Høgskulen på Vestlandet

TST507: Bacheloroppgave i norsk tegnspråk og tolking

TST507

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Western Norway University of Applied Sciences

BACHELOR'S ASSIGNMENT

Comparing handshapes, classifiers and markedness in Norwegian Sign Language and Auslan

En sammenlikning av håndformer, proformer, og markedness i Norsk tegnspråk og Auslan

Candidate: Kjersti Granlund

Word count: 8132

Bachelor program in Sign language and interpreting, Institute for language, literature, mathematics and interpreting.
Supervised by Benjamin Anible.
Submitted 13th of December, 2018.

I confirm that the work is self-prepared and that references/source references to all sources used in the work are provided, cf. Regulation relating to academic studies and examinations at the Western Norway University of Applied Sciences (HVL), § 10.

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Sammendrag

Denne oppgaven er skrevet innenfor feltet tegnspråk og tolking, som en konklusjon på et treårig utdanningsprogram. Det blir gjennomført en sammenlignende analyse av håndformer, proformer og markedness i to tegnspråk, der det gjennomgås og sammenlignes hvordan disse tre fenomenene opptrer i materialet fra de respektive språkene. Sammenligningsgrunnlaget er lite, og prosjektet skal ikke å fastslå likheter eller forskjeller, men heller antyde muligheten for at forskjeller eksisterer. To videoer der morsmålsbrukere av de respektive språkene forteller en og samme fortelling, hentet fra to uavhengige forskningsprosjekter, annoteres for å danne sammenligningsgrunnlaget. Dataene systematiseres og analyseres i Excel. Det finnes et overlapp i håndformene som brukes i de to språkene, og de aller fleste tegn som opptrer i dette prosjektet innebærer håndformer som er felles for begge språk. Håndformer som er mindre markerte forekommer oftere enn veldig markerte former i begge språk, og det ser ikke ut til å være forskjeller i markedness på tvers av språkene. Forskningsgrunnlaget for tegnspråklingvistikk vokser, men det er fremdeles mye som ikke er kartlagt. Eventuelle funn må leses som tentative, og som en oppfordring til videre granskning.

Abstract

This thesis is written within the field of sign language and interpreting, at the end of a three year bachelor's program. It is an analysis of handshapes, classifiers and markedness across two languages, comparing how these three phenomena occur in the respective languages. The material for comparison is small, and the aim of this project is not to assert whether differences or similarities are present, but rather to allude to the fact that differences are possible and should be studied. Two videos involving two native language users telling the same story, originally acquired for two independent research projects, are annotated to create material for comparison. The data is sorted in Excel, and analyzed. There is an overlap in handshapes used in the two languages, and most signs that occur in this material involves handshapes that are common across the two languages. I find that handshapes that are less marked occur more frequently than marked ones in both languages, and there does not seem to be differences in markedness overall. Sign language research is growing, but there are still gaps in our knowledge. Any findings in this project must be interpreted as tentative. This discussion is primarily intended as encouragement for further research.

1. Introduction

In my first few years as a student at tertiary level I jumped from program to program, all related to language and linguistics. I looked long and hard for my niche. In 2015 I quit a program in computational linguistics, which was a little too dry a field for me. I had a deaf flatmate at the time, and so more by chance than by choice I landed on a bachelor program in sign language and interpreting to see what it was all about. When I first "discovered" sign language I was baffled. I was baffled because of its visual beauty. I was even more baffled when I didn't know how to apply any of my knowledge of written and spoken languages to a signed language. I had so many questions. Why weren't the linguistics of signed languages covered in any of my classes? Surely if there were no sounds, a signed language could not have phonemes. Could sign language (which at the time looked to me like graceful waving and pointing) be divided into grammatical units at all? I was so intrigued by the thought of a soundless language. I got over the initial shock and today I am well on my way to becoming a sign language interpreter. Interpreting between two languages requires proficiency in much more than just the linguistics, like deep cultural understanding and an ethical framework that's not always straight forward. Most of my initial questions about signed languages have already been answered by linguists in the past century. That notwithstanding, I am writing my thesis with a linguistic approach to sign language. I do this because it seems worthwhile as a future scholar of sign language and interpreting to try my hand and add my research to the growing stack of academic research on signed languages. Signed languages are still understudied. There are still things we don't know, and looking into a foreign language might teach us something about the one we already know.

This thesis is in the field of sign language linguistics. I have chosen to do a comparative analysis of the linguistic unit of handshapes, and a phenomenon that occurs in all documented sign languages, namely the use of classifiers. I am familiar with how classifiers are used in Norwegian Sign Language ([NTS), where they are dubbed "proformer". I compare a native NTS speaker's use of handshapes and classifiers to those of a native speaker of Australian Sign Language (Auslan). I have acquired video material involving native language use in the two different sign languages, where two research

participants are given a story to recite in their own words. I analyze how handshapes and classifiers are used in the two languages when reciting identical stories, and see what this reveals in terms of similarities and or differences.

2. Literature review and theoretical framework

The purpose of this section is to present the theoretical framework and relevant literature for this project. All analysis and subsequent discussion will build upon this framework.

Primary Literature

There is a considerable amount of literature written about the workings of signed languages. I have chosen three books to serve as my primary literature on sign language linguistics. One is specific to NTS, *Se Mitt Språk* (Mosand, 1996). One is specific to Auslan, *Australian Sign Language - an introduction to sign language linguistics* (Johnston & Schembri, 2007). Both of these books are thorough in their descriptions of the respective languages. To my knowledge they represent the most complete descriptions of the two languages yet. However they do not always use the same definitions, and they do not overlap completely in regard to what phenomena they describe. For reference and to fill any gaps I also use *Sign Language and Linguistic Universals* (Sandler & Lillo-Martin, 2006*).* This book provides a broad, international perspective on the linguistics of signed languages in general. The research and articles of Pamela Perniss, PhD and Senior Lecturer in Linguistics at the University of Brighton, provides invaluable insight. One of her articles were especially helpful, concerning how make use of annotation software to create and extract language data *(Orfanidou, Woll, Morgan, 2015:55).*

Secondary Literature

In addition to the literature mentioned above, I use a basic introductory book on Linguistics, *Innføring i Lingvistikk (Endresen & Simonsen, 2000),* an introduction to statistics called *Statistics Without Tears - An Introduction for Non-Mathematicians*

*(*Rowntree, 1981*),* and a book about method and academic writing, *Metode og Oppgaveskriving (*Dalland, 2017*).*

Dictionaries

I use three online sign dictionaries to verify my glossings. I use Tegnordbok, an NTS dictionary developed by the Norwegian Directorate for Education and Training (Statped, 2003), to verify NTS signs. To verify Auslan signs, I use the online Auslan dictionary developed by Trevor Johnston, Auslan Signbank (Johnston, 2014). Because Auslan and British Sign Language (BSL) share a close history, they have been found to have some similarity in their lexicons (Johnston & Schembri, 2007:60). If a sign is missing from the Auslan Signbank I use the SignBSL dictionary to look for a match. SignBSL's entries are sourced from over 16 different sources including several British universities (Mitchel, 2013).

