\_ DÜŞ]

man woman follow fall



KİM

DÜŞ

who

fall

Interpretation: ‘*Who falls?*’

Moreover, I recorded short videos which questioned the subject and the object of the event when the second clause involves a transitive verb as exemplified in (21):

(21) Question for transitive continuation

Task item: [KADIN DÜŞ] [ \_\_ ADAM \_\_ TAKİP]

woman fall                      man                      follow



KİM

KİM

TAKİP

who

who

follow

Interpretation: *'Who follows whom?'*

#### 4.3.3 Procedure

The comprehension task was presented to the informants on a computer screen using PowerPoint. The task material was randomized for each participant to eliminate any potential ordering effects.

Before the actual study, I conducted a pilot study with a Deaf colleague. I used two SONY Handycam cameras which recorded the process in HD format. As shown in Figure 11, I placed one camera right across the informant who faced the computer screen. Another camera which was placed behind the informant recorded the responses of the informant. Any influence of spoken or written Turkish was avoided during the recordings of this task.

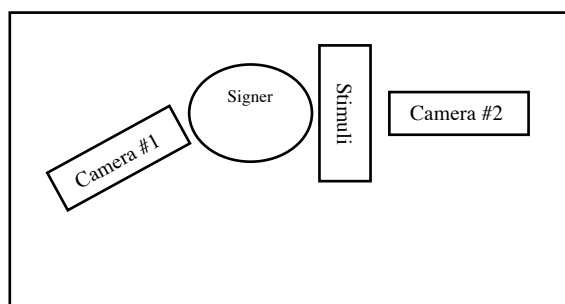


Figure 11. Setting for the comprehension task

Following the pilot study, the task was repeated with twenty informants with the help of a Deaf colleague. Before each recording, the informants filled a consent form and a questionnaire as in the production study.

Before the task started, my Deaf colleague informed the participants about the task. Moreover, an introduction video which described the details of the task in TID was presented at the beginning of each session. After the introduction video, a blank page popped up on the screen and the informants were asked to continue the task by using arrow keys of the computer. Following the blank page, the video depicting the first sentence played on the screen twice. At the end of the sentence, the visual that coerced the SOV or SV orders for the interpretation of the first clause of the sentence occurred as illustrated in Figure 10 at Section 4.3.2. The informants continued the task by using the arrow key of the computer. I avoided using a force-paced design for this task since I was acknowledged by my Deaf colleague about the fact that the informants could get overwhelmed easily when there would be a time limit in the task.

Each sentence was followed by a question video which targeted the argument(s) of the verb in the second clause. I applied forced choice method in this part of the task in order to be able to measure the response times of the informants as well as avoiding any misinterpretation regarding their answers during the coding

process. The informants were asked to choose between two possible options<sup>11</sup> by pointing to the related visual image which popped up immediately after the question sentence ended. Similar to the task material, the locations in which the options appeared were randomized. Figure 12 (a) and (b) illustrates the task design below:

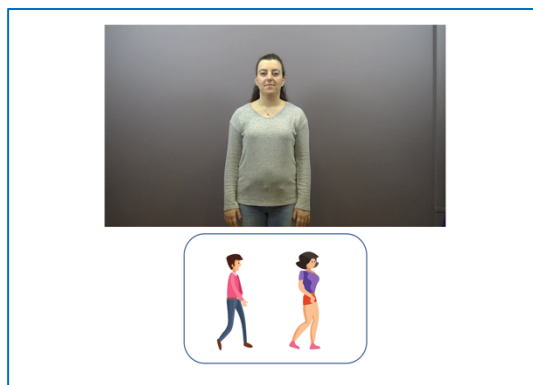


Figure 12(a). The representation of the first clause in the sentence “A man follows a woman, \_\_ falls.”

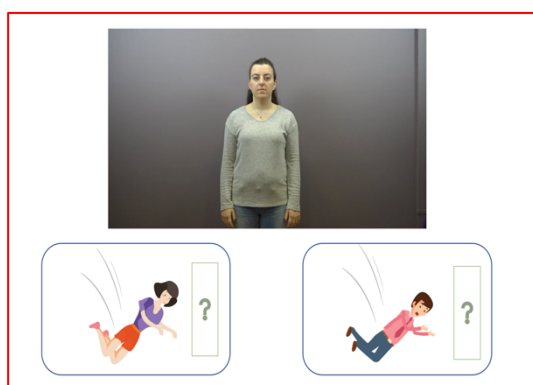


Figure 12(b). The representation of the question which targets the dropped argument in the sentence “A man follows a woman, \_\_ falls.”

The signers responded to the related questions by pointing to the picture of relevant argument in the intransitive continuation or the relevant relation between two arguments in the transitive continuation. How a signer responded to a question is shown in Figure 13.

<sup>11</sup> i) Something happens to either the man or the woman/ either the man or the woman does something,  
 ii) Either the man does something to the woman, or the woman does something to the man.

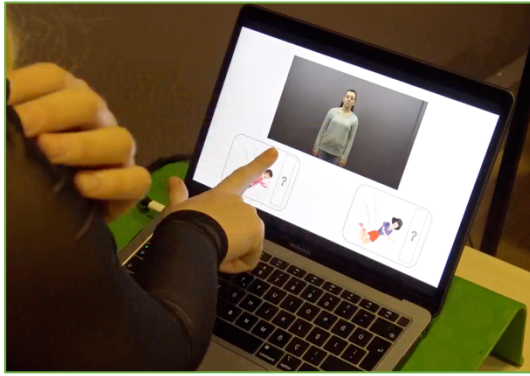


Figure 13. Pointing moment of a signer for the related question

A blank page followed the question sentence in order to allow the informant to continue in a controlled way. The next sentence did not appear on the screen until the informant pushed the button again. Each signer completed 24 sentences constructed for the comprehension task without having any problems related to the task procedure.

