South African Sign Language
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Proximalisation in the acquisition of sign language by hearing adult learners

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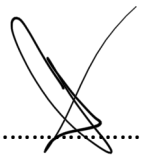
Declaration

I, Dana Chambers, declare that this dissertation is my own work and has not been submitted before, in whole or in part, to any previous institution for assessment purposes.

Further, I acknowledge all sources used and have cited these in the reference section



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Abstract

This research study explores whether or not proximalisation is present in the acquisition of South African Sign Language (SASL) by hearing adult learners. This research will specifically be looking at the extent of proximalisation, as well as the details of how and when proximalisation occurs. This research is motivated by the fact that while both the study and the use of sign language by hearing people is growing on a global scale there is very little research done on their production using the necessary joints.

I have used a quantitative descriptive study in order to investigate the presence of proximalisation in the signs produced by hearing learners. I have used the study done by Mirus, Rathmann and Meier (2001) who looked at the proximalisation and distalisation of German Sign Language and American Sign Language as a basis for this research study. This study focused on the proximalisation in the production of signs by hearing adult first year SASL learners with no prior knowledge of sign language. I have also used a study by Napoli et al (2014) to identify additional features regarding joint usage and joint manipulation in regards to ease of articulation.

Based on the findings by Mirus, Rathmann and Meier (2001) in their study the findings of this study show a significantly lower than expected presence of proximalisation. It was found that participants joint manipulation rather favoured that of distalisation, joint omission (the complete lack of the joint in the production) and joint addition. These were unexpected and all resulted in an ease of articulation and overall, less energy and effort production.

Acknowledgments

First and foremost, I would like to thank my mom, Linda Peplar-Chambers. Without whom I would not have made it to this point. Thank you for your wise words in my times of doubt as well as your love and support in all that I do and all that I am.

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Chapter 1: Introduction

Language acquisition studies delve into various aspects unravelling the intricate tapestry of linguistic structures and the fascinating realm of cognition. In the quest to understand how individuals acquire language, researchers investigate the fundamental components that underpin this remarkable process. Phonology, those minuscule building blocks shaping a languages sound, and morphology, the tiniest units of meaning form its bedrock. Syntax constructs the very fabric of phrases and sentences, while semantics unveils their rich tapestries of meaning. Additionally, an expansive vocabulary is the gateway to linguistic prowess as it expands one's linguistic horizons (Johnston & Schembri, 2007).

While sign languages share these core elements with spoken languages, the acquisition of sign language merits dedicated scrutiny. In her study on Second Language Acquisition of sign language, Woll (2012) illuminates the distinct features that shape the journey of second language learners. Iconicity kindles a symbiotic connection between sign form and meaning, intertwining them in a harmonious dance of comprehension. Motor skills, those intricate muscle movements, manifest as the vehicle of sign production, demanding precision and finesse (Woll, 2012).

Proximalisation, an intriguing phenomenon, is to replace the use of smaller joints in the citation form of a sign, such as the wrist or finger joints, with the use of larger joints such as the shoulder joints (Napoli et al., 2011). It is most commonly seen in the acquisition of sign language by infants, as they develop and acquire new motor skills starting from the shoulder joint down to the knuckles in the fingers. Due to this development the infants often sign bigger movements from the shoulder (the joints most proximal to the torso) rather than the smaller movements from the wrist and knuckles (the joints most distal from the torso) (Napoli et al., 2011). In contrast to this, the phenomenon of distalisation is the replacement of the larger proximal joints closer to the torso with the smaller distal joints away from the torso (Napoli et al., 2011). The easiest way of identifying whether or not proximalisation and distalisation are present in the production of signs is by comparing the use of joints in the sign produced

by a learner to that of a target *citation* form – the form accepted by the signing community based on how it is produced by a native sign language user.

Over the last decade there has been an increasing interest, by hearing adults, in the acquisition of a sign language as a second language (L2). This increased interest has stemmed from professional reasons - such as the need for more interpreters, the increased visibility of sign languages in the media (especially during the Covid-19 pandemic in countries such as South Africa and The United States to name a few), as well as in the fulfilment of language requirements put in place by colleges and universities (such as the University of the Witwatersrand) around the world (Quinto-Pozos, 2011) and in South Africa with the hopes of creating a multilingual and culturally rich population (University of the Witwatersrand, 2015).

However, even though there is a growing amount of research on the acquisition of sign languages as an (L2) by hearing people (Holmstörm, 2019), there is very little research on whether or not proximalisation is present in their production of signs. Most research focuses on proximalisation in the acquisition of sign languages as a first language (L1) by babies. This focus of sign language acquisition studies on proximalisation in L1 babies rather than L2 adult learners can be attributed to several reasons: the developmental perspectives (L1 babies provide valuable insights into the natural acquisition process and developmental milestones), critical period hypothesis (a specific period during early childhood with language acquisition is optimal), a foundation for L2 acquisition), and research focus and resources (due to significance of understanding how language develops in infancy and early childhood, as well as practical considerations of studying babies in controlled settings).

While studies on proximalisation in L1 babies may dominate the research landscape, it is still crucial to investigate its presence in the acquisition patterns in L2 adult learners. Understanding how adult learners acquire and incorporate proximalisation in their sign language proficiency contributes to our knowledge of second language acquisition, pedagogical practices, and the specific challenges faced by L2 learners.

The purpose of this research is to investigate whether or not proximalisation is present in the acquisition of South African Sign Language (SASL) by hearing adult learners. The extent of

proximalisation, as well as the details of how and when proximalisation occurs (including whether particular types of signs tend to be proximalised more), will be explored.

The main question of this research is:
Is there evidence of proximalisation in the signs produced by hearing adult learners acquiring SASL?
The following are the sub questions:

1. What is the extent (%) of proximalisation by hearing adult signers learning SASL?
2. Is proximalisation the only type of joint manipulation present? If not, what is present and to what extent?
    a. Distalisation
    b. Joint omission
    c. Joint addition
    d.

    2.1 Are any other formational features of the sign affected, such as
    e. Handshape
    f. Location
    g. Movement
    h. Palm orientation

3. Which signs are the most commonly proximalised - iconic or arbitrary signs?
4. Does proximalisation occur only with one joint up or can it take place with a joint that is more than one level up?
5. Do learners improve their performance in relation to proximalisation when they are told to concentrate on their use of joints in their second production?

I, as the researcher, will answer these questions posed, by looking at and comparing how the sign is originally signed by a native Deaf[1] SASL signer (someone whose L1 is SASL) and how the sign is produced by the hearing participants. I will specifically be looking at the joints used in the production of the sign, how they are affected, manipulated and changed as well as how

[1] Deaf with an upper case 'D' refers to a group of people who share a language (sign language) and culture and follow the notion of Deafhood (Ladd, 2003).

the other formational features (handshape, location, orientation, movement) of the sign are affected or changed and whether proximalisation affects iconic and arbitrary signs differently. The methodology designed for this research study includes four research participants, all of which are first year students at the University of the Witwatersrand, taking a course in South African Sign Language. Individual Zoom meetings were then set up with each participant where they were asked to introduce themselves in SASL and then reproduce a list of 20 given signs twice. These meeting were recorded and transcribed into ELAN using a list of tiers. After which the data was transferred into an Excel spreadsheet allowing for comparison tables and graphs to be created so that conclusions could be made.

This research is important, as not only is there a lack of research on this topic within the South African context but rather on a global scale with Mirus, Rathmann and Meier's (2001) study 'Proximalisation and distalisation of sign movement in adult learners' being one of a few research studies on this topic. Therefore, this study will add valuable information, as well as research material, on the topic of the acquisition of sign language by hearing adult learners This research may further lead to assisting educators (Mirus et al., 2001) in developing and improving effective pedagogical techniques specifically created for the acquisition of sign language by adult hearing learners. These improved techniques can immediately be put into practice by a number of institutions, especially by South African universities which teach South African Sign Language to a large number of undergraduate students who are both hearing and new to the language entirely.

Chapter 2: Literature review

Introduction

In this literature review I will discuss certain themes in detail, each under their own heading. These themes along with a short summary of what they cover are as follows:

2.1 Introduction to sign languages, specifically SASL: This section explains that sign languages are fully fledged natural languages and

2.2 Language acquisition (LI and L2): This theme discusses the process of acquiring the ability to understand and use a language, which can occur at any point in a person's life for a variety of reasons. It encompasses both first language (L1) acquisition and second language (L2) acquisition.

2.3 Language acquisition versus language learning: This theme discusses the distinct processes of language acquisition which is a naturally occurring process versus language learning which involves direct instruction.

2.4 L1/L2 acquisition in children versus adults: this section discusses how children and adults exhibit differences in second language acquisition, making mention of the critical period hypothesis.

2.5 The teaching of a language to children versus adults: this section discusses the topics of children acquiring their native language through exposure without explicit instruction compared to adult L2 learners having various active teaching methodologies of explicit learning.

2.6 Motives for learning a L2: this section covers the differing motives that one may have for acquiring a new language later in life.

2.7 L2/M2 acquisition of sign language: this section covers the acquisition of a L2/M2 which involves not only the acquiring of a new language but a new modality as well.

2.8 Structure of sign language: phonology and morphology: this section covers the linguistic features of phonology and morphology by going into detail about each feature and how it is seen in sign language. This section is relevant as these features contribute to the formation of the signs which will be looked at in this research study.

2.9 Parameters: in this section the parameters (handshape, location, movement, orientation and non-manual features) are explained in depth. This analysing of the parameters is vital for understanding sign language and how it is acquired.

2.10 Errors at different linguistic levels: in this section the common errors which occur at various linguistic levels for both L1 and L2 learners are explained in depth. These errors impact the accuracy and meaning of signed communication therefore playing an important role in sign language acquisition.

2.11 Arbitrary and iconic signs: in this section the differences between arbitrary and iconic signs are explained as well as their role in the acquisition sign language by both L1 and L2 learners.

2.12 Sign language lexicon: this section discusses the two forms of lexicon in sign language, these being established or core signs and productive signs. Both of which are necessary for the acquisition of sign language as they are needed for accurate communication.

2.13 Ease in articulation: this section shows that ease in articulation is not only present but crucial for fluent and efficient signing as it improves fluency, accuracy and clarity of communication. Therefore, playing an important role in the acquisition of sign language.

2.14 Proximalisation: this section explains the formation and movement of any sign as it requires the activation, movement and manipulation of joints. The joints located closer to the torso are refers to as proximal while those located further away are referred to as distal. This is how the terms proximalisation and distalisation came into being to explain the phenomenon of the replacement of one joint for another.

2.15 Proximalisation by language acquirers/learners (incl. Mirus et al., 2001): this section covers the phenomenon of proximalisation in both L1 and L2 learners using a number of research studies, including the main study that this research study is based on, Mirus et al. (2001).

2.1. Introduction to sign languages, specifically SASL

Sign languages are fully-fledged, complex, natural languages used by Deaf people across the world and possess their own phonological and morphological systems and syntactic rules (Sandler & Lillo-Martin, 2006). These sign languages are not universal but are rather regionally unique and differ in their grammatical structure from the surrounding spoken languages (Ortega, 2017). Sign languages also differ primarily from spoken languages in the use of modality in production. Modality refers to the way that a language is expressed. Spoken languages such as English involve an oral modality which is based on sounds produced with vocal tracts and perceived through hearing. Visual-gestural languages such as SASL on the

other hand rely on purposeful movements of the hands and facial expressions which are perceived with the sense of vision. Though these languages are processed through different modalities, they exhibit the same linguistic structures (phonology, morphology, syntax) and engage many of the same networks in the brain (Baker, van den Bogerde, Pfau & Schermer, 2016). Some modality-specific features of sign language include an extensive use of iconicity as opposed to arbitrariness, as well as the prominence of productive lexicon, which will be discussed below.