An introduction to sign language phonology

In human languages, speakers create meaning by organizing small, meaningless units into meaningful expressions. In spoken languages, one of the smallest units that can distinguish words from one another are the distinct sounds we use to make them, called *phonemes* (Endresen & Simonsen, 2000:212). Like spoken utterances, signed ones can be broken down into smaller units as well. Johnston & Schembri(2007:86) and Mosand (1998:82-83) agree on this: A sign consists of both *manual* and *non-manual* parts; meaning that naturally the hands are involved, but so are other parts of the body. The non-manual parts involve facial expression, shoulder and body movement among other things, but for this project I am interested in manual elements only. I am interested in the hands. In some signs the hands plays a more minor role. For instance, in signs like SCOTLAND in British Sign Language, the shoulder and arm are the primary articulators, and the handshape is secondary.

Figure 1. Illustration of the sign SCOTLAND, from BSL online dictionary (british-sign.co.uk).

In the majority of signs however, the hands will be the primary articulator. The manual parts of a sign can be divided into four main features: *handshape, hand movement, hand location* and *palm orientation* (Johnston & Schembri, 2007:86-89). In this project I focus on handshapes. A sign's handshape literally refers the arrangement of the fingers and hands when producing a sign. A spoken language does not use an unlimited number of speech sounds, but rather a defined set, the size and inventory of which will vary depending on the language in question (Endresen & Simonsen, 2000:212). Similarly, signed languages tend to use a defined set of handshapes, the size and inventory of which will vary depending on the language in question (Johnston & Schembri, 2007:100). Mosand points out this variance in handshape inventory, but does not specify which handshapes that definitely occur in NTS (Mosand, 1996:82). This set of handshapes are considered native to the language, and additional handshapes occuring only in loanwords for example would be considered non-native. When signs are adopted from other languages the handshapes are often modified slightly to match the native handshapes better. Both Auslan and NTS have borrowed signs from American Sign Language (ASL) for instance. Some handshapes are so similar that they can be used interchangeably without changing the perceived meaning of a sign, making them *allophones*. Allophones are alternative realizations of the same phoneme (Johnston & Schembri,2007:87). The handshapes for the letters A and international S are sometimes considered two such allophones, despite different positions of the thumb.

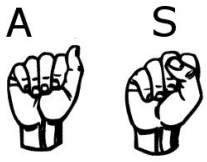

Figure.2 two allophonic handshapes, A and S. Handshape illustrations from Lifeprint.com (Vicars, 1997).

To be able to talk about handshapes, we must identify them and name them. Accurate phonemic description can get quite complex, depending on the level of detail involved. Handshapes can be meticulously analyzed by which muscles are used and how, but for identifying and counting them they just need to be assigned names. The convention is to assign names based on existing systems like hand alphabets and numeric systems. Johnston and Schembri have a catalogue of handshapes that occur in Auslan. It is this system I have used when assigning handshape names, with any additional handshapes that are not covered by their catalogue being named intuitively as an extension of their system, with names from numbers and letters (Johnston & Schembri, 2007:89). Some signs involve more than one handshape. Some signs are produced with both hands, in this case the handshapes can either be identical or different (Johnston & Schembri, 2007:84). Johnston and Schembri also note that signs can involve a change from one handshape to another, so called *internal* change (2007:92). I will not be looking into internal change.

Markedness

Handshapes can be further categorized by their features. The term *markedness* in linguistics sometimes refers to how complex a form is in contrast to other forms. High markedness tells us something about how complex or unusual that form is. It was theorized by Roman Jakobson, an originator of markedness theory, that there are certain properties that we can look at to determine markedness (Jakobson(1968), cited in Sandler & Lillo-Martin, 2006:160). For instance forms that are less marked tend to occur frequently, be frequent across languages, and be easier to produce than more marked forms. Marked handshapes should then be more complex and less frequent than unmarked ones. Some models, like the one used by Sandler(1996) have ways to count how many features are active in a hand configuration, in essence trying to measure how

hard that handshape is to produce(Sandler,1996, cited in Sandler & Lillo-Martin,2006:163). I will keep it simpler, and try to decide upon which handshapes are definitely unmarked and consider the rest marked. Sandler gives a set of four handshapes, and argues that they are definitively unmarked based on their high frequency and use. She lists the handshapes S, 5, 1 and O (2006:16). Johnston and Schembri references Robin Battison(1978) and lists seven handshapes as unmarked, 1, 6, S, B, 5, bC and O, pointing out that these handshapes occur in over 60% of signs, and occur the most in combination with other handshapes in two handed signs (2007: 106). I use Johnston and Schembri's set of handshapes because it is larger, I think they fit the conditions because I know the three additions 6, B and bC occur frequently in NTS, which is one of the common features of unmarkedness. It is these seven handshapes I have categorized as unmarked in my subsequent analysis, with all other handshapes being marked.

Figure 3. The unmarked handshapes, ltr. 1, 5, 6, S, B, bC, O. From tegnbanken.no (Statped).