#### 4.3.4 Coding

I converted the obtained video data into mp4 via Adobe Premier CS6 to be able to process it on ELAN. The coding process of this task was different from the production task since there was no signing to annotate. Instead, I paid attention to the properties of the manipulated sentences and the responses of the informants. To highlight the differences between sentences belonging to the different conditions, I formed the following tiers on ELAN:

- Is the first clause intransitive?
- Is the subject of the intransitive verb an agent?

I annotated an item by giving the values of “1” if the clause with an intransitive verb is the first clause while I gave the value of “0” if the clause with an intransitive verb is the second clause. Further, I annotated the stimuli with respect to the thematic role of the argument of the intransitive clause. I annotated the stimuli as “1” if the argument

of the intransitive clause is an agent while I annotated it as “0” if the argument of intransitive clause is non-agent. This annotation led me to solidly code the conditions of the task design which were the independent variables as shown in Table 15:

Table 15. Independent Variables of the Design

|                                                 |   |
|-------------------------------------------------|---|
| Intransitive clause is the first clause         | 1 |
| Argument of the intransitive clause is an agent | 1 |
| Intransitive clause is the second clause        | 0 |
| Argument of the intransitive clause is an agent | 1 |
| Intransitive clause is the first clause         | 1 |
| Argument of the intransitive clause is a theme  | 0 |
| Intransitive clause is the second clause        | 0 |
| Argument of the intransitive clause is a theme  | 0 |

In order to encode the responses of the informants, I created another tier, which is the dependent variable in this design. This third tier, which questioned “Is the subject of the first clause the subject of the second clause?” targeted the information regarding the interpretation of the arguments in the given data. I annotated the response as “1” if the subject of the first clause is also the subject of the second clause. If not, I annotated the response as “0”.

Furthermore, I focused on the response time for each stimulus by the informants in order to investigate any differences between early learner and late learner T1D signers. Since each question did not last the same amount of time, I defined a criterion for calculating the response time: I considered the interval between the end of the question video and the moment the informant pointed to the response as the response time for the analysis.

I exported and compiled the processed data via ELAN in order to analyze and compare the data obtained from twenty informants.

#### 4.4 Results and discussion

The morphosyntactic analysis of classifier constructions proposed by Benedicto and Brentari (2004) and the production task conducted in this study indicate that sign languages show Active Alignment, i.e. the single external argument of an unergative verb and the agent of the transitive verb are treated in the same way while the single internal argument of an unaccusative verb and the theme of the transitive verb are treated in the same way. In other words, the arguments are differentiated with respect to their thematic roles within a classifier construction. In this chapter, I described the comprehension task conducted in this study to confirm this finding.

Based on the annotation of the data on ELAN, I obtained the results in Table 16 which show the tendency of early learner and late learner T1D signers for using a Nominative–Accusative alignment which corresponds to the responses where the participants interpret the dropped argument as coreferential with the subject of the first clause irrespective of the thematic roles.

Table 16. Ratio of Nominative–Accusative Alignment System Driven Responses

| Conditions                                                   | Early learner signers | Late learner signers |
|--------------------------------------------------------------|-----------------------|----------------------|
| I<br>NP <sub>1</sub> NP <sub>2</sub> TR   ____ UE            | 15%                   | 26%                  |
| II<br>NP <sub>1</sub> NP <sub>2</sub> TR   ____ UA           | 26%                   | 41%                  |
| III<br>NP <sub>1</sub> UA   (____) NP <sub>2</sub> (____) TR | 4%                    | 33%                  |
| IV<br>NP <sub>1</sub> UE   (____) NP <sub>2</sub> (____) TR  | 9%                    | 28%                  |

The ratios above indicate that there is a difference between the responses of early learner and late learner T1D signers which can be explained through the alignment system they use as proposed in the previous chapter. However, the results do not confirm the hypothesis which argues that early learner signers use Active Alignment while late learner signers use Nominative–Accusative alignment in this

comprehension study. Moreover, when the ratios of responses in each condition were taken into account for each group separately, I observed that there is a significant difference in the responses of early learner T1D signers among the conditions ( $\chi^2 = 23.0358$ ,  $p = .00004$ ; the result is significant at  $p < .01$ ). What is more interesting is that there is no such difference in the responses of late learner T1D signers for these conditions ( $\chi^2 = 6.1581$ ,  $p = .104167$ ; the result is not significant).

Before conducting a statistical analysis, I plotted the data focusing on the responses given by the T1D signers in the comprehension task. Since the preliminary findings indicate the effect of the thematic roles on the alignment system, I focused on the thematic roles of the arguments of the intransitive verbs and its effect on the comprehension of the dropped arguments. The plot in Figure 14 shows the responses belonging to these two groups:

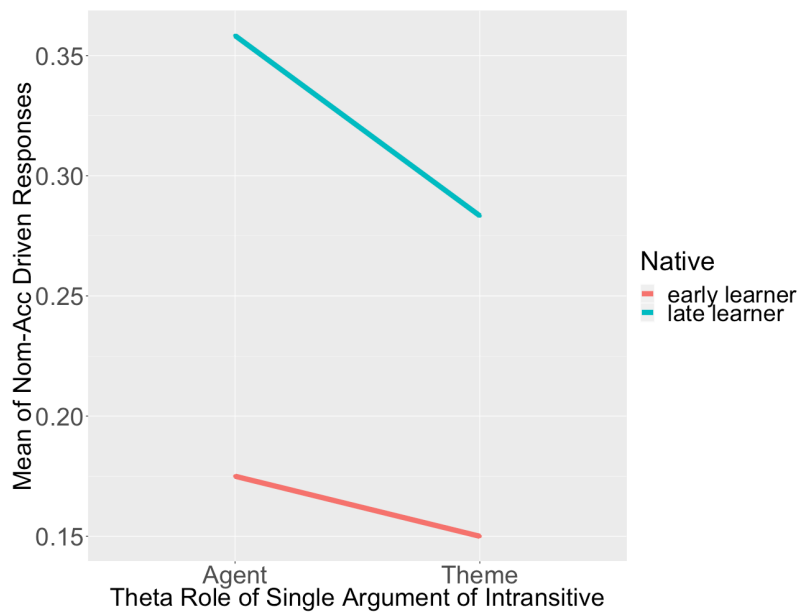


Figure 14. Results of the effect of the thematic role of the argument of an intransitive verb on responses