In a recent workshop convened by PanSALB, a PanSALB representative stated that South African Stats confirmed that there are about 4 million South Africans who use SASL. This is similar to statistics presented by Heap (2003). The majority of which are Deaf users, though there are a number of hearing people who are parents or children of the Deaf or professions working with Deaf people or in the Deaf community and are required to use sign language frequently as a means of communication (Aarons & Akach, 1998). At the initial hand in date of this research study SASL had not yet been made one of the official eleven languages of South Africa though it is still mentioned by the constitution as one of the languages that must be promoted and for which adequate ongoing development and materials must be created (Aarons & Akach, 1998). However, as of the 2nd of May 2023 parliament voted in favour of the constitutional amendment to declare SASL an official language, making it the 12th official language of South Africa (Dentlinger, 2023). In South Africa, sign language was developed in areas where there were communities of Deaf people as these were the most natural environments for the language's development. Today SASL is highly present in media, educational settings such as schools (44 schools for the Deaf across South Africa) and universities (University of the Witwatersrand, University of Cape Town, Stellenbosch, University of the Free State, University of the North West and University of KwaZulu Natal), healthcare and many career fields and is not limited to being used only by Deaf people.

2.2. Language Acquisition (L1 and L2)

Language acquisition refers to the process of acquiring the ability to discern and make sense of a language, which can take place at any time in a person's life, under any conditions and for a multitude of reasons (Chen Pichler & Koulidobrova, 2015). Acquisition of language can be divided into first language (L1) acquisition, which is the acquisition of a person's native

language, and second language (L2) acquisition, which is the acquisition of any non-native languages acquired after L1 (Mejia-Menendez, 2016). First language acquisition is the process of gaining the capacity to use human language where previously no such capacities existed and this typically occurs during infancy. L1 is naturally acquired (not explicitly taught) quickly, without any conscious effort. There is uniformity in L1 acquisition (everyone becomes 'native' regardless of their different backgrounds). Second language acquisition is the process of acquiring language capacities after the first language has been learned. It is usually acquired much slower than L1 and requires conscious effort. L2 acquisition shows huge individual differences among learners (some learn quickly while others struggle). L2 refers to any languages that are acquired after the L1, and is not limited to the 'second' language in its literal sense (it can refer to the acquisition of the third language, fourth language, and so forth), only that it was not learned natively and refers to any number of non-native languages (Mejia-Menendez, 2016). The study by Mayberry (2007) – When timing is everything: Age of first language acquisition effects on second language learning – explores the impact of age of first language acquisition on second language learning. It examines how the timing of language acquisition affects the learning process. The findings suggest that individuals who acquire their first language early in life have an advantage in acquiring a second language compared to those that acquire their first language later. Early language acquisition provides a strong foundation for language learning, allowing for better phonological, syntactic and cognitive abilities in second language acquisition. The study highlights the critical role of timing in language acquisition and its impact on subsequent language learning abilities (Mayberry, 2007).

2.3. Language acquisition versus Language learning

It is important to distinguish between language learning and language acquisition. When acquiring a language, it occurs naturally such as, children having a natural source of communication with a native user of the language. Compared to language acquisition, language learning is the result of direct instruction in the rules of language and implies that learners have a conscious knowledge of the new language and are therefore able to talk about it (Shaul, 2014). This means that language learners usually have knowledge of the grammar of their first acquired language and therefore know the differences between their first language and the language they are learning such as intonation (rise and fall of one's voice),

the sound of words and the word order. When one learns a new language, they have a deductive approach (ability to develop a hypothesis based on existing information) to the intonation, phonology, morphology and syntax of the new language (Shaul, 2014). This typically occurs when in a school setting where the learners are instructed in the language by learning to read and write on top of learning how to verbally produce the language. Whereas in cases where language learning does not involve literacy development, learners may simply learn how to verbally produce and understand the second language and still be able to function well in that setting (whether regional or cultural). This requires the learning of the sounds and how they are combined, words and their meaning as well as the context in which they are correctly used, which are all used to convey thought. One must also learn the rules of the language concerning word placement and position and differing meanings based on context (Shaul, 2014). Language learning is generally considered to be a much slower process than language acquisition. This means that a person can study a language for years without mastering it, this can lead to students learning the language for years but never truly mastering it and therefore never truly acquiring it (Shaul, 2014).

Several studies have focused on examining the differences between language learning and language acquisition. The notable ones are: Krashen (1981): In his influential work on second language acquisition. Krashen proposed “monitor model,” which distinguishes between language acquisition (subconsciously internalising language rules through exposure and interaction) and language learning (conscious, formal instruction of language rules). Bley-Vroman (1990): this study introduced the “Aspect Hypothesis,” which suggests that language acquisition and language learning involve different cognitive processes. It argues that language acquisition is governed by implicit processes, while language learning involves explicit rule-based processes. DeKeyser (2003): this study focused on the “Implicit vs. Explicit Knowledge” debate in second language acquisition. It investigated whether language learning (explicit instruction) can lead to the same outcomes as language acquisition (implicit learning). The findings suggested that explicit learning alone is not sufficient for native-like language proficiency. Johnson and Newport (1989): this study examined the critical period hypothesis by investigating the language learning abilities of individuals who were exposed to a second language at different ages. The results suggested that there is a critical period during which language acquisition is most effective, with younger learners out performing

older learners in acquiring native-like pronunciation. Long (1997): this study explored the "Interaction Hypothesis," which emphasise the importance of interaction and negotiation of meaning in language acquisition. It highlights the role of social interaction in facilitating language acquisition and suggests that meaningful communication promoted language development more effectively than explicit instruction. These studies contribute to the understanding of the differences between language learning and language acquisition as they shed light on the role of factors such as age, implicit versus explicit knowledge, and interaction in language development. It is also important to note that language learning and language acquisition can be combined, which is what occurs most of the time. This is relevant to this research study as it is important to understand that the learners used in this research study experience a combination of learning and acquisition.

2.4. L1/L2 Acquisition in children versus adults

In second language research there are many differences in the acquisition of a language when comparing children and adults. The critical period hypothesis (CPH) states that there is an ideal period of time between certain ages (widely accepted being early childhood to adolescence) where full native competence in the acquisition of a language is possible (Vanhove, 2013). The critical period concept was first introduced into the field of acquisition by Penfield and Roberts in 1959 and later refined by Lenneberg in 1967. Lennegerg argued that language acquisition needed to take place between the ages of two and puberty (age fourteen) – a period believed to coincide with the lateralisation of the brain (the tendency for some neural functions or cognitive processes to be specialised by one side of the brain). Other scholars have drawn the cut-off point of the critical period at twelve, fifteen, sixteen and even eighteen (Vanhave, 2013). Most researchers today however, do not define the starting age of critical period learning and consider the possibility of it ending much earlier than puberty. The critical period hypothesis has specific implications for teachers and learning programmes despite not being universally accepted. Many acquisitions theories state that adults do not acquire languages to the same degree as children would due to external and internal factors rather than a lack of ability. Mayberry and Squires (2006) also noted that those exposed to language earlier in life tend to perform better than those exposed to the language later. Therefore, it is important to clarify that when referring to adults in this section, it comprises

of all those learning a language (L2) after puberty, while, when referring to children it refers to those who have not reached puberty yet.

As the above paragraph mentions, children acquire a second language almost effortlessly as if it were second nature compared to adults. Children use a part of their brains called 'deep motor area' to process language information (D'Ausilio et al., 2009). Deep motor area is a part of the brain which processes the activity that is not thought about or happens without consciously thinking, such as blinking or breathing. It is like an automatic function of the child's brain used to acquire language. Children acquire and learn language intuitively, while adults think about it actively making it an 'intellectual process' for them (D'Ausilio et al., 2009) Secondly, unlike children, adults are able to digest abstract or formal thinking cognitively. Children have no merit or retention of formal operational thought in learning a language as children's cognitive abilities have not yet been developed and have not yet reached a mature cognitive state and lateralisation (Hu, 2016). Adults can be said to learn a second language in an analytic way (a careful systematic study) as they are also more conscious that they are learning a language, which can lead to them being nervous of making mistakes and taking risks. Different from adults, children learn a second language in a more natural way by absorbing language from those around them and reproducing it in in a more care free manner (D'Ausilio et al., 2009).

In addition to this, children tend to acquire their L2 while still acquiring their L1. This means that their vocabulary – while being large enough to adequately communicate their needs, thoughts and feelings – is not yet as large as an adult. This means that when acquiring their L2 they also need to acquire a smaller vocabulary which will increase as their L1 vocabulary does (Hu, 2016).

Despite having many differences there are two common characteristics that children and adults have when learning a second language. The first is that of imitation. This can mean a variety of things: the imitation of words and how they sound, the way these words are used to form sentences and the context in which these words are used. As adults have the experience of comprehensive learning (to understand as well as comprehend what one is being taught) they are able to imitate the surface structure (the way the words are used

together to form coherent sentences) by paying more attention to grammar and other surface features while children pay more attention to the context that the words are used in (D'Ausilio et al., 2009). In addition to this, both children and adults learn by imitating those around them such as parents, teachers or friends, by watching movies, reading books or listening to audios and then imitating the idioms, accent and pronunciation (D'Ausilio et al., 2009). Second is that of applying meaningful learning. This means that learned information is completely understood and can now be used to make connections with others. This also means that adults and children actively use what they have learned in the new L2 with others based on what they have learned both in the study and observation of the L2 and their previous knowledge of their L1 (Hu, 2016).

2.5. The teaching of a language to children versus adults

As mentioned above, children (again referring to those who have not reached puberty yet) acquire their native language through their interactions with native speakers such as their parents, family and environment (television shows, YouTube, music etc). This communication paves the way for language acquisition to take place. As mentioned under the heading "Language acquisition (L1 and L2)" in many instances parents never really sit down with their children and show them the intricate rules of the language and yet they are still able to express ideas clearly in an almost perfect form. This shows that through exposure they are still able to acquire the language without the need of systematic studies (Snow & Hoefnagel-Hohle, 1978). As a result, even teachers focus more on the communicative aspects of the language rather than on just the rules. This means that in order for the learners to acquire the language they must source out natural communication by talking to native speakers or watching shows in that language (Snow & Hoefnagel-Hohle, 1978).

There are various teaching methodologies for adult L2 acquisition. The three general types are: grammar-based approach, cognitive approach and concurrent approach. Grammar based approaches are based on the assumption that the best way to acquire a new language is through the memorisation of rules and sentence patterns. This approach includes: the grammar-translation method which focuses on the translation of difficult texts into the L2 with little emphasis on the oral language development and a focus on reading, writing and grammar, the audiolingual method which consists of memorising and practicing repetitive

pattern drills and conversation and error correction, and the direct approach which uses dialogues in the L2 that are initially presented orally and grammar is taught inductively through questions and answers without translation (Ulanoff, 2009). The cognitive approach focuses on the explicit teaching of learning strategies within a communicative context. In this approach teachers often use collaborative learning activities in order to promote peer interaction. This approach includes: the natural approach which is a communicative approach focusing on providing comprehensible input, communicating messages and creating a low affective filter situation (environment or instructional setting that minimises emotional barrios or negative affecter barriers) organised according to the learner's proficiency level. The cognitive approach also includes content-based language instruction which integrates language and content instruction through the stages of language proficiency and views the content as merely the vehicle of instruction (Ulanoff, 2009). Concurrent translation can be defined as the use of both the L1 and L2 interchangeably or concurrently and the use of the L1 to assist in building the background knowledge to activate already existing schemata (Ulanoff, 2009).

Unfortunately, when it comes to adult students, many courses revolve around grammar, patterns, repetitions, drillings and rote memorization without even a human interlocutor (conversation partner) to interact with (Nikolov & Djigunovic, 2006). This therefore shows that teaching is characterised by rule-based learning unlike the teaching of children where it is a memory-based process (Nikolov & Djigunovic, 2006). This is often justified due to the decline in plasticity of the procedural memory (a type of long-term memory that aids in the performance of tasks without conscious awareness) which happens after the age of five and is often used for L1 acquisition, which results in late second language learners relying on explicit learning (Nikolov & Djigunovic, 2006). This section is relevant to the research study as knowing the differences in how L1 acquirers learn a language versus how L2 learners learn a language is important as it provides insight into factors which influence language production and in turn proximalisation.