The lexicon of sign language

All human languages have a vast, theoretical list of meaningful words that are used and known by its speakers. This list is known as its *lexicon*. In sign language, different kinds of signs are grouped together in this lexicon, depending on their features. For my project I have classified all signs into three sign type categories, *Frozen signs*, *Classifier signs* and *Constructed Action.*

Frozen Signs

Words that most speakers use or are familiar with, are considered part of the frozen or core lexicon (Battison & Padden, 2001, cited in Johnston & Schembri, 2007:157). These forms one can definitely expect to find in a dictionary. I have briefly mentioned the different morphological features of a sign, handshape, movement, location, etc. In most

core lexical signs, all of these features are fixed, or frozen, meaning that if just one feature changes it becomes a different sign (Johnston & Schembri, 2007:159). It also means that the individual features create a specific meaning only when combined, and the features do not represent that meaning on their own (Sandler & Lillo-Martin, 2006:77). The term "frozen" sign appears in both Sandler and Lillo-Martin's (2006:97) and in Johnston and Schembri's (2007:163) discussions on lexicons as a contrast to the more productive *depicting signs*. I use the term *frozen signs* to refer to this type of sign throughout my project.

Depicting signs - Classifiers and Constructed Action

Some signs are only partly specified, meaning that some features of it can change freely without it becoming a different sign. These signs are actively created by the signer, with perhaps endless variations available to the speaker. Johnston & Schembri note that in *depicting signs* the individual features (handshape, movement etc.) often have their own inherent meaning. The term "depicting signs" is used about several different types of signs, as it is an umbrella term for signs where the signer depicts some sort of action happening. For the purpose of this project, I am interested in two distinctions of depicting signs, namely *classifiers* and *constructed action.*

Constructed Action

Constructed Action (CA) is a form of depicting where the signer reenacts the actions of something or someone other than the signer using their entire body. Mosand does not cover Constructed action. In Danish sign language literature it is sometimes referred to as "role shift", although it is also said that role shift can occur with all types of signs (Engberg-Pedersen, 1998:145). What distinguishes Constructed Action from Frozen signs is that all the features of a CA sign, i.e handshape, movement etc., can be freely changed to convey the intended meaning, allowing the signer to depict how someone moves and feels in great detail. The term Constructed Action appears in Johnston and Schembri (2007:173), and it is this term I have used throughout my project.

Classifiers

The use of classifiers is the use of categorized handshapes to represent nouns, like objects or people. In Frozen signs, the different features (handshape, movement etc) don't normally have inherent meaning before being combined into signs. Classifier handshapes however are able to carry meaning on their own. The movement, and location of classifier signs are not fixed, but can be combined in endless ways, creating different meanings (Johnston & Schembri, 2007:117). The handshape B in NTS for instance, can refer to a car, or any other flat thing. The movement and location of this handshape could produce different meanings like CL:B-CAR-STOPPING, where the hand would be brought to a halt, and CL:B-CAR-TURNING-LEFT, where the hand would curve to the left. The handshape cannot be changed and still be understood to refer to a car, as there are norms within a language about which handshapes can represent what (Mosand, 2000:115). The movement and location are modifiable however, and can be changed to show anything from spatial relation, physical characteristics, to movement, speed etc. Both hands can use a classifier each, enabling the signer to express the relation of two different referents to each other as well. Signs involving classifier handshapes have many names. Johnston and Schembri use the term *depicting verbs* (2007:163), and Mosand mentions the term *polysynthetic signs* coined by the Swedish Lars Wallin (Mosand, 1996:106). I have decided to refer to signs involving classifiers simply as "classifier signs" in this project.

Entity Classifiers, Handling Classifiers and SaSS

Johnston and Schembri, and Sandler and Lillo-Martin group different classifier signs together, using the same three categories. Their grouping is based on how they are used grammatically and what they represent when used, and it is this same grouping I use in my project. [1] They group classifier signs into three main categories: *Entity classifiers, Handling Classifiers* and *Size and Shape Specifiers (SaSS)(*Johnston & Schembri, 2007*:168-170).* Entity Classifiers are classifier signs where the handshape directly represents, and often resembles, the shape of an object or part of an object. The B handshape representing a car in the last section is an example of an entity classifier. An

[1] I have also seen NTS lecture material group classifier handshapes by what they depict, i.e handling, shapes and outlines, people, limbs (legs, eyes etc.), resulting in more categories. *Lecture in 2015 at the Western Norway University for Applied Sciences.*

entity classifier can refer to a whole object, body parts, groups of objects, and even the amount or volume of something (Johnston and Schembri, 2007:168). Handling classifiers imitate how hands or other body parts interact with or handle an object. They can show holding, touching or using objects by assuming different handshapes that would be realistically used to do it (Johnston and Schembri, 2007:169). How one would hold a key is different from how one would hold a glass for instance, and would be represented with different handshapes. Size and Shape Specifiers use classifier handshapes to illustrate an object's size and shape, either by tracing the shape or by using the shape of the hands with the hands held still (Johnston and Schembri, 2007:169).

Video sources

The video material comes from two independent research projects on Auslan (Johnston, 2008), and NTS (Halvorsen, 2012), where a non-verbal story was used to elicit their data. The participants I compare are both telling the same, monological story, "Frog, Where are You?". It is ideal that they tell the same story, with the same referents and events, as it makes the data more comparable. As I have no prior proficiency in Auslan, knowing beforehand what story is being told makes the work of understanding and transcribing the Auslan rendition considerably easier.

3. Predictions

As no project comparing these two languages has been done before, there should be no difference assumed between Auslan and NTS until proven otherwise. The null hypothesis for this project is that there are no significant differences in how sign types, classifier types and handshape markedness happens in the two languages when two users are directly compared. Based on assertions from my primary literature I have some predictions about what I will find when analyzing the data, before comparison.

Sign types

As Johnston and Schembri(2007:157) describe the core lexicon as consisting of frozen signs**,** I expect the frozen signs to be most frequent. I expect this to be true for both languages. No literature I have concludes whether Classifier signs or Constructed action is more frequent. Classifier constructions are frequently discussed, and are pointed to as

the origin of many frozen signs (Sandler & Lillo-Martin, 2006:87). Constructed Action is mentioned significantly less in all the literature I use. I tentatively assume Classifier construction will be more frequent than Constructed Action.