Surprisingly, in the stimuli of the comprehension task in which plain verbs were used, we do not observe any effect of the thematic role of the argument of the intransitive verb on the resolution of the zero anaphora in a coordinated structure.



Nonetheless, when the position of the intransitive structures is the focus of analysis, there is a significant difference between early learner and late learner TID signers as shown in Figure 15. This plot indicates that early learner TID signers pay attention to the position of the intransitive verb while determining the antecedent of the dropped argument whereas late learner TID signers do not take the difference in the position of intransitive verb into account.

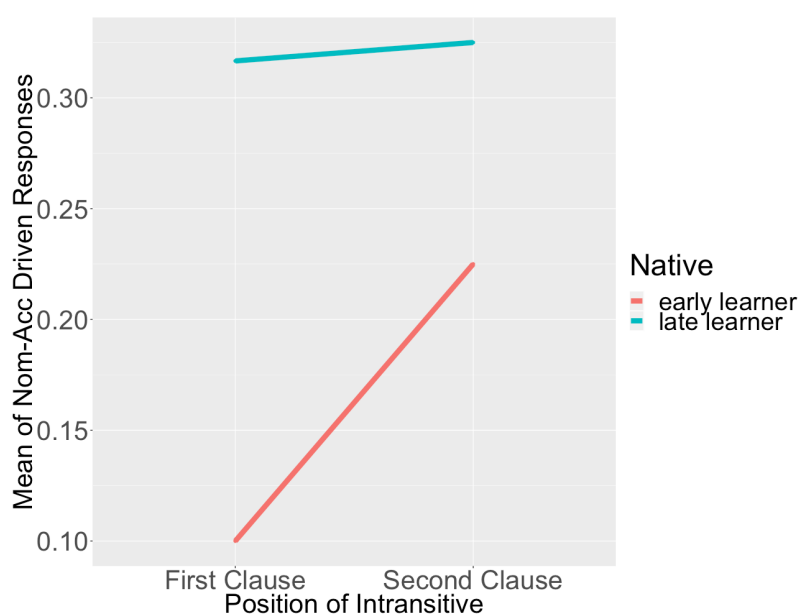


Figure 15. Results of the effect of the position of an intransitive verb on responses

Before running the model, I used sum contrast value of +0.5 and -0.5 on the independent variables in order to balance the data and interpret the main effects better in the presence of any interactions. I fit a Bayesian generalized linear model with a logit link function. I analyzed the responses of the signers which were coded as binominal units (“0” and “1”). By using such a model, I investigated the effect of the independent variables on the dependent variable and the interaction between the independent variables, which is beyond the advantages provided by computing conditional probabilities.

This model targets to find out the probability of the comprehension of a coordination structure clause with a dropped argument (i) when the subject of the

intransitive clause is agent, (ii) when the first clause of the coordination structure is an intransitive clause, (iii) when the signer is early learner, and (iv) the interaction between any independent variables.

This statistical analysis reveals a significance difference between early learner and late learner T1D signers with respect to the interpretation of the zero anaphora as shown in Table 17:

Table 17. Results of the Mixed Effects Linear Regression Model

| <i>comparison</i>           | coef. | 95% credible interval |
|-----------------------------|-------|-----------------------|
| Early learner               | -1.12 | [-1.84, -0.45]        |
| Theta_Role                  | -0.02 | [-1.79, 1.62]         |
| Position of Intransitive    | -0.91 | [-1.51, -0.31]        |
| Theta_Role X Pos.Int        | 0.25  | [-0.93, 1.50]         |
| Early learner X Pos.Int     | -1.14 | [-2.17, -0.15]        |
| Theta_Role X Early learner  | -0.17 | [-1.18, 0.80]         |
| Pos X Early learner X Theta | 0.57  | [-1.46, 2.63]         |

The data above indicates that being an early learner signer has a significant negative effect on the response being according to Nominative–Accusative alignment.

However, there is no significant effect of thematic role of the argument of the intransitive verb on the responses unlike the results of the production study. What is more interesting is that the position of the clause with an intransitive verb has also a significant negative effect on being in compliance with Nominative–Accusative alignment. In other words, if the informant is an early learner T1D signer and the sentence has an intransitive clause in the first position, the tendency of the response to be in accordance with Nominative–Accusative alignment decreases. The results also indicate that there is an interaction between being an early learner signer and the position of the intransitive clause, which increases the tendency of moving away from Nominative–Accusative alignment.

The results of the comprehension study also show that there is a difference between the alignment system which is utilized by early learner and late learner adult TID signers in the interpretation of zero anaphora in the sentences with coordinated clauses.

As indicated above, early learner signers seem to utilize different strategies in order to retrieve the antecedent of the zero anaphora in the different conditions.