2.6. Motives for learning a L2

There are many reasons people choose to acquire and learn new languages at different stages of their life. For many adult learners who live in this multilingual world being able to

communicate in varying languages allows form more connections and opportunities giving them advantages in their career and social settings. Learning new languages also exposes people to various cultures, religions and traditions allowing for a more enriched experience of the world and a more understanding view of different groups of people. Learning a second language also improves memory by making use of the brain more in order to learn and recall new skills and vocabulary while also improving one's ability to multi task by switching between language (Quinto-Pozos, 2011). While these may be personal motives in learning a new language there are also nonpersonal motives which require the learning of a new language. In many schools and universities fulfilment of language requirements require the learner to choose a second language of a list of acceptable languages (Quinto-Pozos, 2011) with the hopes of creating a multilingual and culturally rich population (University of the Witwatersrand, 2015). While for many other people a job may require the employees to be able to communicate in a certain language in order to adequately fill the position or a regional move may require the acquisition of a new language in order to be able to adequately communicate and thrive in the community. Understanding one's motives when looking at this research topic are important as understanding that the motives lead to understanding the underlying factors which influence one's willingness, effort and overall performance in a new language. This leads to the topic of mistakes in production and ease in articulation which in turn leads to proximalisation.

2.7. L2/M2 Acquisition of Sign Language

In the acquisition of sign language as an L2 by hearing people, not only are they required to learn a new language with its own structure but a new language in a new *modality* as well. Chen-Pichler (2009) refers to this unique experience of hearing adult learners of sign language as L2/M2 (second language, second modality) acquisition. This means that they are required to learn how to use their hands, arms and face as articulators to express the language rather than relying on their voice (Holmstörm, 2019). These articulators can all be moved in different ways to create a variety of signs which make up the language. For a first-time hearing learner of sign language these new skills may lead to some challenges. One of these challenges is that of thinking in English and then having and produce the thought in sign language, this can be a confusing and tedious activity, or while interacting with a native signer who expresses

thought naturally and quickly in sign language the hearing learner is now forced to rely on the eyes to take in information quickly rather than on the ears (Holmstörm, 2019). Also, when taking in information from a native signer it is not just one variable which is used to transmit information, the facial expression, position and speed are all factors which also need to be paid close attention to as they may change the context as well as the meaning of the sign completely. Fortunately, though, like all languages these challenges can be overcome by practice, confidence and familiarity with the language.

I will now illustrate the process of teaching SASL as L2/M2 at a tertiary education using the department of South African Sign Language at the University of the Witwatersrand (Wits) as a case study. Since my research participants come from this department, it is important to understand how SASL is taught. The teaching of SASL at Wits SASL Department is split into two parts: the learning of the language (vocabulary, rules and production) and the theoretical study of Deaf culture, which includes the study of linguistics, literature and the community (SASL Student Guide, 2023). This section is taught to the students by hearing and Deaf academics using readings, presentations and discussions. Deaf culture refers to the social beliefs, behaviours, art, literary traditions, history, values, and shared institutions of communities that are affected by deafness and use sign languages as the main means of communication. The language section is taught by a native Deaf signer who ensures that the signs learned by the students are correct, their production is correct, the way they are used together is in line with the syntactic rules of the language and allows for interaction with a native signer in order for acquisition to occur. The students usually learn the alphabet first so that they can introduce themselves and then move on to the most commonly used signs needed for a basic conversation. These are greetings, self-identification and introduction, describing their surroundings, telling time and dates and animal names. From there their vocabulary is built on with more complex topics to allow for broader and more intimate conversations. This learning and the interaction with native signers allow for the students to not only practice their productive skills but also practice a natural conversation where they learn to understand, interpret and respond to the language. This allows the students to truly acquire and use the language with Deaf people.

2.8. Structure of Sign Language: Phonology and Morphology

Sign languages, like spoken languages, can be analysed in terms of different linguistic levels: phonology, morphology, syntax, semantics, and pragmatics. First, I will briefly explain each level, and then provide a more detailed explanation of parameters (phonology), which is most relevant to this study. This section aims to lay foundation for my later discussion of acquisition errors that occurs at different linguistic levels.

Phonology in sign language refers to the study of smallest units of sign language. Signs are created using *parameters*, which are considered as the phonemes of the language (a distinct unit which forms part of a word/sign and distinguishes it from another). This term refers to the five phonological units of sign language: handshape (the distinctive design hands take up to form words and letters), location (where the sign is produced), orientation (the direction of the palm), movement (hand actions), and non-manual features (mouth patterns, eye gaze, facial expressions, body shift and head tilting, and so on) that are used in the production of signs (Johnston & Schembri, 2007). For example, the sign HELLO[2] is made with a B[3] handshape at the forehead of the signer (location), moving forward and away from the signer in straight line (movement), palm facing inward (orientation), and usually accompanied by a mouthing[4] of 'hello' (non-manual feature). As signs are part of a linguistic system, they have strict rules governing the range of acceptable handshapes they are able to make use of, and locations and movements which are governed by the available signing space that the signer has access to. Palm orientation is also determined in each sign. Nonmanual features can be flexible but there are many signs that need to be accompanied by a particular mouth pattern or body posture. I will explain each parameter in more depth below.

Morphology refers to the internal structure of words/signs and how meaning can be generated and modified within each word or sign. Individual signs in a signed language are the basic equivalent of words in a spoken language (Johnston, 2006). The unique feature of sign language is that the parameters mentioned above (phonemes) are also seen as morphemes (the smallest meaningful units of the language) (Baker et al., 2016). They are

[2] Signs are represented using the standard glossing system – corresponding English word written in small capitals.

[3] The list of handshape symbols can be found in Appendix 3.

[4] The production of visual syllables using the mouth to accompany a sign.

critical in the formation of meaningful signs and the modification of any of them may result in a completely different sign with its own meaning taking form (Baker et al., 2016). For example, the parameter of movement can change to show the manner or speed of something – such as WALK becoming WALK-FAST or WALK-SLOWLY. Morphemes can effect changes in meaning by signalling the creation of a new word or change in word class, or by signalling grammatical information such as case, number, person, aspect or tense (Baker et al., 2016).

2.9. Parameters

The understanding of parameters is important as they are seen as the building blocks of the sign. When looking at proximalisation in this study these parameters become important as they are what are affected, manipulated and changed.

As stated above, handshape refers to the specific design and shape that the hand takes when producing a sign. In order to do this the signer manipulates the metacarpophalangeal and interphalangeal joints (Anderson et al., 2022). These handshapes are formed from different configurations (open, closed, curved) of specific parts of the hand (fingers, thumb and wrist). Some handshapes are also more difficult to produce due to their constraints on the anatomy and physiology of the fingers and joints (such as hyperextension—bending the fingers backwards past their natural range) (Mann et al., 2010). There are two types of handshapes in sign language, marked and unmarked. Unmarked handshapes tend to be the most common handshapes as well as the earliest ones acquired by children as they are typically the simplest and most frequently occurring. These handshapes tend to be the easiest to articulate as well as distinguish as they are considered more natural or default in sign language and are often used as starting points for creating signs (Lucas & Valli, 2000). Examples of these handshapes are the B-handshape and the 5-handshape (which can be seen below).

Figure 1: 5-handshape

Figure 2: B-handshape

Marked handshapes, on the other hand, tend to be acquired later and are less common and harder to articulate and distinguish (Anderson et al., 2022). These handshapes are often more complex, involve finger movements, or have specific finger configurations that distinguish them from unmarked handshapes. These marked handshapes may also include variations or modifications of unmarked handshapes to indicate meaning or characteristics. These variations may involve bending or twisting fingers, adding finger movements or altering the orientation. Examples of these handshapes are the X-handshape and the CORNA-handshape (which can be seen below).

Figure 3: CORNA handshape

This relates to the acquisition of sign language in babies as their joints and motor skills are still developing and therefore, they do not have the precise control needed to correctly create marked handshapes. This may lead to them producing a sign that is usually produced using a marked hand with an unmarked hand instead. As the child grows and their control and joints develop so too does their ability to correctly use marked handshapes. The complexity and markedness also affect the frequency with which different handshapes occur within the language, research findings indicate that unmarked handshapes are more frequently occurrent than marked handshapes (Mann et al., 2010).

Location refers to where in the signing space or on the body the sign is produced. While most signs are produced in the neutral space in front of the torso signs can occur nearly anywhere in the designated signing space. This signing space includes anywhere on the signer from the waist up and the neutral space around that. This means that signs cannot be located behind

someone's back or below their waist (apart from the exceptions such as the variant of the sign DOG in SASL which is produced by touching one's thigh) (Anderson et al., 2022). Some examples of common locations are: the neutral signing space in front of the torso, *on the cheek* and *on the non-dominant hand in the neutral space in front of the torso*.

Location can be divided into descriptive localisation and non-descriptive localisation. Descriptive localisation or topographic space refers to meaningful locations that exploit the iconic properties of the visual-spatial modality and are used to express spatial relationships among objects. This localisation represents the spatial information from the signer's perspective and uses classifier constructions and placement of the hands (Anderson et al., 2022). An example of how this would be used would be in describing how a car drove into a tree. The signer would set up the story by placing the tree in the signing space (perhaps in the neutral space of the left side of the body) and represent where the car was coming from and how it ended up hitting the tree – using a flat B-handshape moving in a zigzag motion from the neutral space of the right side of the body and making impact with the left hand – the manipulation of the location of the car or tree would therefore make changes to the story. In contrast, non-descriptive localisation refers to the abstract use of space in which entities are localised arbitrarily to identify the agreement of the verb therefore this localisation can be shifted without affecting the truth conditions of the sentence (Anderson et al., 2022). An example of this use of location would be in the sign DOG. This sign tells us what it is without specifically telling us where it is located. Nouns can be assigned locations vertically above or below the horizontal plane in certain circumstances (Anderson et al., 2022).

Among the five parameters, the movement of the hands is also very important as it too plays a crucial role in the construction and understanding of many signs (Sandler, 2011). Like the other parameters, the movement of the hands is an important identifying feature that allows one to make the connection to what sign is being conveyed as there are signs that may only differ on the basis of movement (for examples, SASL signs, BROTHER, MATHS and SPORTS are all identical except a difference in their movement). In the development of many productive signs (which will be discussed below) movement also plays a very important role in timing, identifying and location information. This means that the movement of the sign, as denoted

by the signer, is able to represent the speed at which something is happening as well as where it is taking place and how it occurs (Sandler, 2011).

There are two types of movement which can make up a sign. The first type of movement is path movement. This movement is produced at the shoulder or elbow and results in the sign moving in a path through the signing space (Sandler, 2011). An example of a sign that uses path movement is the sign AEROPLANE-FLY. This sign is a one-handed sign using Y-handshape, and the sign then uses path movement, using the shoulder joint to move across the body in an upwards motion. This movement represents an aeroplane taking off. The second type of movement is internal movement. This movement is produced either by the wrist to create a change in palm orientation, or by the fingers to create a change in handshape (Sandler, 2011). The hand(s) producing the sign remains in the same place. An example of a sign that uses internal movement is the sign BOOK. This sign is created by putting your hands together palm-to-palm, then keeping your pinkies together, move your palms away from each other. This movement represents the opening of a book. While some signs only make use of path movement or internal movement, there are signs that make use of both. An example this type of sign is INFORM. This is a two-handed sign, both hands in Irish K handshape, moving away from the signer. Path movement occurs as both hands move from the forehead away from the signer in a downward motion. As the hands move away from the signer, internal movement occurs with the thumb and middle finger on both hands creating a flicking motion. These movements occur at the same time to create the sign.

As mentioned above, orientation refers to the distinct direction of the palm when creating a sign. In the past, there have been two ways to refer to orientation. Absolute orientation refers to the direction that the palm side of the hands are pointing. While relative orientation refers to the location of the thumb in the production of the hand (Crasborn & van der Kooij, 1997). However, as mentioned above we make use of absolute orientation relating to the position and direction of the palm when producing a sign. Examples of palm orientation would be *palm facing away from signer* or *palm facing up*. Examples of standard palm orientation in signs would be the sign APPLE where the palm is orientated towards the signer or the sign BOOK where the orientation changes from left hand right and right hand left to upwards. Examples of how orientation affects meaning would be the sign I-LOVE-YOU palm facing away from signer

indicating that it is directed towards the person standing opposite the signer. If it was palm facing left then it means that it is directed at the person to the left of the signer.