Duration of Sign Types

I know from experience that sign duration can vary greatly depending on the sign produced. I assume that depicting signs like Classifier signs and Constructed action take longer than frozen signs to produce because they often contain more meanings than a frozen sign. They can even span several sentences, and take several words to translate into spoken language (see the example in the paragraph on Classifiers). Furthermore, several linguists have noted that forms that occur frequently in a language show a tendency to shorten over time, resulting in faster production (Gahl, 2008). For these two reasons I expect the frozen signs to have a shorter average duration than Classifier signs and Constructed Action. I make no predictions as to which of the Depicting sign types take longer to produce.

Classifier types

I know nothing about which classifier types occur more frequently Sandler and Lillo-Martin use Ted Supalla's representations from his research on classifier constructions to illustrate different handshapes belonging to the three classifier categories (Supalla, 1982, cited in Sandler & Lillo-Martin, 2006:78). They point out that SaSS classifiers seem to have a larger set of possible handshapes, and entity seems to have the smallest set of possible handshapes. I tentatively assume that the classifier type that has the least possible variations in handshape, assumed to be entity classifiers, is also the type used the most frequently. In terms of the longest duration, entity classifiers seem like the most likely candidate because they are often used to express longer strings of events, involving whole entities and not just part of them or the shape of them like handling and SaSS classifiers (Sandler & Lillo-Martin, 2006:87).

Handshapes

Looking at Johnston and Schembri's chapter 4 on phonology, I find several points that lead me to make some basic assumptions about what I will find regarding handshapes. We know handshapes can have inherent meaning in classifier signs, but generally do not in frozen signs. It is then natural to assume that the set of handshapes used in classifier constructions will differ in some way from the set of handshapes used in frozen signs, because their selection is less arbitrary (Johnston & Schembri, 2007:87). Further, Johnston found in 1989 that just four handshapes are involved in over 50 percent of all signs in the Auslan dictionary at the time. The data for this project being a only couple minutes of storytelling, it can not be directly compared to a dictionary that seeks to represent all of language use. Still, I do expect some handshapes to be very frequent and some to be very infrequent in this material, similar to what Johnston found when looking at a much bigger data set.

Markedness

We know from the literature review that there are few unmarked handshapes and many marked ones. Despite their low number, the unmarked handshapes can be assumed to occur more frequently compared to marked ones. We know classifier signs use a subset of handshapes that are not chosen arbitrarily, but can be consciously chosen based on their resemblance of objects and creatures . I expect to find higher rate of marked handshapes with classifier signs compared to all signs.

4. Method

To compare two instances of language use, I use a quantitative method. I collect numerical data from the two video files, and measure differences in order to do a comparative analysis of the two data sets. Ideally all tests performed in this project should be performed on a larger data sample. With only two participants, all similarities and differences found could be put down to personal style, environmental factors, social factors or just about anything else. It cannot be proven through this project that there are definite similarities or differences in how AUSLAN and NTS are used. However, we assume that in being native speakers the two participants are representative enough of their respective language groups that they can be compared to each other. As no

previous comparison has been done involving these two languages and these focal points, my project can offer a new perspective that might inspire further research.

Data collection

The data is collected by manipulating pre-existing video material. I use a multimedia annotator called ELAN to elicit data from the two video files separately. The software is free, and continues to be updated and improved upon in newer versions. ELAN has been used to annotate and analyze signed language before, and was said to be very suitable for this purpose at a conference for sign language corpuses in the Nordics at The University of Stockholm in 2006 (Halvorsen, 2012:132). The ELAN software is very suitable for my project because it allows for annotating multiple parameters at once using *tiers*. I add four separate tiers for english translation, sign glosses, and handshapes for the right and left hand, in addition to one tier for unidentified sequences. Using these tiers I can attach several layers of textual information to sequences of the video. This information can later be exported into a spreadsheet like Excel as interlinear text, to be sorted and analyzed.

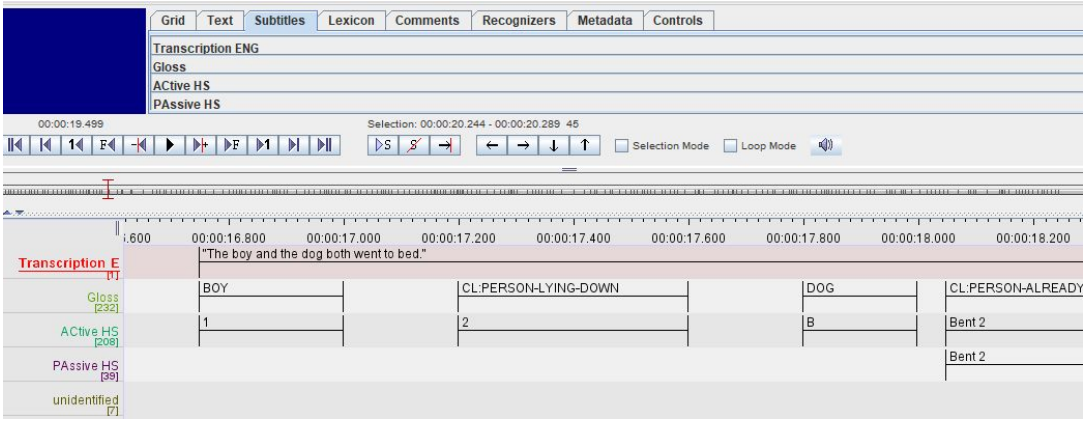

Figure 4. ELAN annotation with five tiers.

Annotating

With only four tiers, annotating 1 minute of the NTS material took approximately 4 hours. Annotating the Auslan material took significantly longer, as more time was spent double checking what was said, and consulting dictionaries and language learning material for verification. Annotating all the material using ELAN took approximately 60 hours. For the glossing tier I use a simplified version of the conventions for sign notation

found in Johnston & Schembri(2007:xiv). A frozen sign is glossed with its most commonly associated translation, often the one found in a dictionary, written in capital letters. A classifier construction is written CL, followed by a description of what is depicted in capital letters. A constructed action is written CA, followed by a description of what is depicted in capital letters. Handshapes are referred to by names found in Johnston & Schembri's handshape table in their chapter on phonology (2007:89). The glossing of a sign begins at the nearest video frame where the sign's handshape is fully formed, but to no more detail than 50ms. The annotation ends when the sign loses its location, which often means from the moment the hands starts to "drop" from holding a sign. In cases where signs follow each other so rapidly that the beginning distinction cannot be made, the annotations start at the moment the prior annotation ends.