When we focus on the condition in which the clause with an intransitive verb is located in the first position, we observe a parallelism of responses by early learner TID signers with a phenomenon widely attested in sign languages; i.e. split-sentence constructions (Napoli & Sutton-Spence, 2014). When there are two new arguments, the tendency is to introduce the first argument and then introduce the other argument in the second clause as exemplified below:

- (22) CHILD SEDUTO MAMMA PETTINARE  
 child seated mother comb  
 “the child sits and mother combs (his) hair.”  
 (Volterra et al., 1984, p. 32)

In such constructions, the argument introduced in the first clause tends to be the object of the event realized in the second clause. In other words, the subject of the first clause is interpreted as the object of the second clause; however, it is not overtly expressed in the second clause. It might be the case that TID also utilizes such a strategy to interpret the dependency resolutions. The late learner TID signers do not use this strategy as much as early learner TID signers do, as the results show.

In the conditions in which the clause with a transitive verb is located in the first position, the results show a really interesting case for the interpretation of the zero anaphora. The responses of the early learner TID signers indicate that the coordination in the given sentences for this study is not a VP-level coordination but a higher-level coordination since otherwise we would expect to have shared subjects

for coordinated clauses in the task sentences. However, regardless of the thematic role of the argument, the signers mostly tend to choose the object of the first clause as the subject of the second clause, which shows the signers do not tend to utilize Nominative–Accusative alignment. The only cue on which they focus is the argument’s linear closeness to zero anaphora. This issue may be accounted via the effect of memory on retrieval processes which can be accounted by models such as Friedmann & Costa (2010) as reviewed above in Section 4.1.

Although this task also indicates a difference between the alignment of early learner and late learner TİD signers, this difference does not completely parallel the differences observed for the production of the clauses with classifier constructions. As opposed to the significant difference which we observed in the differential dropping of the arguments according to their thematic roles in clauses with classifier constructions, we do not encounter such an effect of thematic roles in plain verbs. Moreover, these results do not indicate a clear-cut difference between two groups with respect to the alignment of the language. For example, late learner TİD signers also do not utilize a total Nominative–Accusative alignment unlike the findings of the production study. Nonetheless, when we compare the tendencies, we observe that late learner signers tend to utilize a more Nominative–Accusative alignment than the early learner signers.

Moreover, as Sevinç (2006) indicates semantic bias based on world knowledge may have a prominent weight in the interpretation of the missing arguments, hence semantics may overrule syntax (p. 41). It is important to note that the sentences in the comprehension task may have such semantic biases which would lead to the current results.

This study suggests that although the clauses with classifier constructions utilize the thematic roles of the arguments during production, it is not the case with the comprehension of plain verbs which do not bear any cue regarding the semantic properties of the referent. In order to tackle this issue a similar comprehension task which involves sentences with classifier constructions should be conducted.

## CHAPTER 5

### CONCLUSION AND FURTHER STUDIES

In this study, I investigated whether there are any differences between the grammatical system of early learner and late learner TlD signers. For this purpose, I focused on the production of classifier constructions which are complex structures. In this chapter, I will summarize the findings of each study and discuss what the results indicate for TlD as well as sign language linguistics in general.

The first analysis on the production task indicated that early learner and late learner Deaf TlD signers accurately encode the thematic roles of the arguments on the underspecified verbal root in most cases. Their comparable competence in the morphological marking of the semantic properties of the arguments shows that this aspect of the language is not age-sensitive.

The second analysis on the production task showed that early learner TlD signers seem to differentiate between the thematic roles of the arguments; moreover, based on this differentiation, early learner TlD signers tend to drop the agent argument of the clause. Such a pattern is in accordance with an Active Alignment in which the arguments are encoded according to their thematic roles. This finding corresponds with Benedicto and Brentari's analysis of classifier constructions (2004). However, late learner TlD signers do not differentiate between the thematic role of the arguments with respect to expression of the arguments in a sentence. This pattern seems to be in line with Nominative–Accusative alignment. This aspect of the language seems to be age-sensitive due to the difference between the productions of two groups.

The analysis of the follow-up comprehension study also indicate that early learner and late learner TİD signers use different alignment systems; however, the findings of this study does not confirm the findings of the production study since early learner TİD signers seem not to use a pattern similar to an Active Alignment system in the comprehension of the coordinated clauses which include plain verbs. Similarly, late learner TİD signers seem not to use a pattern similar to a Nominative–Accusative system in the comprehension of the coordinated clauses which include plain verbs even though the pattern they use is closer to a Nominative–Accusative system than the system which is utilized by early learner TİD signers.

The asymmetry in the results of these production and comprehension studies lead us to further questions in the field. Even though late learner signers do not differentiate between the thematic roles of the arguments with respect to their expression or omission in the clause, they differentiate the thematic roles of the arguments in the production of classifier types accurately in most cases. Then, one cannot argue that late learner TİD signers are not aware of the distinction between the thematic roles of the arguments. They can utilize this difference in the morphosyntactic level but not in the syntax-discourse level. One could argue that this situation is against the acquisition literature since morphology has been claimed to be the most difficult aspect of the language to acquire (Newport, 1990; Mayberry & Eichen, 1991, Mayberry & Kluender, 2017). On the other hand, one could also argue that since morphology interacts with different components of the grammar, the difficulty might actually result from the sensitivity of the interfaces between morphosyntax and discourse (Ketrez; in press)<sup>12</sup> depending on the acquisition age.

---

<sup>12</sup> Ketrez (in press) argues that the use of accusative case to mark direct object is observed very early in Turkish speaking children; however, full competence of this case with all functions related to discourse is acquired quite late.

Such an account actually better maps to the complex nature of classifier constructions which subsumes interaction between different components of grammar; therefore, more detailed analyses should be conducted on the production and comprehension of these constructions with respect to further morphosyntax-discourse interface issues.