Finally, non-manual features or non-manual articulators include the facial features (eye-brows, eyes, nose, cheeks, lips tongue), the whole head (head tilting or moving) and torso (body shifting, leaning) which can all move in a variety of ways (Napoli et al., 2014). Most, if not all nonmanual features accompany the manual features in several ways: they can be part of the lexical item and therefore compulsory, they can carry morphological or syntactic information (such as the intensity of the statement or whether it is just a statement or a question), they can also be affective in showing the emotion appropriate to the message and they can be used to repair or monitor an utterance (Napoli et al., 2014). Some examples of nonmanual features are *squinted eyes, puckered lips* and *mouthing.*

2.10. Errors at Different Linguistic Levels

In the acquisition of sign language by both L1 and L2 people, there are common production errors that can be made at different linguistic levels (Johnston & Schembri, 2007). Common production errors include: phonological errors, morphological errors or inflection errors, semantic overgeneralisation, syntactic errors, pronoun acquisition and fingerspelling (Crawson, 1994). These will be discussed in this section, all sign language examples used in this section are provided as a hypothetical by the researcher (a non-native signer).

Phonological errors occur when there are errors occurring in the smallest units that make up the language. In spoken language this would refer to the sounds made, which occurs in a pattern and is referred to as a phonological process (Johnston & Schembri, 2007). In English spoken language an example of this would be the consistent replacement of the sound [s] with [th] in the following sentence: “I’m [th]cared that there i[th] a [th]pider in my [th]ock” which should rather be produced as “I’m scared that there is a spider in my sock”. In sign language this refers to the errors in the construction of signs using parameters, as explained above (Brentari, 2019). An example of a phonological error with the parameter of handshape – which is said to be the hardest parameter to accurately produce when acquiring the language (Chen Pichler, 2015) – would be the sign AEROPLANE being produced with a 1 handshape instead of a Y handshape. These errors in handshape can be said to occur due to

the unfamiliarity in the use and manipulating of the finger joints which can lead to the substitution of marked handshapes for unmarked handshapes, as mentioned above. An example of phonological errors occurring in the parameter of location could occur in the sign PREGNANT, which has the tip of the index finger located on a puffed-out cheek rather being produced with the index finger located on the nose. An example of a phonological error occurring with the movement parameter would be in the sign COFFEE which is produced with the dominant hand moving in a circular motion on top of the non-dominant hand instead being produced with the dominant hand moving up and down in a tapping motion on top of the non-dominant hand. An example of phonological errors in the parameter of orientation could occur in the sign APPLE, which is correctly produced with palm towards signer rather being produced with palm towards the left or right. These errors result in the sign being wrong or even producing a completely different sign (minimal pairs). Proximalisation, the focus of this research, may be understood as part of the phonological errors, as it affects the formational features of parameters, mainly movement.

Morphological errors in spoken language, English, refers to

Type of error	Example
Derivation: omission of inflection -es and –'s	A bee is an insect
Omission of inflicting – ing and er	A sunflower is one of the flower<u>ing</u> in our garden
Omission of preposition to and in	The pizza store is in by the mall
Omission of the, copula be	there are many tall trees <u>are</u> there
Omission of is and am	<u>The a</u> dog is playing with the ball
Omission of pronouns - it	I bought a new car and it red
Omission of auxiliary - has	snakes <u>have</u> <u>have</u> long bodies and scales'

(Gayo & Widodo, 2018)

In sign language this refers to the absence, or incorrect use, of inflections (change in form of the sign to express grammatical function) when signing (Crawson, 1994). In sign language, common morphological errors are inflection errors that take place with verb agreement. Verb agreement can change the subject-object structure as well as incorporate pronouns by changing the direction of movements (Aronoff et al., 2005). An example of this would be

inflecting the verb HELP to $_2$HELP$_1$ (“You help me”) directed towards the signer, or $_1$HELP$_2$ (“I help you”) directed away from the signer. Inflection errors can result in the wrong sign being created (such as directing HELP away from the signer when the meaning is to “Please help me”) and therefore the wrong meaning or information being conveyed.

In spoken language syntactic errors refer to errors in the omission of subject verb agreement (the grammatical rule that the verb in the sentence must match the number, person and gender of the subject), passive voice (the grammatical voice construction which is written in the word order object + action + subject), tense (past, present and future), noun phrase (a group of two or more words headed by a noun that includes a modifier such as *the* or *a*), auxiliary verb (helper or helping verbs that support the sentences main verb to communicate aspects of time and modality), comas and demonstrative determiners *there* and *are* (Gayo & Widodo, 2018). Examples of these errors in subject-verb agreement is in the sentence ‘she like to read before bed’ which should be written as ‘she like*s* to read before bed’ demonstrative determiner; ‘in the world ø about 20000 species of butterfly’, passive voice; ‘they are breed by sprouting’, tense; ‘I am living in South Africa for 20 years’, noun phrase; ‘cactus has body large’ and auxiliary; ‘turtles not have teeth’ (Gayo & Widodo, 2018).

In sign language, syntactic errors refer to errors in the sequence of signs (Johnston & Schembri, 2007). As mentioned above, different languages have different word order. Therefore, errors in syntax occur as learners find it difficult to switch from their L1 word orders to their L2 word order. Native English speakers, for example, may struggle to learn the sign order of SASL as it is different from that of English. Many L2 learners acquiring sign language use their English L1 word order, constructing sentences like ‘my name is James’ as MY NAME JAMES rather than using the correct signing order of sign language, NAME MY JAMES. Syntactic errors also occur in the lack of NMFs. As discussed earlier, NMFs refer to mouth patterns, eye gaze, facial expressions, body shift and head tilting, all of which are important in not only sign construction but sentence differentiation (e.g., the creation of statements versus questions) (Johnston & Schembri, 2007). For example, yes/no questions are usually accompanied by raised eyebrows and the body leaning forward. Therefore, not using these correct NMFs to create a question such as APPLE EAT YESTERDAY ? (“Did you eat an apple yesterday”) results in

misunderstandings and misinformation (it may be interpreted as a statement "You ate an apple").

Semantic overgeneralisation refers to the overgeneralisation (the use of one word to represent a larger group sharing those characteristics) of a word such as using the sign GRANDMOTHER to represent all old women (Crowson, 1994). It also refers to underextenstion, an example being the use of the word 'dog' to refer to 'my dog' only. This may be due to the cognitive development and world knowledge that the language user has, so it is primarily used with L1 acquirers rather than L2 adult acquirers as they have enough knowledge of their world (Crowson, 1994). Pronoun acquisition errors refer to errors such as confusing and/or misusing the signs INDEX_1 and INDEX_2 (Mayberry & Squires, 2006). According to Mayberry & Squires, (2006) fingerspelling errors refer to basic spelling errors in the production of fingerspelled words (the manual representation of letters of a written language, which are used to fill lexical gaps in sign language (Sutton-Spence & Woll, 1999).

2.11. Arbitrary and Iconic Signs

This section is important to the research as the research will make use of both arbitrary and iconic signs therefore it is important as it will allow a comparison to be made as to which ones are perhaps affected the most often.

Semiotically, signs can also be divided into two groups, arbitrary and iconic signs. Arbitrary signs can be defined as those signs constructed solely based on convenience, meaning that there is no direct link between the signs formation and meaning (Johnston & Schembri, 2007). Examples of arbitrary signs in SASL are the signs MOTHER, constructed using a W-handshape on both hands tapping, and SISTER, constructed using an X-handshape and tapping on the bridge of the nose. On the other hand, iconic signs can be defined as the sign having a resemblance to its meaning or referent (Johnston & Schembri, 2007). Examples of iconic signs include APPLE, which represents how an apple would be held as it is bitten into, and PREGNANT, which uses a puffed-up cheek to represent pregnancy. While iconicity can be present in a spoken language in the form of onomatopoeia (words that sound like the sound they represent examples: such as English words '*hiss*, *splash* and *swoosh*), it is much more common

to see iconicity in visual-gestural languages such as SASL. This is because it is much easier to visually represent a referent using the hands and face rather than the voice (Frishberg,1975).

The iconicity of signs has two important characteristics. Firstly, despite the sign having a visually motivated resemblance to the referent it still has to follow the phonotactic (the branch of phonology dealing in language restrictions) constraints of the language (Ortega, 2017). This means that a sign cannot simply be developed and used just because it represents the referent. The sign must take into account the way the body is used to convey signs such as where on the body a sign can be located and how it can be shaped. An example of this, using the construction of the sign PREGNANT in SASL, is the fact that the phonologically correct way to construct this sign would be to use the puffed-up cheek to of the face to represent a pregnant belly rather than on the actual belly as it is not within the appropriate signing frame. Secondly, iconicity is not a categorical property of signs but rather a continuum (a concept or phenomenon that exists on a continues scale or spectrum, rather than being limited to distinct categories or points) with some signs being easier to link to their referents than others (Ortega, 2017). Kilma and Bellugi (1980) proposed a four-level continuum of sign iconicity with each level representing a different degree of iconicity. *Transparent* signs are those that are the easiest to link to their referent. Hearing non-signers, without any knowledge of sign language, can understand the meaning of transparent signs. An example of this would be the sign RUN, as it represents the movement of the arms of someone as they run. *Translucent* signs are those whose referent or meaning might not be immediately understood by hearing non-signers but when the meaning of the sign is explained the connection becomes clear. An example of this would again be the sign APPLE. One handed sign in bent 5-handshape moving upward in front of the mouth may not immediately calls for an image of an apple, but once it is explained to be the sign APPLE, the form-meaning connection becomes clear without further explanation. *Obscure* signs also have a link to their referent. However, a connection between the sign and the referent may only be understood once explained however, not directly seen. An example of this would be the sign YES, which is constructed using a fist-handshape which repeatedly moves forward and back at the wrist. This sign would be considered obscure as only once it is explained that the fist represents the head nodding would a hearing non-signer see the link. Finally, *opaque* signs are those signs without an evident connection to their referent (they are arbitrary signs), such as the sign WHAT (Kilma & Bellugi, 1980).

Although sign languages conform to the same grammatical constraints and linguistic principles of spoken languages, they make use of iconicity to a much greater extent than spoken languages which make use of arbitrariness to a large degree. This may be attributed to the modality and fact that the hands (signing) are better at mapping out form compared to the voice (speaking) (Thompson et al., 2009).

There are a number of studies pertaining to the role of iconicity in the acquisition of sign language as an L1 by deaf babies, many of them yielding conflicting results. A study done by Orlansky and Bonvillian (1984) also yielded the result that suggested that the role of iconicity in a child's early acquisition of sign language is not all that important. In a study conducted by Meier et al. (2008), examining the earliest ASL signs of 4 deaf children aged 8-17 months found that the children did not learn and produce iconic signs faster, easier or earlier than the arbitrary signs. The study conducted by Thompson et al. (2009) asked whether or not iconic signs were comprehended and produced earlier by children in early sign language acquisition. They conducted this study by looking at parental reports adapted for British Sign Language. Their results showed that iconicity did in fact facilitate the early acquisition of sign language as iconic signs were easier to learn and understand therefore playing a larger role than that of phonological complexity. Iconicity therefore bridges the gap between the linguistic form and human experience allowing children to capitalise on this as they experience more and gain cognitive ability (Thompson et al., 2012). This study was replicated by Caselli and Pyers (2017) with a much larger scale with a different sign language (American Sign Language) where the results reinforced that which was concluded by Thompson et al. that iconicity did in fact promote productive sign acquisition. The same findings were found in the studies by Sümer et al. (2017) for Turkish Sign Language and Woolfe et al. (2010) for British Sign Language. However, a fact that remains the same among these studies is that the comprehension of iconic signs is heavily reliant on a number of factors grounded in human experience. This means that in the acquisition of sign language as a L1 by Deaf babies, iconicity does not facilitate lexical development as children lack the conceptual ability to make associations between the sign and the referent. An example of this would be the sign MILK, which shows an action of milking a cow. While an older person who knows and understands where milk comes from may find the connection between the sign and the referent quite

easily, an infant with no knowledge of this would not be able to make the link. In fact, Ortega (2017) suggests that arbitrary and iconic signs are learned at the same rate by infants and experience the same acquisition errors because they approach these signs in the same way. In the acquisition of sign language as an L2 by hearing adults, however, iconic signs are recalled significantly better than arbitrary signs as the signer is able to make associations between the sign and the referent as they have access to the human experience required to make the necessary links (Ortega, 2017). For this reason, this study attempts to compare the presence of proximalisation in arbitrary and iconic signs. If learners are more sensitive to the formation of iconic signs than that of arbitrary signs, proximalisation errors may be reduced in the former.