Sorting the data

Before any data is analyzed I start out with a list of information I want to elicit from the data:

- How the different sign types are distributed, both within and across the languages.
- What the average duration of the different sign types is.
- How the different classifier types are distributed, both within and across the languages.
- Which handshapes occur in both languages, and whether any are unique to either language.
- Which handshapes occur in classifier signs in both languages.
- Which handshapes occur most frequently within both languages, and whether they are the same across the languages.
- What proportion of all handshapes are marked vs unmarked.
- What proportion of classifier handshapes are marked vs. unmarked.

The data collected from annotation is exported to an Excel spreadsheet. This raw data contains information from every tier. All time codes, annotation durations, translations, glosses and handshapes, and unidentified sequences are found in this spreadsheet. Initially, I remove all translations and unidentified sequences, as these will not be used to compare anything in this project. In cases where signs involve internal change of handshape, this was annotated in ELAN with a comma between the two handshapes. I decide to ignore internal change, so when I sort the data material in Excel, I count the

first occurring handshape only, and ignore the second handshape in order to reduce every sign to one handshape for easier counting and comparison. This means that some handshapes are left out of the analysis all together, and it cannot be ruled out that the results may have been affected by this. Because this omission is applied consistently across both languages, it is reasonable to assume that the results are still comparable. There is currently no evidence to suggest that Auslan and NTS use internal change differently. I classify sign types manually because the way this feature was annotated in ELAN didn't allow for a quicker, safer option. This could have been annotated with an extra tier in ELAN before exporting the text. To assign markedness or unmarkedness to handshapes, I use inbuilt conditional functions like "=if" with several conditions. To be able to test for differences in the average duration of each sign and classifier type, I create sorted copies of the data, where I sort it by categories such as sign type and classifier type. To count the frequency of the different sign types, classifier types, handshapes and handshape markedness, I use Excel's counting functions. I look into the handshapes used in all signs, and the handshapes used with classifiers specifically. I calculate how many handshapes occur within each language, and across the languages, and how these are distributed. I find the 5 most frequently used handshapes within each language, and calculate how much of the whole they represent. I also compare the two sets of handshapes for markedness. To illustrate my findings I choose to show tables when discussing numerical information, and bar graphs to illustrate trends. I use Excel's inbuilt options to create the graphs that illustrate my findings. To test my findings, I use Excel's inbuilt t-test function to compare sets of averages, like average durations for instance, and an external chi-square table to compare sets of frequencies, like the frequencies of marked versus unmarked handshapes. All of the procedures above are applied once for the NTS data set, and once for the Auslan data set to find trends and key points within each language. After obtaining all my information about each language separately, I compared these findings side by side and performed statistical tests to look for significance in the results.

Additional analysis

After analyzing sign types and their frequency, new questions arose leading me to add further analysis to the project. I decided to look into a sample of the story, to see if I could find an action packed sequence that could illustrate how the two signers choose sign types differently. I looked at the part of the story where the dog falls out of the window. I isolated the signs involved in telling this, starting from the moment the dog leans on the window and ending with the boy picking him up off the ground. Coincidentally, both signers tell this part of the story using the same number of signs(14 signs). I use the same procedure as earlier to count sign types and illustrate them with a graph.

Figure 5. NTS to the left and Auslan to the right. The NTS participant uses a handling classifier to depict the dogs paws falling off the window sill. The Auslan participant uses an entity classifier to show the whole body of the dog falling to the ground.

4.Findings

Sign types

Analyzing the sign type distribution shows that the most frequently occuring sign type in both languages is frozen signs(F), followed by classifier signs(CL), and constructed action(CA) being the least frequent, see figure below for the average distribution.

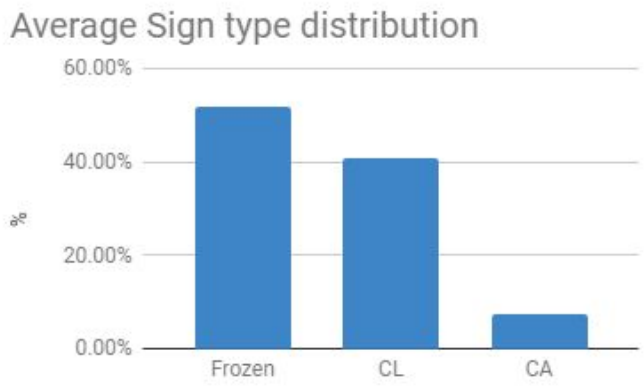

Figure 6. Average sign type distribution across the languages.

While this distribution pattern appears in both languages, Classifier signs occur more often in Auslan (42%) compared to NTS (32%). A chi-square test was performed to examine the relation between language and sign type, yielding a p-value of p=0.002. There is a difference in sign type distribution and language. Classifiers are more likely to occur in Auslan.

A sample of 14 signs from both languages were analyzed for differences in sign type distribution. The sample is too limited, and this difference was not found to be statistically significant. The graph below illustrates a vague tendency: the Auslan signer uses more classifier signs to talk about action, and the NTS signer uses more constructed action.

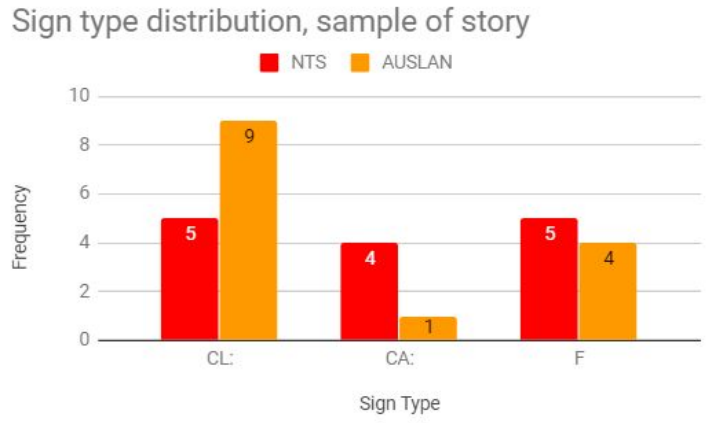

Figure 7. Sign type distribution in both languages from a sample of the story.