As indicated, these results show that early learner and late learner TİD signers seem to use different alignment systems which results from the difference in the age of language acquisition. Moreover, these studies also show that early learner TİD signers seem to utilize different linguistic strategies in the production and comprehension of the language. One possible explanation is the use of different linguistic organizations in production and comprehension of the language. Another possible explanation is that such differences may indicate the nature of plain verbs and classifiers in Turkish Sign Language. This study shows that classifiers are very strong strategy to encode the thematic role; therefore, they enable the signer to track the reference in discourse more easily. Moreover, classifiers are actually a crucial cue for the resolution of zero anaphora similar to an agreement system. The results may also be interpreted to indicate that TİD has actually a split in its alignment system, which is attested with some other languages like Punjabi and Kurdish (Manzini et al., 2015).

Besides, this study confirms that the use of body use instead of the hands is a nonnegligible and crucial difference between early learner and late learner TİD signers. Unlike early learner signers, late learner TİD signers tend to use their bodies as an argument in unergative structures which require a BPCL handshape.

Initial observation which could not be included in the thesis due to time restrictions indicate that early learner signers use their nondominant hand in



unergative clauses to refer to a locative argument. However, we do not observe such use in late learner TID signers as frequently. On the other hand, for early learner signers, in many instances, the nondominant hand is a classifier for the direct object argument or oblique object argument and the dominant hand acts on it.

Such information is necessary to determine further age sensitive structures within TID grammar so that we can develop necessary diagnostic materials and intervention strategies to make sure that Deaf children at the risk of language deprivation are provided with the required sensitive primary linguistic input as early as possible.

## CHAPTER 6

### FURTHER STUDIES AND LIMITATIONS

For further studies, a follow-up comprehension task should be conducted with coordinated sentences at least one of which should include a clause with a classifier morpheme in order to better understand the effect of thematic roles on the resolution of dropped argument in Turkish Sign Language. Such a study would reveal the difference between the grammatical behavior of predicates with a classifier morpheme and plain verbs regarding their scope in encoding alignment and their role in reference tracking.

Within the scope of this thesis, the size of the coordination is determined depending on the previous theoretical accounts and the obtained data. In order to confirm this analysis, tests with adverbials and other scope bearing elements should be conducted in further studies. Moreover, such tests will enable us to understand whether TİD is an EPP language or not which will show the internal operations of the language.

The tasks conducted within the study required the participants to visit the sign laboratory at Boğaziçi University. Due to time restrictions in addition to the issues related to the financial resources, these tasks were conducted with a small number of participants. Moreover, the annotation of the obtained data required quite a lot of time which let me code only 8 participants for this thesis. In order to increase the reliability of these findings, further studies should be conducted with more participants and a certain amount of the data should be annotated by another annotator.

As discussed in Chapter 4, the comprehension task included 24 sentences in which the referents are WOMAN and MAN. Each identical event was used twice and only the thematic roles of the referents were changed in each case as in “Man follows woman” and “Woman follows man.” However, despite the equal distribution of thematic roles, world knowledge might be overriding any alignment system especially for late learner signers. For example, signers tended to choose MAN for the event HIT while they chose WOMAN for the event CRY in a stereotypical way. This can be another difference between early and late learner signers; however, any studies which controls this factor should be conducted to understand the significance of such an effect.

Another issue is the question to what extent Turkish has an effect on the language of these signers. It is important since Deaf schools in Turkey do not provide courses exclusively in sign language but in Turkish and not every deaf individual receives a systematic sign language education. Moreover, the production task implies that late learner TİD signers utilize an alignment system similar to a Nominative–Accusative pattern and one may argue that it is due to the effect of Turkish. However, the competence of TİD signers in Turkish should be tested as an extension of this study in order to understand how Turkish has an effect in their language development.

## APPENDIX

### CLASSIFIER HANDSHAPES IN TİD

|                                                                                     |                    |                                       |
|-------------------------------------------------------------------------------------|--------------------|---------------------------------------|
|    | <b>1-HANDSHAPE</b> | Long-thin objects, human-being        |
|    | <b>FLAT-HAND</b>   | Flat objects, surfaces, vehicles      |
|    | <b>V-HANDSHAPE</b> | Standing or walking human-being       |
|    | <b>ASL A-BAR</b>   | Honorific human-being, bottle, drinks |
|    | <b>5-HANDSHAPE</b> | Plural non-honorific human-beings     |
|    | <b>O-HANDSHAPE</b> | Cylindrical objects                   |
|   | <b>HORNS</b>       | Square objects                        |
|  | <b>CURVED_5</b>    | Small spherical objects               |
|  | <b>F-HANDSHAPE</b> | Small round objects                   |
|  | <b>S-HANDSHAPE</b> | Handling objects, vehicles            |
|  | <b>Y-HANDSHAPE</b> | Airplanes                             |

(Adapted from Kubus, 2008)