2.12. Sign Language Lexicon

There are two types of lexicons in sign language: established and productive. Established (frozen or core) signs are those signs that are recognised as the language's vocabulary – such as HOUSE, DOG, BEAUTIFUL or RUN. They are also referred to as frozen signs as their form and meaning are fixed. These are the signs that would be found in a dictionary and are often not necessarily strongly visually-motivated (Baker et al., 2016). These are the signs which are listable and can be provided to learners in the form of a vocabulary list or dictionary and can be taught explicitly as well as being identifiable by the community as having a specific meaning or referring to a specific referent (Baker et al., 2016). Established signs refer to a general idea or abstract concept rather than a specific example of that concept. Signs such as RUN or JUMP tell us basic information about the action but lack information on position, time, location and who is involved due to the fact that they are governed by their permitted range of handshapes, locations and movements that they are able to make use of, once additional manipulation and features are added to the sign it is no longer considered an established sign (Johnston & Schembri, 2007). This means that a single established sign may lack the additional information that would be needed to fully understand the proposition and a constructed established sentence (with a range of separate lexical items) would be needed to convey all of the necessary information. An example of this would be RUN $INDEX_2$ FAST HILL DOWN. This sentence has now conveyed the information of what the action is, who is doing the action, where it is occurring and how it is occurring, all information that would not have been conveyed by the single sign RUN.

In contrast, productive signs (also known as classifier[5] signs) describe the specific appearance, movement and location of a referent. They can be created at any time as an entirely new sign. An example of a productive sign would be the use of a B-handshape, with palm facing down moving upwards away from the signer to represent how a car moves up on a slope (CAR-DRIVING-UP-SLOPE). These signs are not governed by specific parameters but are rather uniquely constructed and manipulated by the signer (Johnston & Schembri, 2012) to explain a specific visual scene, such as how a car crashed into a tree. This means that individual examples of productive signs are not listable and cannot be taught, so learners have to learn how to construct them. There are three main types of classifiers; *handling* classifiers which are used to represent how the hand is used to interact with a specific referent, an example being holding a cup of coffee; *entity* classifiers which use the entire hand to represent a part or the entire referent, such as flat palm of the hand facing downwards, in a B-handshape representing a car; and finally *size and shape specifiers (SASS)* where the hand is used as a pencil to outline a specific referent such as showing the outline of a box (Johnston & Schembri, 2007). This would allow the signer to convey all the necessary information needed to understand the intended message with a single sign rather than a signed sentence using a string of separate lexical signs (as seen in established signs above).

Signing L1 children acquire classifiers and their ability to use them the same way they acquire any other aspect of the language, through exposure and practice. Early research on how signing L1 children produced classifiers focuses on 'complex verbs of motion' such as the example above. This research has noted that an extended course of acquisition and a pattern of errors suggesting that children approach these constructions as being morphologically complex (containing more than one morpheme) (Chen Pichler, 2012). In research done by Newport and Supalla (1980) it was found that signing L1 deaf children under the age of three failed to express the manner of movement and often leave out the secondary object (such as the tree in the example of a car crashing into a tree). similar findings have been noted by Morgan et al. (2008) and Tang et al. (2007). Other early studies showed evidence of sequence of acquisition for the subcategories of classifiers (as mentioned above) based on the type of

[5] The term classifier has been pointed out as being not entirely accurate, but it will be used in this research essay as it is still the most widely used term.

information encoded by the classifier handshape. More recently many researchers argue that the prolonged cause of acquisition for classifier construction is due to the complex discourse functions that children must control when they use these constructions, including establishment of referents represented by handshape, coordination of relation of figure to ground and manipulation of focus or perspective (Schick, 2006).

Hearing learners may also struggle to produce productive signs, as they are unique to sign language (spoken languages mostly consist of established vocabulary). As in spoken languages, the ability to create sentences and produce meaningful productive signs using the correct grammar and vocabulary takes practice, knowledge and familiarity of the language. To overcome the challenges, hearing L2 learners of sign language can benefit from focused instruction on the use of classifiers, regular practice with feedback from native signers or qualified sign language instructors, and immersion in sign language environments where they can observe and interact with signing peers and native signers. It's also important for L2 learners to be conscious of the differences between spoken and signed languages, and to focus on the spatial and visual aspects of sign language when producing classifiers. With consistent exposure and support, L2 learners can become proficient signers and produce classifiers accurately and effectively. Therefore, both L1 and L2 sign language acquirers need to obtain a multitude of established signs forming part of their lexicon as well as know how to correctly use them to form grammatically correct, meaningful sentences. They also need to learn how to create productive signs (Johnston & Schembri, 2012).

2.13. Ease of articulation

This section is important in relation to the research essay as proximalisation (the focus of the research) can fall into this category of ease of articulation for various reasons. Articulatory effort can be defined as the total biomechanical effort or the sum of all the articulatory forces or extent of activation, therefore ease of articulation can be defined as the reduction of this effort (Kirchner, 1998, cited in Napoli et al., 2014).

In a study done by Sanders and Napoli (2016), a distinction was made between active effort and reactive effort. As mentioned above, active effort can be defined as the effort of moving an articulator or holding it stable, an example of this would be the production of the sign

AEROPLANE as it requires the intentional movement of the dominant arm in an arch like motion from right to left while the non-dominant hand remain still. Reactive effort can be defined as the effort that is expanded elsewhere in the body to resist incidental movement induced by active articulation, an example of this using the sign AEROPLANE would be the reactive movement of the non-dominant hand moving in a slight up and down motion due to the dominant hand leaving its contact point on the palm (Sanders & Napoli, 2016). In research reactive effort is not as greatly studied as active effort. Sanders and Napoli's (2016) main findings were that the drive to reduce reactive effort was responsible for the fact that signs that did not affect torso stability such as the sign APPLE, are highly present in the lexicon, while signs that destabilised the torso where significantly less present with those that destabilised the torso via twisting being less common than those that destabilised the torso via left-right or front-back rocking, such as the sign SEASONS (Sanders & Napoli, 2016). As sign languages regularly make use of path movement which causes the arm to trace a route through space, an example being the sign AEROPLANE, this movement is large enough to induce observable incidental movement of the torso. As this torso movement is generally undesirable the signers resist it by expending reactive effort (Sanders & Napoli, 2016)

Therefore, ease in articulation in sign language production refers to the physical and cognitive ease with which a signer can produce signs and sign sequences. Sign language production requires the use of specific handshapes, movements, and spatial relationships, and non-manual features such as facial expressions and body language. When signers have ease in articulation, they are able to produce signs and sequences fluently and efficiently, without hesitations or errors. Factors that can affect ease of articulation in sign language production include motor skills, cognitive processing, language proficiency and fatigue or injury. Sign language production involves complex motor skills, including the ability to coordinate handshapes and movements with facial expressions and body language. Signers with strong motor skills and dexterity may have an easier time producing signs accurately and fluently. Sign language production also requires cognitive processing, including the ability to recall and retrieve signs from memory, and to plan and sequence the signs for effective communication. Signers with strong cognitive processing skills may be able to produce signs more easily and efficiently. Signers who are highly proficient in sign language may have an easier time producing signs, as they have a larger vocabulary and a deeper understanding of the

grammatical rules and nuances of the language. Sign language production can be physically demanding, and signers who are fatigued or have injuries may struggle to produce signs accurately and fluently.

Ease of articulation in sign language is related to several factors: Manual dexterity, movement smoothness, sign complexity and sign repetition: Ease of articulation is closely linked to manual dexterity, which refers to the ability to make fine motor movements with the hands and fingers. Signers with greater manual dexterity are able to produce signs more fluently and efficiently, with fewer errors and hesitations (Napoli & Liapis, 2019). It can also be related to movement smoothness, which refers to the fluidity and coherence of sign movements. Signers who are able to produce smooth and coherent sign movements are more likely to have greater ease of articulation (Napoli & Liapis, 2019). Sign complexity can also affect ease of articulation in sign language. Simple signs that require fewer handshapes and movements are generally easier to produce than more complex signs that require multiple handshapes and movements (Napoli & Liapis, 2019). Repeating signs can also affect ease of articulation. Signers who repeat signs frequently may be able to produce them more fluently and efficiently over time, as the repeated practice can help to improve ease of articulation (Napoli & Liapis, 2019).

Several methods of ease of articulation occur in sign language conversation at a lexical level. These include:

- weak drop (dropping one hand in a symmetrical two-handed sign) – an example is the two-handed sign BOOK; it would be affected by dropping one hand while the other hand remains in place. The dropped hand represents a weaker or reduced movement.
- weak freeze (holding one hand in a symmetrical two-handed sign in a stagnant position) – in the sign HELP$_2$ both hands start in the same location however one hand freezes or holds its position while the other hand continues its movement.
- joint freeze (freezing one joint) – in the sign CAT the fingers of the one hand may freeze or hold a specific joint position while the other hand completes the movement. The frozen joint remains stationary while the rest of the hand moves.

- distalisation (migrating movement to a more distal joint) – the sign RUN the movement starts with the movement of the arms coming from the elbow joint if replaced with more distal joints such as movement from the wrist results in distalisation.
- location undershooting (shortening movement) – if in the sign AEROPLAN the sign does not reach its intended target but rather falls short or ends too soon.
- iteration loss (decreasing the number of repeated movements) – the sign REPEAT involves repeated movement to accurately produce the sign however if this repetition is lost then it undergoes iteration loss.

(Napoli & Liapis, 2019).

There is evidence of exhibiting ease in articulation or a reduction in effort in the use of joints (joints will be discussed further on) when signing. Many two-handed signs in which hands move independently with reflexive symmetry across the midsagittal plane (vertical split of the body into two equal parts) in the formal register result in the non-dominant hand being omitted in the casual register. This is called weak drop (Napoli et al., 2014). This therefore halves the biomechanical effort required with no cost to the identification of the sign. In weak freeze, the hands of the two-handed sign assume the location of the sign but the non-dominant hand does not move (Napoli et al., 2014). Instances where articulation is cut short also reduces effort. This means that fast signers have two options when undershooting the location, they can either undershoot a phonetic target location or increase articulatory effort in order to achieve targets quicker. Signs made outside of the usual signing space create a greater effort in location, again the alternative is to undershoot the location (Napoli et al., 2014).

There is evidence from research studies that ease in articulation plays an important role in the production of signs in sign language. For example, a study by Pizzuto et al. (2001) found that signers who had greater manual dexterity were able to produce signs more quickly and accurately than signers with lower manual dexterity. Other studies have found that ease in articulation can affect the quality and clarity of sign production. Brentari et al. (2011) found that signers who had greater ease in articulation were able to produce signs with greater clarity and distinctiveness, which made them easier to perceive and understand. In addition, studies have shown that ease in articulation can be influenced by various factors, including

age, experience, and physical condition. Schembri et al. (2008) found that signers who were younger and had more experience with sign language had greater ease in articulation than signers who were older or less experienced. Overall, there is evidence to suggest that ease in articulation plays an important role in the production of signs in sign language, and that it can affect the fluency, accuracy, and clarity of sign production. Just like spoken language sign language exhibits a drive for ease of articulation, particularly in fast casual conversation where methods of reduction effort are shown here to be limited by the need to maintain recognisability (Napoli & Liapis, 2019).