Duration

The average duration spent producing the different sign types is similar in both languages. The data shows a tendency for high frequency sign type having lower average duration. Frozen signs have the lowest average duration, followed by classifier signs, while constructed action has the highest average duration.

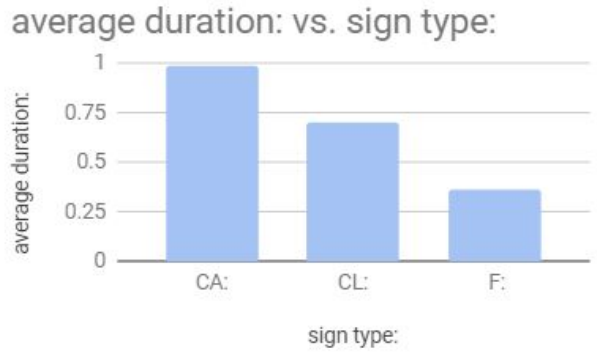

Figure 8. Average duration of the sign types across languages.

The average duration of the different sign types is similar across the two languages, with frozen signs averaging 0,36 seconds (M=0.36s, SD=0.25s) in Auslan and 0,37 seconds (M=0,37s , ST=0,26) in NTS. Classifier signs average at 0,69 seconds (M=0,70s, SD=0,26) in Auslan and 0,69 seconds (M=0,69, SD=0,43) in NTS. The biggest difference between the languages is found in CA duration, where Auslan averages 0,96 seconds (M=0,96s, SD=0,51s)and NTS averages 1.01 seconds (M=1,01s, SD=0,59).

Handshapes

29 unique handshapes (HS) occurred throughout the project, and their distribution varied between the languages.

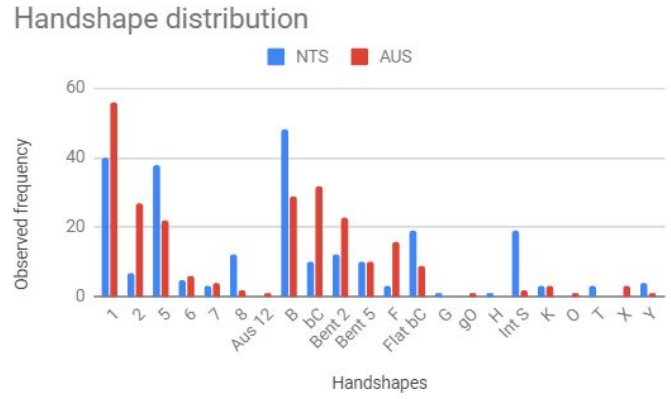

Figure 9. Distribution of the different handshapes for both languages.

Commonality in handshapes

18 handshapes occur in the NTS story, and 19 in the Auslan one. Out of all the distinct handshapes registered, 51,7% occur in both Auslan and NTS. The handshapes that occur only in either language are infrequent, and account for just over 2% of all handshapes in signs, with more than 97% of signs involving handshapes common across both languages. The handshapes that occur only in either language are X, T, O, H, gO, G and the Auslan-12.

Chi square, Handshape commonality	**Frequency NTS**	**Frequency Auslan**	**Total**
Common HS	233	242	475
Not common HS	5	6	11
Total	238	248	486
chi square	p = 0.8		

Table 1. A chi square table for common vs. not common handshapes for each language.

A chi-square test was performed to examine the relation between commonality in handshapes and language, yielding a p-value of p=0.8. There is no significant difference in which language has more or fewer handshapes in common with the other.

Handshape distribution

The four handshapes 1, B, 5 and S that were observed in over 50% of signs in Johnston's Auslan dictionary, were observed in only 43,9% of the Auslan participant's signs. They were observed in 60,9% of all the NTS signs.

Johnston handshapes:		
Handshape	**Auslan %**	**NTS %**
1	22.58%	16.81%
B	11.69%	20.17%
5	8.87%	15.97%
S	0.81%	7.98%
total	43.95%	60.92%

Table 2. The distribution of Johnston's four handshapes, 1, B, 5 and S in Auslan and NTS.

Which handshapes that are the five most frequent handshapes used in this material differs within the languages. In Auslan it is 1, bC, B, 2 and bent 2 respectively. Together these five handshapes account for 67,3% of all the Auslan signs. If we use four like Johnston, the first four of these account for 58% of all Auslan signs. The five most frequent handshapes in NTS were B, 1, 5, Flat bC and S. These five account for 68,9% of all NTS signs.

Markedness

Chi square for markedness	**FREQ NTS**	**FREQ AUS**	total
Marked	83	99	182
Unmarked	155	139	294
total	238	238	476
	P = 0.13		

Table 3. Distribution of marked and unmarked handshapes by both languages.

The data shows that unmarked handshapes occur more often, in 65,1% of NTS signs compared to 58, 4% of Auslan signs. A chi-square test was performed to examine the relationship between all handshape markedness and language, yielding a p value of p= >0.1. There doesn't seem to be significant differences in overall markedness in NTS and Auslan.

Classifiers

Most of the classifiers observed across the languages are entity classifiers, followed by SaSS classifiers, with handling classifiers being the least frequent. The data suggests more SaSS-classifiers used in Auslan(38,1%) compared to NTS(21,6%), and more handling-classifiers in NTS(18,2%) compared to Auslan(5,9%). They use entity classifiers at similar rates, with 57,7% of classifiers being entity classifiers in Auslan, compared to 60,2% in NTS.

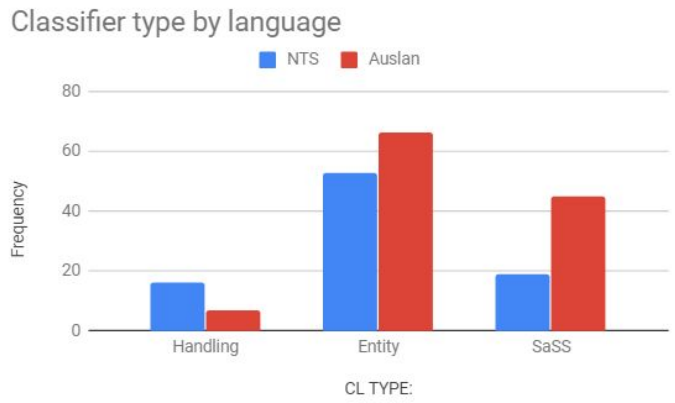

Figure 10. Distribution of classifier types across the languages.