## REFERENCES

- Açan, Z. (2001). *A study on sign languages and Turkish Sign Language* (Unpublished master's thesis). Hacettepe University, Ankara, Turkey.
- Allan, K. (1977). Classifiers. *Language*, 53(2). 285–311.
- Arik, E. (2003). *Spatial representations in Turkish Sign Language (TİD)* (Unpublished master's thesis). University of Amsterdam, the Netherlands.
- Arik, E. (2013). Introduction: Previous and current research on Turkish Sign Language (TİD). In E. Arik (Ed.), *Current directions in Turkish Sign Language research* (pp. 1-17). Newcastle upon Tyne: Cambridge Scholars Publishing.
- Aronoff, M., Meir, I., Padden, C., & Sandler, W. (2003). Classifier constructions and morphology in two sign languages. In K. Emmorey (Ed.), *Perspectives on classifier constructions in sign languages* (pp. 52-84). Mahwah, NJ: Lawrence, Erlbaum.
- Aronoff, M., Meir, I., Padden, C., & Sandler, W. (2005). The paradox of sign language morphology. *Language*, 81(2), 301-334.
- Ayer, M. (2014). *Allen and Greenough's New Latin Grammar for Schools and Colleges*. Carlisle, Pennsylvania: Dickinson College Commentaries.
- Bahan B., Kegl J., Lee R. G., MacLaughlin D., & Neidle C. (2000). The licensing of null arguments in American Sign Language. *Linguistic Inquiry*, 31(1), 1-27.
- Baker, M. (1988). *Incorporation: A theory of grammatical function changing*. Chicago: University of Chicago Press.
- Benedicto, E., & Brentari, D. (2004). Where did all the arguments go? Argument-changing properties of classifiers in ASL. *Natural Language & Linguistic Theory*, 22(4), 743-810.
- Berman, R. A., & Slobin, D. I. (1994). *Relating events in narrative: A crosslinguistic developmental study*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Boudreault, P., & Mayberry, R. I. (2006). Grammatical processing in American Sign Language: Age of first-language acquisition effects in relation syntactic structure. *Language and Cognitive Processes*, 21(5), 608-635.
- Brentari, D (1996). Sign language phonology: ASL. In J. Goldsmith (Ed.), *A handbook of phonological theory*. Oxford: Blackwell.
- Brown, R. (1981). Semantic aspects of some Waris predications. In K. J. Franklin (Ed.), *Syntax and semantics in Papua New Guinea Languages*. (pp. 93-123). Ukarumpa: Summer Institute of Linguistics.

- Cogill-Koez, D. (2000). Signed language classifier predicates: Linguistic structures or schematic visual representation? *Sign Language & Linguistics*, 3(2), 153-207.
- Corazza, S. (1990). The morphology of classifier handshapes in Italian Sign Language (LIS). In C. Lucas (Ed.), *Sign language research: Theoretical issues*, (pp. 71-82). Washington, DC: Gallaudet University Press.
- Crasborn, O. (2007). How to recognise a sentence when you see one. *Sign Language & Linguistics*, 10(2), 103-111.
- Crasborn, O., & Sloetjes, H. (2008). Enhanced ELAN functionality for sign language corpora. In O. Crasborn, T. Hanke, E. Efthimiou, I. Zwitterlood, & E. D. Thoutenhoofd (Eds.), *Proceedings of the third workshop on the representation and processing sign languages: Construction and exploitation of sign language corporas* (pp. 39-43). Paris: European Language Resource Association.
- Crasborn, O. (2011). The other hand in sign language phonology. In M. van Oostendorp, C. J. Ewen, E. Hume, & K. Rice (Eds.), *The Blackwell companion to phonology* (pp.223-240). Oxford: Wiley-Blackwell.
- Deal, A. R. (2016). Syntactic ergativity: Analysis and identification. *Annual Review of Linguistics*, 2(1), 165-185.
- Dixon, R. M. W. (1994). Ergativity. *Language*, 55(1), 59-138.
- Durie, M. (1988). Preferred argument structure in an active language: Arguments against the category 'intransitive subject'. *Lingua*, 74(1), 1-25.
- Eccarius, P., & Brentari, D. (2007). Symmetry and dominance: A cross-linguistic study of signs and classifier constructions. *Lingua*, 117(7), 1169-1201.
- Edmonds, W. (1990). A non-concatenative account of classifier morphology in signed and spoken languages. In S. Prillwitz & T. Vollhaber (Eds.), *Current trends in European Sign Language research: Proceedings of the Third European Congress on Sign Language research* (pp. 187-202). Hamburg: Signum Press.
- Emmorey, K. (2002). *Language, cognition, and the brain: Insights from sign language research*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Emmorey, K. (2003). *Perspectives on classifier constructions in sign languages*. Mahwah, NJ: Lawrence Erlbaum.
- Engberg-Pedersen, E. (1993). *Space in Danish Sign Language: The semantics and morphosyntax of the use of space in a visual language*. Hamburg Signum.

- Friedmann, N., & Costa, J. (2010). The child heard a coordinated sentence and wondered: On children's difficulty in understanding coordination and relative clauses with crossing dependencies. *Lingua*, 120(6), 1502-1515.
- Frishberg, N. (1975). Arbitrariness and iconicity: Historical change in American Sign Language. *Language*, 51(3), 696-719.
- Gast, V., & Diesel, H. (2012). The typology of clause linkage: Status quo, challenges, prospects. In G. Volker, & D. Holger (Eds.), *Clause linkage in cross-linguistic perspective: Data-driven approaches to cross-clausal syntax* (pp. 1-36). Berlin: Mouton de Gruyter.
- Glück, S., & Pfau, R. (1998). On classifying classification as a class of inflection in German Sign Language. In Cambier-Langeveld, T., A. Lipták, & M. Redford (Eds.), *Proceedings of ConSole 6: 6th Annual Conference of the Student Organization of Linguistics in Europe* (pp. 59-74). Leiden: SOLE.
- Gökgöz, K. (2011). Negation in Turkish Sign Language: The syntax of nonmanual markers. *Sign Language & Linguistics*, 14(1), 49-75.
- Hartshorne, J. K., Tenenbaum, J. B., & Pinker, S. (2018). A critical period for second language acquisition: Evidence from 2/3 million English speakers. *Cognition*, 177(1), 263-277.
- Haspelmath, M. (2007). Coordination. In T. Shopen (Ed.), *Language typology and syntactic description* (pp. 1-51). Cambridge: Cambridge University Press.
- Huang, Y. (2000). *Anaphora: A cross-linguistic study*. Oxford Studies in Typology and Linguistic Theory. Oxford: Oxford University Press.
- Jantunen, T. (2013). Ellipsis in Finnish Sign Language. *Nordic Journal of Linguistics*, 36(3), 303-332.
- Jantunen, T. (2016). Clausal coordination in Finnish Sign Language. *Studies in Language*, 40(1), 204-234.
- Johnston, T., & Schembri, A. (2007). *Australian Sign Language (Auslan): An introduction to sign language linguistics*. Cambridge: Cambridge University Press.
- Kegl, J., & Wilbur, R. B. (1976). When does structure stop and style begin? Syntax, morphology, and phonology vs. stylistic variation in American Sign Language. In S. Mufwene, C. Walker, & S. Steever (Eds.), *Papers from the twelfth regional meeting: Chicago Linguistic Society* (pp. 376-396). Chicago: The University of Chicago Press.
- Ketrez, F. N. (in press). "Error-free" acquisition of Turkish: A child-friendly language? In B. Erbaşı, S. Özkan, & I. Mantenuto (Eds.) *Proceedings of the 3rd Workshop on Turkish, Turkic, and the languages of Turkey (Tu+3)*. California: UCLA