2.14. Proximalisation

The movement of signs activate a series of joints from the shoulder, elbow, wrist and knuckles. Napoli et al. (2011) have identified six joints that are used to produce manual signs (See Figure 1 below). There are four joints in the arm: the shoulder, the elbow, the radioulnar and the wrist. There are three sets of knuckles in each finger and two sets of knuckles in the thumb. The first set of knuckles is referred to as the metacarpophalangeal joints, the second set of knuckles is referred to as the interphalangeal joints and the third set of knuckles is referred to as the distal phalangeal joints although people are not trained to move this set of joints independently (Napoli et al., 2014). Those joints located closer to the torso are called *proximal joints* while those joints located further from the torso are called *distal joints* (Napoli et al., 2011). The movement of the most proximal joint, the shoulder, would result in the entire arm moving and will require a greater amount of energy and effort, while movement of more distal joints - the knuckle - will result in smaller sections of the arm moving and a smaller amount of energy being used (Napoli et al., 2011). This means that proximal joints are more commonly used in the production of path movements, an example again being the sign AEROPLANE, which requires the movement of the shoulder joint, while distal joints are used in the production of internal movements, an example again being the sign BOOK, which uses the wrist.

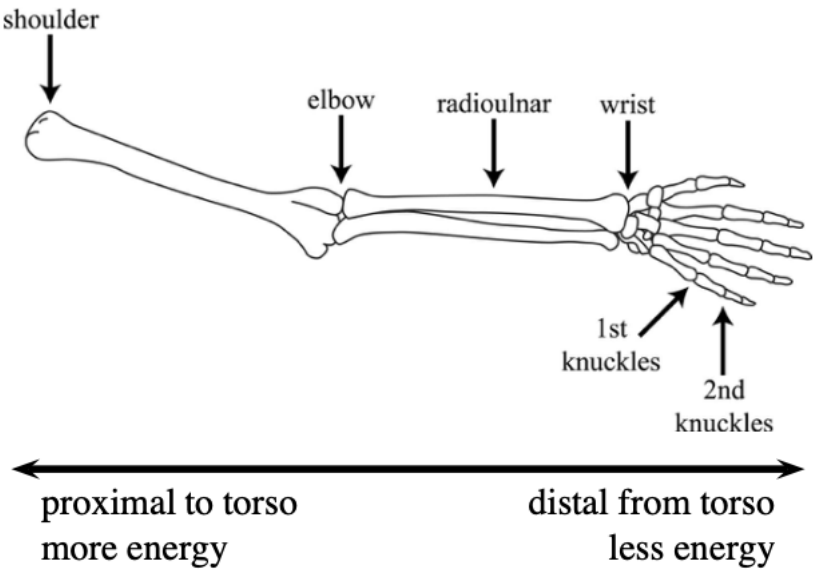

Figure 4: Proximal and distal joints in the arm (Napoli et al., 2011).

Using this understanding of joint location, *proximalisation* – the main topic of this research essay – can be defined as the substitution of proximal joints for distal joints (Napoli et al., 2011). This means that a sign such as BOOK, which is produced using the wrist joints can be proximalised by instead producing it using the elbow joins, creating a much larger movement. Contrary to this is *distalisation*, which can be defined as the substitution of distal joints for proximal joints (Napoli et al., 2011). This means that a sign such as DAY, which is produced using the elbow joint is instead produced using the wrist joint, therefore creating a smaller movement. Proximalisation and distalisation are not limited to single joint signs (signs that only use one joint to move) but can also occur in multi-joint signs (signs that use more than one joint in the production).

Proximalisation and distalisation of signs are natural aspects of sign language production and does *not* always result in errors. Native signers proximalise signs in formal situations so that the audience can see better (similar to speaking loudly, slowly and clearly in spoken language); it was noted that in some cases proximalisation was used to intensify adjectives by native signers (morphological inflection) – these are accepted variations of the citation form (Mirus et al., 2001). However, like any other aspect of language production, errors can occur during the use of these movements due to whether or not they are proximalised or distalised. For example, a signer may accidentally use the wrong movement to indicate a spatial relationship between two objects, which could lead to confusion or misunderstanding on the part of the observer. Additionally, improper use of proximalisation or distalisation could result

in a sign being interpreted as having a different meaning than intended, or as conveying a different tone or emphasis. However, such errors are not unique to proximalisation and distalisation, and can occur in any aspect of language production. With practice and experience, signers can learn to produce signs with the appropriate use of proximalisation and distalisation, thereby reducing the likelihood of errors.

This means that joint selection is a rich area of research in the establishment of ease of articulation, and proximalisation and distalisation can affect the ease of articulation in sign language production. This means that when a signer uses proximalisation to select joints closer to their body, it can be more difficult to produce the sign because the movement is much larger and requires more energy to produce. On the other hand, when a signer uses distalisation, selecting joints further away from their body, it can be easier to produce the sign because the movement is shorter and requires less energy. This can be particularly beneficial for signs that need to be produced quickly or repetitively. This can be challenging for signs that need to be produced with precision or with a lot of force. Thus, the ease of articulation in sign language production can be influenced by the signer's decisions about whether to use proximalisation or distalisation based on the ease of producing the sign, as well as other factors such as the meaning or emphasis of the sign (Napoli et al., 2014).

In terms of physical effort required, distalisation should be preferred. However, contradictory to the information above, it is also shown that proximalisation can increase ease of articulation - due to the effort and concentration required in manipulating smaller joints. It has also been found that though distalisation is more commonly used in the effort to reduce effort, proximalisation can be easier in certain circumstances. Some citation versions of signs can be awkward to produce and thus to avoid a physiologically awkward movement an alternative articulation that moves a greater mass through more proximal joints that the signer perhaps has better control of and that may even reduce iconicity may be used (Napoli et al., 2014). This means that in some circumstances the production of a sign requires the intricate manipulating of distal joints – for a new signer especially, the manipulation of these joints is quite difficult as it is still new to the learner – which make the sign physiologically awkward to produce. This leads to the ease in articulation through proximalisation as the

substitution of this distal joint for a more proximal joint leads to an easier production of the sign, even though it may reduce the iconicity of the sign.

Overall, the relationship between proximalisation and distalisation and the ease of articulation in sign language production is complex and can depend on a variety of factors. This means that one variant of a sign can differ from another with respect to the joint involvement in two ways: the transfer of movement from one joint to another (also referred to as movement migration) and the addition or subtraction of joints (Napoli et al., 2014).

This leads to the introduction of multiple joint manipulation techniques used in the ease of articulation. In general, movements that involve multiple joints can be more effortful than movements that involve a single joint production, as they require more muscle activity, coordination, and precision. This is because multiple joint movements require the activation and coordination of multiple muscle groups, and precise timing of these muscle activations can be more difficult to achieve with multiple joint movements (Napoli et al., 2014). This leads to the movement of more joints taking up more effort especially as the joints are more proximal. So, the freezing of joints (not moving joints that are active in the citation form) should be more favoured over grafting (moving joints that are inactive in the citation form) (Napoli et al., 2014). Therefore, when freezing a joint, it would predict that espaliation (freezing of the most proximal joint in a multi-joint sign) would occur more frequently than pruning (freezing of the most distal joint in a multi-joint sign) (Napoli et al., 2014).

Multiple joint manipulation techniques	Hypothetical examples using SASL
Freezing (espaliation)	In the sign for CAR the signer holds the shoulder joint (proximal joint) steady while moving the other joints involved in forming the shape of a steering wheel and indicating the motion of driving.
	In the sign for HOUSE the shoulder joint may be frozen while the signer uses other joints,

	such as the elbow, wrist, and fingers, to create the structure and details of a house.
Grafting	In the sign for COMPUTER the signer activates and moves multiple joints, including the shoulder, elbow, wrist, and fingers, to simulate typing or manipulating a keyboard or mouse.
	In the sign for FLOWER the signer combines movements of the shoulder, elbow, wrist, and fingers to represent the stem, leaves, and blooming petals of a flower.

Napoli et al (2014) aimed to investigate the linguistic effects of articulatory ease, with a particular focus on sign languages. To do so, they analysed a large database of sign language data (looking at formal and casual production) from around the world (using L1 native sign language users), looking for patterns in the frequency and distribution of handshapes and movements. Their analysis involved measuring the ease or difficulty of producing different handshapes and movements, based on factors such as the number of fingers involved, the direction of movement, and the degree of muscular effort required. They then compared these measures to the frequency and distribution of these elements in the sign languages they examined (American Sign Language, British Sign Language etc.), looking for correlations between ease of articulation and linguistic structure. Overall, the study aimed to provide insights into the cognitive and neural processes involved in sign language production and comprehension, and to shed light on the role of articulatory ease in shaping language structure more broadly. The study examined how the ease or difficulty of producing certain handshapes and movements affects the frequency and distribution of those elements in sign languages. In this study three major trends were found. The first was that there was a strong tendency towards freezing as the casual variant used fewer joints than that of the citation form as 97% involved freezing while only 27% involved grafting (while freezing and grafting

can occur simultaneously in the production of signs the study does not make clear how these percentages were divided and how much occurred simultaneously verses independently). This therefore showed a strong preference for reducing joints rather than adding. The second finding was that when freezing or grafting occurred, there was no effect from relative proximity of a joint with respect to the citation form. When freezing occurred there was no statistical preference for espaliation, medial freezing (the phenomenon where the handshape used in the middle of a sign is held steady, while the surrounding movements continue as normal) or pruning. When grafting occurred, there was no statistical preference between proximal, medial or distal grafting. They did however unexpectedly find that medial grafting (involves inserting a new element into the middle of an existing sign such as the sign HAPPY which is created by taking the sign for SMILE and adding a movement of the hands moving upward from the chest to the sides of the face. The movement that is grafted to create to sign HAPPY, which involves adding to an already existing sign, was more preferred over distal grafting (refers to the creation of a new sign by adding to an already existing sign such as EAT becoming EAT-QUICKLY). Their third trend that they found was what lead to the answer to their question. They found that the shoulder and elbow were significantly reduced in the usage in the casual form compared to the citation form. This pattern fit their model for articulatory ease showing that the more proximal a joint was the more effort was required to move it and it was therefore less likely to be used. Overall, their findings clearly showed patterns in line with the notion of effort reduction and therefore showed that there is a drive for ease of articulation in sign languages, for both L1 and L2 users (Napoli et al., 2014).

2.15. Proximalisation by language acquirers/learners

Proximalisation and distalisation are also displayed by learners acquiring sign language, both L1 learners (babies) and L2/M2 learners (usually adults) (Jensen et al., 1995).

In babies, the joints and motor skills required to operate these joints in the arms are not yet fully developed. It has been observed that the development of joints closer to the torso occur earlier than the development of the joints farther from the torso. This means that the development of proximal joints occurs earlier than the development of distal joints (Jensen et al., 1995). This results in babies having better control over these proximal joints and thus

rely mainly on the use of proximal joints in their actions and in their articulation of signs. This results in the baby omitting distal joints when signing and rather relying on and replacing them with proximal joints instead. This therefore results in the phenomenon of proximalised signs (Mirus et al., 2001).

There have been several studies investigating proximalisation and joint usage in babies acquiring sign language. Petitto et al. (2001) conducted a study on babies acquiring American Sign Language (ASL). Specifically, they aimed to examine how babies' manual actions changed over time and whether there were any patterns in their development. The study involved tracking the manual actions of three deaf infants from ages 8 to 30 months. The researchers used video recordings of the infants interacting with their caregivers in natural settings, and then coded the recordings for the presence of manual actions and the type of manual action used (proximal or distal). The findings of the study showed that the babies initially produced signs with proximal movements, such as tapping the chest or pointing to the body, and then gradually developed more distal movements as they gained more control over their movements. The researchers also found that the development of manual actions was influenced by social interactions, with babies who had more social interaction producing more manual actions overall. This study provides important insights into the development of manual actions in babies acquiring sign language. The findings highlight the importance of social interaction and motor control in the acquisition of sign language and suggests that proximalisation and distalisation are important aspects of sign language acquisition that should be taken into account when teaching sign language to infants (Petitto et al., 2001).