A chi-square test was performed to examine the relationship between the distribution of classifier types and language, yielding a p value of p= <0.005. Auslan uses significantly more SaSS classifiers. NTS uses significantly more handling classifiers.

Classifier markedness

Looking at markedness in classifiers shows that markedness occurs in near 50% of classifier use as a whole for both languages. 53,4% of handshapes in NTS classifier signs are marked. 47.15% of handshapes in Auslan classifier signs are marked. When looking at classifier types, entity classifiers have the most marked handshapes in both languages. 67,9% of entity classifiers are marked in NTS, and 67,6% of entity classifiers are marked in Auslan. SaSS classifiers are more often unmarked handshapes. Handling classifiers show the most uneven distribution of markedness across languages. No marked handling classifiers occur in Auslan(0%), whereas in NTS about 56% of handling classifiers are marked.

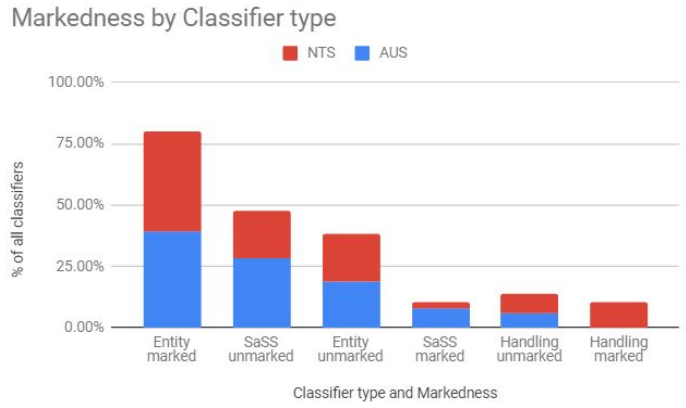

Figure 11. Markedness in classifier types for both languages, stacked.

Two chi-square tests were performed to examine the relationship between markedness and classifier type within NTS and Auslan respectively, both yielding a p value of p= <0.0001. Entity classifiers are significantly more marked, in both languages. SaSS classifiers are significantly more unmarked, in both languages.

Summary of findings

In both languages frozen signs are the most common, followed by classifier signs, and constructed action. Classifier signs occur a little more often in Auslan compared to NTS. The durational data shows a correlation between high frequency and short duration, where high frequency sign types take a shorter time to produce. In regard to handshape distribution, 29 unique handshapes are used across the language material. Most signs involve handshapes that both languages share, only 2% of signs involve handshapes that were only used in one of the languages. Johnstons's 4 handshapes, 1, B, 5 and S do not account for more than 50% of the Auslan handshapes in this material. However the five most common handshapes for each language account for more than 60% of their respective handshapes. In regard to markedness, the data shows that unmarked handshapes occur more often than marked ones, There is not a significant difference in the overall markedness of the NTS and Auslan material. Classifier signs use more marked handshapes than frozen signs. Most of the classifiers observed in both languages are entity classifiers, followed by SaSS classifiers, with handling classifiers being the least frequent. Out of all classifiers, the two languages have entity classifiers occur at roughly the same rate, but more handling classifiers occur in NTS, and more SaSS classifiers occur in Auslan. Roughly half of all classifier signs use marked handshapes in both languages, with NTS having slightly more classifier markedness than Auslan. In both languages, entity classifiers have the most marked handshapes. There were no marked handling classifiers in the NTS material.

5. Discussion

As expected, the distribution of the different sign types shows that the most frequently occuring sign type is frozen signs. We could expect this because we know frozen signs make up the majority of sign language lexicons. Classifier signs turned out to be more frequently used than Constructed action in this material. It makes sense that both are

well represented in storytelling, as storytelling involves many referents, much moving and many events. We know strings with two referents can be expressed very efficiently with classifier signs, making it very suitable to talk about ation happening. While Classifier signs were used more than Constructed action in both languages, there was an unexpected difference in who used Classifier signs the most. It can seem like the NTS speaker sometimes chooses Constructed action in instances where the Auslan signer prefers Classifier signs. Both sign types allow the signer to depict action happening. Constructed action also allows the signer to take on one role in especially great detail. I look into a small sample of the story, examining the part of the story where the dog falls out of the window. Although not significant in itself, the sample illustrates this tendency: the Auslan signer uses the most classifier signs to talk about action, and the NTS signer uses more constructed action to emphasize the boy's feelings and reactions. As mentioned previously, any differences in how the participants tell these story could be due to many factors. My assumption is it is their personal style choice to emphasize different things in storytelling. It would be interesting to see if this difference persisted in a larger project with a larger sample.

High frequency sign types and short duration

Looking further into the different sign types I find that the average duration spent producing each of the different sign types is roughly the same in both languages. The NTS signs are consistently a little slower, but not significantly so. Duration averages in both languages show the same vague tendency. There is a correlation between high frequency sign type and low average duration. We see that frozen signs, the sign type with the highest frequency, have the lowest average duration, and constructed action, the sign type with the lowest frequency has the highest average duration. This correlation is in agreement with many of the theories discussed in Gahl (2008). Although these theories are founded on analyses of spoken language, it can seem like it holds true for signed languages as well that high frequency forms benefit from higher predictability in discourse, and maybe even go through a phonological change that makes them less difficult to articulate (2008:491). It could be interesting to study this further both on

sign level and on phoneme level, to see if frequently used signs, and frequently used handshapes display these changes as well. We know classifier signs can become part of the core lexicon, gradually becoming frozen signs as they reach a certain popularity. It could be interesting to see what comparing classifier signs to frozen signs with classifier origins would reveal regarding duration. Classifier signs that are in the process of becoming part of the core lexicon exist on a spectrum, where some are fully standardized and some are just beginning to be standardized. It would be interesting to see if this spectrum could be plotted, and if possible, record over time if something happens to the articulation as they become standardized.