- Kimmelman, V., Pfau, R., & Aboh, E.O. (2019). Argument structure of classifier predicates in Russian Sign Language. *Natural Language and Linguistic Theory*. 1-41.
- Klima, E., & Bellugi, U. (1979). *The signs of language*. Cambridge, MA: Harvard University Press.
- Kratzer, A. (1994). *The event argument and the semantics of voice*. (Unpublished master's thesis). University of Massachusetts, Amherst, Massachusetts.
- Kubus, O. (2008). *An analysis of Turkish Sign Language (TİD): Phonology and morphology* (Unpublished master's thesis). Middle East Technical University, Ankara, Turkey.
- Lehmann, C. (1988). Towards a Typology of Clause Linkage. In J. Haiman, & S. A. Thompson (Eds.), *Clause Combining in Grammar* (pp. 181-226). Amsterdam: Benjamins.
- Lenneberg, E. H. (1967). The biological foundations of language. *Hospital Practice*, 2(12), 59-67.
- Levin, B. (1999). Objecthood: An event structure perspective. In S. J. Billings, J. P. Boyle, & A. M. Griffith (Eds.), *Proceedings of 35<sup>th</sup> Meeting of Chicago Linguistic Society* (pp. 223-248). Chicago: The University of Chicago Press.
- Liddell, S. K., & Johnson R. (1987). *An analysis of spatial-locative predicates in American Sign Language*. Paper presented at the 4th International Symposium on Sign Language Research. Lappeenranta, Finland.
- Liddell, S. K. (2003). *Grammar, Gesture, and Meaning in American Sign Language*. Cambridge: Cambridge University Press.
- Lillo-Martin, Diane (1986). Two kinds of null arguments in American Sign Language. *Natural Language and Linguistic Theory*, 4(4), 415-444.
- Manzini, M., Savoia, L., & Franco, L. (2015). Ergative case, Aspect and Person splits: Two case studies. *Acta Linguistica Hungarica*, 62(3), 297-351.
- Marschark, M., Lang, H., & Albertini, J. (2002). *Educating deaf students: From research to practice*. New York: Oxford University Press.
- Mayberry, R. I., & Eichen, E. B. (1991). The long-lasting advantage of learning sign language in childhood: Another look at the critical period for language acquisition. *Journal of Memory and Language*, 30(4), 486-512.
- Mayberry, R. I. (1998). The critical period for language acquisition of the deaf child's language comprehension: A psycholinguistic approach. *Bulletin d'Audiophonologie: Annales Scientifiques de L'Université de Franche-Comté*, 15(1), 349-358.



- Mayberry, R. I., & Kluender, R. (2017). Rethinking the critical period for language: New insights into an old question from American Sign Language. *Bilingualism: Language and Cognition*, 21(5), 886-905.
- Mayberry, R. I., Davenport, T., Roth, A., & Halgren, E. (2018). Neurolinguistic processing when the brain matures without language. *Cortex*, 99(1), 390-403.
- McShane, M. (2005). *A theory of ellipsis*. Oxford: Oxford University Press.
- Mithun, M. (1986). The convergence of noun classification systems. In C. Craig, (Ed.), *Noun classes and categorization: Typological studies in languages* (pp. 379-397), Amsterdam: John Benjamins.
- Moore, D. (2001). *Educating the deaf: Psychology, principles, and practices*. Boston: Houghton Mifflin Company.
- Napoli, D. J., & Sutton-Spence, R. (2014). Order of the major constituents in sign languages: Implications for all language. *Frontier Psychology*, 5(1), 1-18.
- Nespor, M., & Sandler, W. (1999). Prosody in Israeli sign language. *Language and Speech*, 42(2-3), 143-176.
- Newport, E. L. (1990). Maturation constraints on language learning. *Cognitive Science*, 14(1), 11-28.
- Newport, E., & Supalla, T. (1990). *A critical period effect in the acquisition of a primary Language* (Unpublished Manuscript), University of Rochester, Rochester, NY.
- Nyst, V. (2007). *A descriptive analysis of Adamorobe Sign Language (Ghana)*. Utrecht: Lot.
- Özçiçek, A., & Gökgöz, K. (2018). *Grammatical and iconic constraints on serial verb constructions in TİD*. Poster presented at Feast 2018. Venice, Italy.
- Özkul, A. (2013). *A phonological and morphological analysis of noun-verb pairs in Turkish Sign Language* (Unpublished master's thesis). Boğaziçi University, Istanbul, Turkey.
- Özkul, A. (forthcoming). Classifiers. In *Turkish Sign Language Online Grammar Report*. SignHub Project, Horizon 2020.
- Öztürk, B. (2005). *Case, referentiality, and phrase structure*. Amsterdam: John Benjamins.
- Özyürek, A., & Perniss, P. (2011). Event representations in signed languages. In J. Bohnemeyer, & E. Pederson (Eds.), *Event representations in language and cognition* (pp. 84-107). New York: Cambridge University Press.