Bonvillian et al. (1983) conducted a study on babies acquiring ASL. Specifically, they aimed to examine whether joint attention experiences influenced the acquisition and production of American Sign Language (ASL) in infants. Joint attention experiences in babies refer to situations where infants and their caregivers actively share attention and focus on the same object or event. These experiences involve the coordination of attention between the infant and the caregiver, where they both attend to and engage with the same stimulus Bonvillian et al. (1983). It typically involves the infant following the caregiver's gaze or pointing gestures to direct their attention to specific objects or events in the environment.
Examples of joint attention experiences in babies may include:

1. Caregiver and baby looking at and pointing to a toy together.
2. Caregiver and baby looking at and commenting on a picture book.
3. Caregiver and baby engaging in turn-taking vocalizations or gestures.
4. Caregiver and baby following each other's eye gaze to explore the environment.
5. Caregiver and baby engaging in shared play with objects, such as stacking blocks or rolling a ball.

The study involved observing 12 infants who were acquiring ASL and their caregivers during natural interactions in the home setting. The researchers measured the frequency and quality of joint attention experiences, as well as the infants' sign language production. The findings of the study showed that joint attention experiences were positively correlated with the frequency and quality of sign language production. Specifically, infants who had more joint attention experiences had higher levels of sign language production, and were more likely to produce signs that were directed at their caregivers. The study also found that the quality of joint attention experiences, such as joint gaze and joint attention to objects, was more important than the frequency of joint attention experiences (Bonvillian et al., 1983). These joint attention experiences are important for language development as they provide opportunities for infants to learn and understand the social and communicative aspects of language. They help infants develop skills in attention, imitation, turn-taking, and understanding the intentions and meanings behind gestures and vocalizations. Joint attention experiences lay the foundation for later language acquisition and the development of communication skills. In summary, joint attention experiences are important to the study of proximalisation as they provide insights into communication and meaning, language development, social interaction, and cognitive processing in sign language. Understanding the role of joint attention can enhance our understanding of how proximalisation influences sign language production, perception, and overall communication dynamics.

Iverson et al. (2008) conducted a study on babies acquiring British Sign Language (BSL). They aimed to examine whether joint attention experiences influenced the use of distal movements in infants' sign language production. The study involved observing 10 infants who were acquiring BSL and their caregivers during natural interactions in the home setting. The researchers measured the frequency and quality of joint attention experiences, as well as the infants' use of distal movements in their sign language production. The findings of the study showed that joint attention experiences were positively correlated with the use of distal

movements in sign language production. Specifically, infants who had more joint attention experiences been more likely to produce signs with distal movements, such as pointing to objects in the environment. The study also found that the quality of joint attention experiences, such as joint gaze and joint attention to objects, was more important than the frequency of joint attention experiences (Iverson et al., 2008).

Matthews et al. (2011) conducted a study on babies acquiring Australian Sign Language (Auslan). This study specifically aimed to examine whether joint attention experiences influenced the infants' ability to understand and produce signs. The study involved observing 26 deaf infants who were acquiring BSL and their caregivers during natural interactions in the home setting. The researchers measured the frequency and quality of joint attention experiences, as well as the infants' comprehension and production of signs. The findings of the study showed that joint attention experiences were positively correlated with the infants' comprehension and production of signs. Specifically, infants who had more joint attention experiences had higher levels of sign comprehension and production, and were more likely to produce signs that were directed at their caregivers. The study also found that the quality of joint attention experiences, such as joint gaze and joint attention to objects, was more important than the frequency of joint attention experiences (Matthews et al., 2011).

Proximalisation and distalisation by L2/M2 learners of sign language can loosely be compared to the phoneme error of mispronunciation of words when acquiring a spoken language (Gilakjani et al., 2011). Mispronunciation, also referred to as cacoepy, can be defined as the incorrect, faulty or unconventional way of saying a word. This mispronunciation of words can happen to both L1 and L2 language acquirers. An example of this is saying the word ‘toof’ instead of ‘tooth’ or the word ‘twee’ instead of ‘tree’ when acquiring the spoken language English. These mispronunciation errors can occur due to a multitude of reasons. These being: the unfamiliarity with certain phonemes (sounds) of the language and how they are produced, the difficulty of producing sounds, such as ‘f’ being easier to produce than ‘th’ resulting in the replacement of the latter with the former, the influence of accents, motivation and exposure to acquire the language, stress (syllables with a longer, louder and higher sound), intonation (the rise and fall of the voice), rhythm or words, speed of speech and attitude towards the language (Gilakjani et al., 2011). Like proximalisation and distalisation, mispronunciation

occurs due to the unfamiliarity with the language, and the acquisition of new components and skills needed in the production of the language. In both sign language and spoken language, these errors can be corrected with time, practice, comfort and familiarity with the language.

As explained earlier, proximalisation of the signs produced by babies can be attributed to their immature joint and motor skill development. Thus, it would be assumed that proximalisation would not be present in the signs produced by adults acquiring sign language as their joints and motor skills are fully developed. However, there are studies proving otherwise. Ortega and Morgan (2015) conducted a study to investigate the relationship between joint attention and the acquisition of Spanish Sign Language (LSE) by hearing learners. The study involved observing 12 hearing learners of LSE during natural interactions with a Deaf LSE signer. They aimed to examine whether joint attention experiences influenced the learners' ability to understand and produce LSE signs. The researchers measured the frequency and quality of joint attention experiences, as well as the learners' comprehension and production of LSE signs. The findings of the study revealed several important insights. Firstly, it challenged the assumption that proximalisation would not be present in the signs produced by adult learners. Despite having fully developed joint and motor skills, the study showed that proximalisation and distalisation techniques were indeed observed in the signs produced by hearing adult learners acquiring LSE. Secondly, the study demonstrated that joint attention experiences played a crucial role in the learners' acquisition of LSE signs. Learners who had more frequent and high-quality joint attention experiences showed higher levels of comprehension and production of LSE signs. This suggests that joint attention facilitates the learning and understanding of sign language, even in adult learners. Moreover, the study highlighted the significance of the quality of joint attention experiences. Factors such as joint gaze and joint attention to objects were found to be more influential than the frequency of joint attention experiences. This implies that the engagement and mutual focus on relevant objects or events during joint attention interactions contribute to more effective sign language acquisition.

Overall, their study provides important insights into the role of joint attention in the acquisition of sign language by hearing adult learners. The findings suggest that joint attention experiences are important for the development of sign language skills in learners, and that

learners can benefit from high-quality joint attention experiences during the acquisition of sign language. Additionally, the study's findings contribute to the understanding that proximalisation is not only a characteristic of early language acquisition but also a feature that can be observed in adult sign language learners. This expands our knowledge of the factors influencing the production of signs and highlights the complexity of proximalisation as a linguistic phenomenon (Ortega & Morgan, 2015). Overall, the study by Ortega and Morgan (2015) underscores the importance of studying proximalisation beyond the context of infant sign language development. It emphasizes that proximalisation techniques are relevant to the study of sign language acquisition by hearing adults and provides insights into how proximalisation and distalisation are used in the development of sign language skills across different populations.

In a study done by Mirus et al. (2001) (the main study of this research essay) looking at the proximalisation and distalisation of sign language, specifically DGS (German Sign Language) and ASL, in adult learners it was found that proximalisation of signs is present and frequent in the production of signs by hearing adults with no prior knowledge of sign language (Mirus et al., 2001). The aim of this study was to investigate if proximalisation is present in the signs produced by hearing adults learning sign language for the first time and who have little to no prior knowledge of the language and compare it with Deaf people learning a new sign language for the first time, as well as to define how the form and articulation of signs produced by hearing novice signers differs from those same signs produced by native signers (Mirus et al., 2001). The participants for this study included 18 Deaf adults and 18 hearing adults. Two tests were given to each group, the first test containing 20 signs produced using only one joint and the second test containing 20 signs produced using more than one joint. Participants were then tested individually and asked to imitate the given signs (the Deaf participants were given signs from a sign language they were unfamiliar with) after seeing them on a videotape (Mirus et al., 2001).

The results of this study showed that proximalisation of signs is recurring in the imitation of signs produced by hearing adults. For example, the ASL sign BUG is a one-handed sign making use of a 3 handshape where the thumb makes contact with the nose. The movement of the sign is a repeated bending of the first and second fingers at the second knuckle. An error made

by five hearing participants and one Deaf German participant was the execution of the movement by rather using the first knuckle and therefore proximalising the movement of the sign. In contrast, proximalisation of signs produced by Deaf signing adults is infrequent (Mirus et al., 2001), even though they were also asked to imitate the signs that were unfamiliar to them. It can be said that due to the Deaf participants' extensive prior experience with sign language their motor skills and joints are highly developed and they already had a linguistic code for representing the form of signs. This therefore eliminated the imitation mistakes that occurred with the hearing participants (Mirus et al., 2001). These results lead to the conclusion that the proximalisation of signs by adults acquiring sign language suggests that these movement errors occur as they reflect the difficulty in learning new and complex motor skills which they are unfamiliar with (Mirus et al., 2001).

Summary of Chapter 2

This chapter discussed the fact that sign languages are natural, regionally unique languages that differ from spoken languages primarily in their modality of production. South African Sign Language or SASL is the sign language used by 4 million people in South Africa in their daily lives. Language acquisition - which can be divided into L1 (native) and L2 (any language acquired after an L1) – refers to the natural process of obtaining a language and being able to comprehend and produce meaningful statements using it. This differs from language learning which involves a conscious effort, direct instruction, tends to be much slower and often strongly focuses on literacy development. Both language acquisition and language learning can occur at any point in a person's life and can occur through imitation and active usage. While L1 children often acquire their native language through exposure to their environment and interactions with native users, L2 adult acquisition uses the teaching methodologies (which differ to that of the teaching methodologies of children based on the decline in plasticity of the procedural memory after the age of five) of grammar-based, cognitive and concurrent translation approaches. The reasons for acquiring a new language as an adult can be due to many factors such as personal motives, career advancement and opportunities, cultural enrichment, improved memory, relocation and even language requirements put in place by schools and institutes. Acquiring a sign language as an adult can be quite challenging

as it not only requires the learning of a new language but a new modality of production as well.

Like any other language there are different linguistic levels of sign language: phonology (the smallest units of the language i.e., parameters), morphology (the internal structure of words/signs and how meaning is created and modified), syntax (the word order), semantics (the meaning of the statement), pragmatics (what the signer implies and the viewer infers based on various factors). Productivity in sign language refers to the ability to create new signs in order to convey new concepts or ideas. It is achieved through the use of combining different parameters of sign language, such as handshape, location, movement, palm orientation, and facial expression. Productivity is an important aspect of sign language because it allows for the language to evolve and adapt to new concepts and situations. This is done by combining different parameters of sign language, signers can create new signs to express their individual creativity and to reflect the cultural and social context in which they live. There are also common production errors which occur at different linguistic levels, in both L1 and L2 language learners. This means that these errors may occur at the levels of: phonological, morphological, semantic, syntactic, pronoun acquisition and fingerspelling.

Sign languages signs can be divided into arbitrary signs and iconic signs. Arbitrary signs are those signs that are completely abstract and bear no resemblance to their referent. Whereas, iconic signs are those signs that resemble their referent and can be understood without much explanation to varying degrees of transparency. Sign language can also be divided into established and productive signs. Established signs are those which are fixed in form and meaning and can be found in sign language dictionaries, these are made up of both arbitrary and iconic signs. While productive signs - also more commonly referred to as classifiers - are those signs individually created at any time by the signer to describe events, specific appearances, movement and location of referents. These signs are highly iconic and can be divided into handling classifiers, entity classifiers and size and shape classifiers. While L1 children acquire classifiers in the same way as any other aspect of the language, L2 adult acquires tend to struggle in their creatin and production.