Handshapes

It's difficult to determine how many distinctive handshapes should occur within a language. Johnston (1998) once found 37 distinctive handshapes in Auslan, and Stokoe (1960) compiled 21 contrastive handshapes for ASL (Stokoe, 1960, cited in Johnston & Schembri,2007). My material is limited, and elicited from the specific context of storytelling, which is more constricted than a dictionary. I counted 18 handshapes in the NTS story, and 19 in the Auslan one. Of the 29 handshapes I have registered, about half occured in both Auslan and NTS. This suggests quite a lot of overlap in handshapes. This is expected, firstly because the unmarked handshapes are considered basic and easy to produce, and thus can be presumed to occur in many signed languages. We also know Auslan has borrowed signs from ASL, with which NTS shares a similar one handed fingerspelling alphabet. Just because handshapes exist in both NTS and Auslan however, doesn't mean they are used in the same way, as Johnston and Schembri point out regarding similarities in handshapes, movement and location features in all signed languages (2007:101). Here, the distribution of the different handshapes varies. Johnston's Auslan dictionary edition of 1998 showed that just four handshapes(in that case, 1, B, 5 and S) were involved in over 50% of the signs in the dictionary (Johnston 1998, cited in Johnston & Schembri, 2007:87). Trying to replicate this result, I calculated the percentage of signs that use only those four handshapes, yielding only 43,9%. There are several reasons why I could have gotten this slightly lower result, like how small the sample is, and the fact that storytelling is a specific genre of language use and could not

represent language use with the same width as a dictionary. Some words will naturally be repeated very frequently during the story, and if the corresponding sign does not utilise any of Johnston's four handshapes it would affect the result. I later decided to find the five most frequent handshapes in each of the languages, and see how much of the total signs they accounted for. I thought this could be interesting because it might show just how few handshapes you need to account for 50%. For Auslan, the five most frequent handshapes turned out to be 1, bC, B, 2 and bent 2 respectively. Together these five handshapes account for 67,3% of all the Auslan signs, but just the first four of these account for 58% of all Auslan signs. This last result is consistent with Johnston's observation with the dictionary that four handshapes could account for more than 50% of signs, except that I had to use a slightly different set of handshapes to achieve the same result. To the extent of my knowledge, here has not been any projects mapping and describing frequency of handshapes in NTS. When I looked at the same four handshapes again in NTS; and found that the four handshapes 1, B, 5 and S accounted for well over 50% the NTS signs. In fact, when finding the five most frequent handshapes of the NTS data I found that they were the same as Johnston's four, plus the handshape Flat bC, all unmarked handshapes. The top five handshapes for both Auslan and NTS respectively both account for more than 50% of signs in both languages. There is a difference here in what handshapes make it to the top five. This could suggest that my data is skewed to have some handshapes occur with disproportionately high frequency, or even that Johnston's four handshapes aren't the most frequent ones used in storytelling in Auslan. It is very likely there is some literature written on the genre of storytelling and how grammar and lexicon can differ from everyday use. It could be interesting to research whether there are linguistic differences in the storytelling cultures of different sign language communities.

Markedness

The data shows that most signs use unmarked handshapes, for both languages. Some of the data also suggests a slight difference in markedness between the language, while some of it does not. The fact that two out of the five most frequent handshapes in the Auslan data are marked handshapes (2 and bent 2), gives us a clue that they don't fit in with the rest. Their markedness makes it less likely that they should occur at such a high

rate randomly, because we would expect very frequent forms to be shorter and easier than others. And inversely, the unmarkedness of the NTS top five is consistent with the idea that the most frequent forms should be unmarked. Something seems to be skewing the data towards the two marked handshapes. The two handshapes can occur as classifiers, representing people, legs and animals, all of which we find referenced a lot in this story and perhaps most stories.The Auslan signer uses more entity classifiers than the NTS signer, and many of the entities in this story are referred to using 2 and Bent 2 classifier handshapes. This could explain the high frequency of these two marked handshapes. With better research design I could have analyzed and compared what classifier handshapes are used for the different referents. This way I could have looked deeper for an explanation for the high frequency of those two handshapes. Although there is a difference in markedness in these top five handshapes, there does not seem to be a difference in overall markedness between the languages. Markedness could have been quantified beyond marked and unmarked by somehow ranking how complex a handshape is, like Sandler's model for counting features in a hand configuration (Sandler,1996, cited in Sandler & Lillo-Martin, 2007:162). This would have revealed more nuance in markedness, both within and across the languages. From my own experience I know NTS has a degree of signs that are only distinguished by their oral components, or "mouthing". These signs are essentially homophones and I assume this oral component is obligatory in a lot of the NTS lexicon. This view of mouthing as obligatory or natural does not seem to extend to Auslan. In Johnston and Schembri's (2007) chapter 10, they question whether mouthing is really an obligatory distinguishing feature of Auslan or if it is borrowing or code-mixing from spoken English (2007:290). It could be interesting to look into how mouthing is used in different sign languages, especially on how obligatory it seems to be in NTS and what effects this prevalent borrowing from spoken Norwegian is having on the grammar of NTS.

Differences in classifier use

Most of the classifiers observed in both languages are entity classifiers, roughly half of all their classifiers fall into this category. It can seem like entity classifiers are vital to efficient storytelling, with SaSS and handling classifiers adding details more than plot

advancement. Her more frequent use of handling classifiers could be another indication that the NTS participant's personal storytelling style emphasizes the boy's personal interaction with the environment and other characters. The most remarkable difference in classifier use could be that there were no marked handling classifiers in the Auslan material. This is certainly odd. The data showed that classifiers use more marked handshapes compared to all frozen signs, indicating that there is indeed a difference between classifier handshapes and other handshapes.

6. Conclusions

As stated in the method section, this project is too small in scope to reject or confirm if there are significant linguistic differences in Auslan and NTS. I have looked mostly at phonology and found both overlap and divergence. Like with spoken languages, some phonemes are more unique to a language than others, some are very common and some are spreading fast through loanwords. As the world grows smaller and more connected, languages are disappearing at a disheartening rate, and others are assimilating with the help of ever increasing international contact. The same is true of signed languages, despite increasing enfranchisement for deaf people and signed language through organizations like The World Federation of the Deaf(WDF), government bodies, and even small university departments like my own. Signed languages came later to the linguistic research table, and are still criminally understudied. There are gaps that must be closed, and they can only be closed by further research and further dedication. More people with multidisciplinary skill sets should help close this gap. I hope my project, though small in its scope, can give inspiration to further research with bigger and better designs.

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