- Özyürek, A. (2017). Function and processing of gesture in the context of language. In R. B. Church, M. W. Alibali, & S. D. Kelly. (Eds.), *Why gesture? How the hands function in speaking, thinking and communicating* (pp. 39-58). Amsterdam: John Benjamins Publishing Company.
- Padden, C. (1988). *Interaction of morphology and syntax in American Sign Language*. New York: Garland.
- Penfield, W., & Roberts, L. (1959). *Speech and brain mechanisms*. New York: Atheneum.
- Perniss, P., & Özyürek, A. (2008). Representations of action, motion, and location in sign space: A comparison of German (DGS) and Turkish (TİD) Sign Language narratives. In J. Quer (Ed.), *Signs of the time: Selected papers from TISLR 8* (pp. 353-378). Hamburg: Signum.
- Quer, J., Cecchetto, C., Donati, C., Geraci, C., Kelepir, M., & Steinbach, M. (2017). *SignGram Blueprint: A guide to sign language grammar writing*. Berlin: De Gruyter Mouton.
- Sandler, W., & Lillo-Martin, D. (2006). *Sign language and linguistic universals*. Cambridge: Cambridge University Press.
- Schembri, A. (1996). *The structure of formation of signs in Auslan (Australian Sign Language)*. Sydney: North Rocks Press.
- Schembri, A. (2003). Rethinking ‘classifiers’ in signed languages. In K. Emmorey (Ed.), *Perspectives on classifier constructions in sign languages* (pp. 3-34). Mahwah, NJ: Lawrence Erlbaum.
- Schick, B. (1987). *The acquisition of classifier predicates in American Sign Language* (Unpublished doctoral dissertation). Purdue University, West Lafayette, Indiana.
- Schick, B. (1990). The effects of morphological complexity on phonological simplification in ASL. *Sign Language Studies*, 66, 25-41.
- Schick, B., Marschark, M., & Elizabeth, P. (2005). *Advances in the sign language development of deaf children*. New York: Oxford University Press.
- Sevinç, A. M. (2006). *Grammatical relations and word order in Turkish Sign Language (TİD)* (Unpublished master’s thesis). Middle East Technical University, Ankara, Turkey.
- Singleton, J. L., Morford, J. P., & Goldin-Meadow, S. (1993). Once is not enough: Standards of well-formedness in manual communication created over three different timespans. *Language*, 69(4), 683-715.

- Singleton, J. L. & Newport E.L. (2004). When learners surpass their models: the acquisition of American Sign Language from inconsistent input. *Cognitive Psychology*, 49(4). 370-407.
- Slobin, D.I., Hoiting, N., Kuntze, M., Lindert, R., Weinberg, A., Pyers, J., Anthony, M. Biederman, Y., & Thumann, H. (2003). A cognitive/functional perspective on the acquisition of 'classifiers'. In K. Emmorey (Ed.), *Perspectives on classifier constructions in sign languages* (pp. 271-298). Mahwah, N.J.: Lawrence Erlbaum Associates.
- Stokoe, W. C. (1960). Sign language structure: an outline of the visual communication systems of the American Deaf. In *Studies in Linguistics: Occasional Papers*. Buffalo, NY: University of Buffalo.
- Supalla, T. (1982). *Structures and acquisition of the verbs of motion and location in American Sign Language* (Unpublished doctoral dissertation). University of California, California.
- Supalla, T. (1986). The classifier system in American Sign Language. In C. Craig. (Ed.), *Noun classes and categorization* (pp. 181-214). Amsterdam: John Benjamins.
- Tang, G. (2012). Coordination and Subordination in Sign Languages. In R. Pfau, M. Steinbach, & B. Woll (Eds.), *Sign language: An international handbook* (pp. 340-364). Berlin: Mouton de Gruyter.
- Valli, C., & Lucas, C. (1995). *Linguistics of American Sign Language: An introduction*. Washington, D.C: Gallaudet University Press.
- Volterra, V., Laudanna, A., Corazza, S., Radutzky, E., & Natale, F. (1984). Italian Sign Language: The order of elements in the declarative sentence. In F. Loncke, P. Boyes Braem, & Y. Lebrun (Eds.), *Recent research on European Language* (pp. 19-46). Lisse: Swets and Zeitlinger BV.
- Wallin, L. (1990). Polymorphemic predicates in Swedish Sign Language. In C. Lucas (Ed.), *Sign language research theoretical issues* (pp. 133-148). Washington, DC: Gallaudet University Press.
- Wilbur, R. B. (1987). *American Sign Language: Linguistic and applied dimensions*. New York: Little, Brown and Co.
- Wilbur, R. B. (1994). Eyeblinks & ASL phrase structure. *Sign Language Studies*, 84(1), 221-240.
- Wolford, G. W. (2009). *Handshape variation in classifier constructions: A crosslinguistic study* (Unpublished master's thesis). Purdue University, West Lafayette, Indiana.
- Woll, B. (1990). International Perspectives on Sign Language Communication. *International Journal of Sign Linguistics*, 1(2). 107-120.

- Zeshan, U. (2002). Sign language in Turkey: The story of a hidden language. *Turkic Languages*, 6(2) 229-274.
- Zwitserslood, I. E. P. (2003). *Classifying hand configurations in Nederlandse Gebarentaal (Sign Language of the Netherlands)* (Unpublished doctoral dissertation). University of Utrecht, the Netherlands.
- Zwitserslood, I. E. P. (2012). Classifiers. In R. Pfau, M. Steinbach, & B. Woll (Eds.), *Sign language: An international handbook* (pp. 158-186). Berlin: Mouton de Gruyter.