The phenomena of ease of articulation refers to the physical and cognitive ease with which a signer produces signs and sequences. Factors that affect ease of articulation include: motor skills, cognitive processing, language proficiency, fatigue, injury, manual dexterity, movement smoothness, sign complexity and sign repetition. Studies have shown several methods to reduce biomechanical effort in sign production, similar to those seen in participatory dance. Several methods occur at a lexical level: weak drop, weak freeze, joint freeze, distalisation, location undershooting and iteration loss.

Proximalisation refers to the substitution of more distal joints for more proximal joints while distalisation refer to the substitution of proximal joints for more distal joints. These joints required for the production of these signs however, are not fully developed until a specific age. Therefore, we notice the presence of *proximalisation* and distalisation in the production of signs by babies acquiring a sign language but would not expect it to be present in signs produced by adults acquiring a sign language. However, this was proved to be wrong in the study by Mirus et al. (2001) looking at the *proximalisation* and *distalisation* of sign language in adult learners.

Chapter 3: Methodology

3.1. Introduction

In this chapter, I will discuss the research methods used, including participants and data analysis methods. The purpose of this research is to investigate whether or not proximalisation is present in the acquisition of SASL by hearing adult learners, as well as the extent of proximalisation, and the details of how and when proximalisation occurs (including whether particular types of signs tend to be proximalised more). This research study is a quantitative descriptive study, attempting to collect quantifiable data, and to describe and analyse the data in response to my research questions.

3.2. Participants

The sample for this research is the first-year university students taking a course in SASL at the University of the Witwatersrand. While all the first-year students were invited to participate the sample of this research consists of only four participants who volunteered to participate. The student's race, gender and age were irrelevant in their selection to participate. All the participants are hearing females at/above the age of 18 with a spoken language as their primary mode of communication. All four participants gave informed consent in accordance with the purpose of the research study and signed a consent form which also gave consent to be filmed. Apart from these four participants, a native SASL user was asked to sign the signs that will be used as the control (i.e., the citation forms which the experimental group of participants can be compared to) of the study. The participants will be referred to as 'Participant 1', 'Participant 2', 'Participant 3', and 'Participant 4' throughout this essay.

In order to find these participants, I used convenience sampling (Etikan et al., 2016). By doing this, only voluntary participants that were willing and able to participate in my research took part. This ensured that I have no personal/power relations with the acquired participants.

3.3. Procedure

An email as well as an announcement was sent to the first-year SASL students to inform them of who I as the researcher was, what the research was about and what it would entail from them as participants. Once each participant had agreed to participate in the research, they were then emailed an information sheet [6] and consent form[7] which provide details on the reason for this research study as well as what could be expected. After that a Zoom meeting was set up with each individual participant to introduce myself as the researcher, explain what the research is about and to answer any questions that they may have had.

This introductory session was followed by data collection also on Zoom. This is to ensure that the research could be filmed. It was also due to Covid-19 health and safety protocols and to decrease any negative, stressful and distracting influences that an in-person environment may have on the participants. In the Zoom meeting, the participants were asked to introduce themselves briefly using SASL, using the vocabulary they have learned so far in class. The participants were then asked to reproduce a given set of 20 established signs consisting of signs produced using varying joints, from both arbitrary and iconic sets of signs. The motivation for the list of signs is comprised from the vocabulary that the participants have learned throughout the year, making them familiar with the signs.

The list of signs is as follows:

Sign	Iconic or Arbitrary	Type of Iconicity
1. AEROPLANE	Iconic	Translucent
2. BEAUTIFUL	Arbitrary	
3. BOOK	Iconic	Transparent
4. BUS	Arbitrary	
5. CAT	Iconic	Translucent
6. CUP	Iconic	Translucent
7. EAT	Iconic	Transparent
8. GAUTENG	Arbitrary	
9. LANGUAGE	Iconic	Obscure or Translucent

[6] Appendix 2: Information sheet

[7] Appendix 1: Consent form

10. NORMAL	Arbitrary	
11. POLITICS	Arbitrary	
12. RESTAURANT	Iconic	Obscure
13. RUN	Iconic	Transparent
14. RURAL	Arbitrary	
15. SPRING (SEASON)	Iconic	Obscure or Translucent
16. TOMORROW	Arbitrary	
17. VISIT	Iconic	Obscure or Translucent
18. WEEK	Arbitrary	
19. WIND	Iconic	Obscure or Translucent
20. WORK	Arbitrary	

Signs were used in isolation rather than in context as being able to identify, understand and retain signs is easier when they are standing alone (Ceprono, 1981). The given set of signs were recorded and performed by a native SASL user (i.e., someone whose first language is SASL) prior to the interviews with participants. Participants reproduced these signs twice. For the first time, they were simply asked to copy what they saw. For the second time, they were told to pay close attention to which joints were used in the target signs. This is to see if explicit instruction to the joint use would make a difference in their production.

3.4. Transcription and Methods of Analysis

The video recorded data for each participant was then transferred into ELAN (EUDICO Linguistic Annotator). This is a tool created for psycholinguists by Max Planck in 2002 to allow researchers to annotate, document and analyse recorded data using tiers (Plank, 2002).

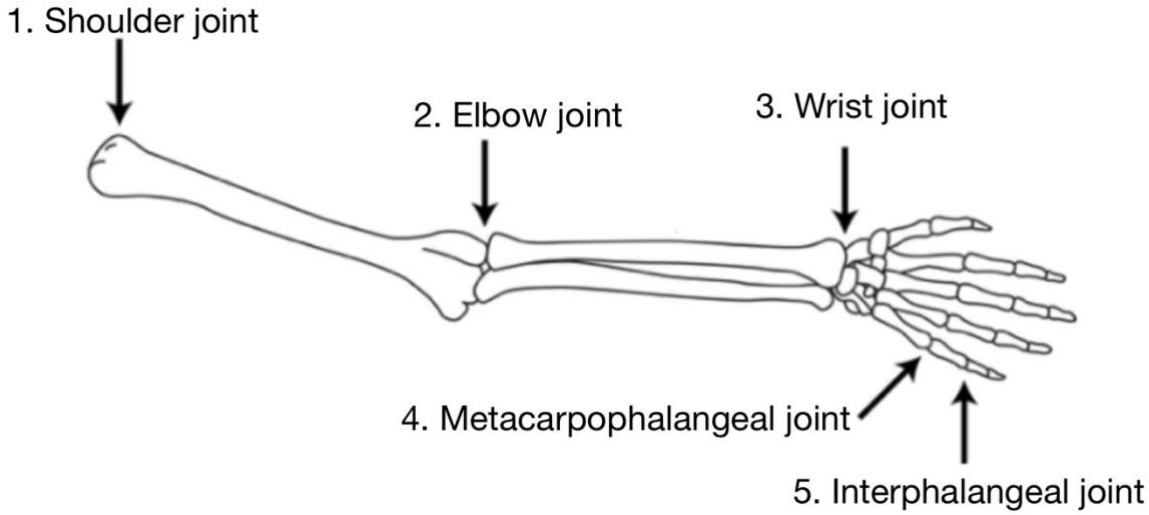

Figure 5: Joint coding (Napoli et al., 2011).

First of all, a number was given to each joint when coding them:

1: Shoulder joint

2: Elbow joint

3: Wrist joint

4: Metacarpophalangeal (MCP) joint (first knuckle)

5: Interphalangeal (IP) joints (second and third knuckles)

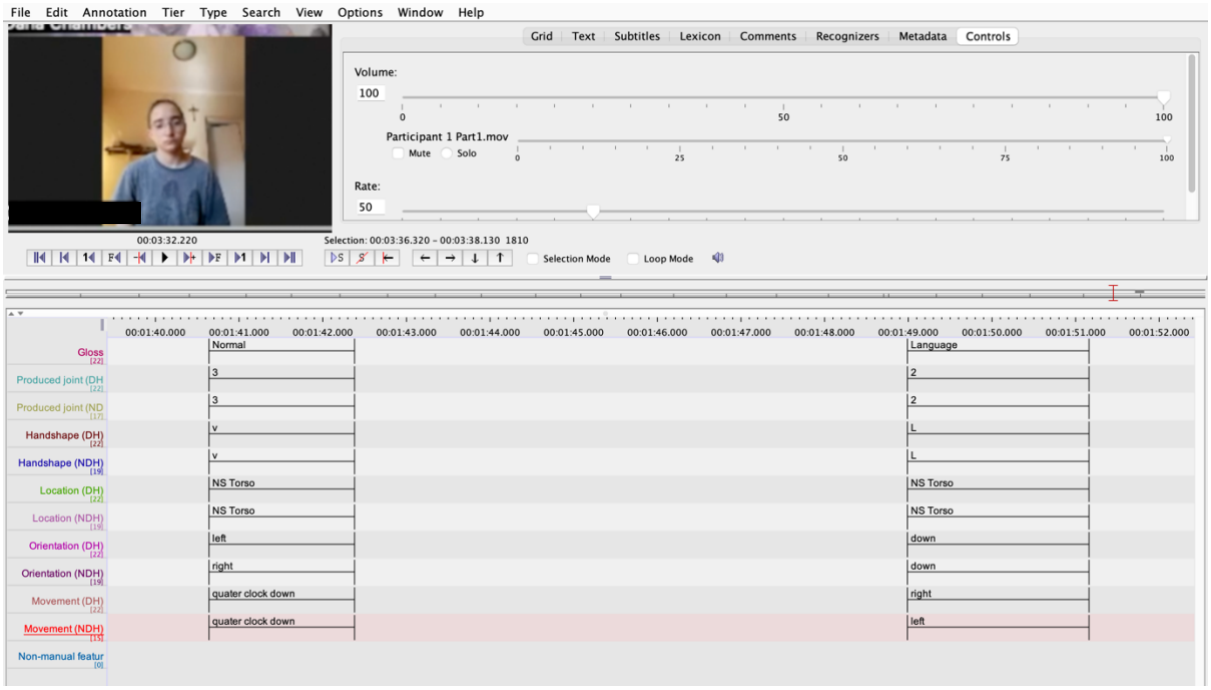

Figure 6: Screenshot of ELAN annotation

Next, tiers were created.

Tier 1: Glosses

Tier 2: Produced joint (DH) – joint of dominant hand produced – coded using the numbers above

Tier 3: Produced joint (NDH) – joint of non-dominant hand produced – coded using the numbers above – will be left blank if it is a one-handed sign

Tier 4: Handshape (DH) – handshape of dominant hand produced – coded using the handshape chart in appendix

Tier 5: Handshape (NDH) – handshape of non-dominant hand produced – coded using the handshape chart in appendix – will be left blank if it is a one-handed sign

Tier 6: Location (DH) – location of dominant hand – coded using the transcription key in the appendix

Tier 7: Location (NDH) – location of non-dominant hand – will be left blank if it is a one-handed sign

Tier 8: Orientation (DH) – palm direction of dominant hand – coded using the transcription key in appendix

Tier 9: Orientation (NDH) – palm direction of non-dominant hand – coded using the transcription key in the appendix

Tier 10: Movement (DH) – movement of dominant hand – coded using the transcription key in the appendix

Tier 11: Movement (NDH) – movement of non-dominant hand – will be left blank if it is a one-handed sign

Tier 12: Non-manual features – any expressions which are not performed using the hands – will be left blank if not present.

A	B	C	D	E	F	G	H	I	J
Gloss	**Aeroplane**								
	iconic								
	Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
		1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
Produced Joint (DH)	1 + 2	slight 1 + 2	2	2	2	1 + 2	1 + 2	2	2
Produced Joint (NDH)			slight 2	slight 2		slight 2			
Handshape (DH)	y	Y	Y	Y	Y	Y	Y	Y	Y
Handshape (NDH)	b	Open B	Open B	B	Open B	Open B	open B	open B	open B
Location (DH)	NS torso	NS Torso	NS Torso	NS Torso		NS torso	NS torso	NS torso	NS torso
Location (NDH)	NS torso	NS Torso	NS Torso	NS Torso	NS torso	Ns torso	NS torso	NS torso	NS torso
Orientation (DH)	down	Down	down	down	NS torso	down	down	down	down
Orientation (NDH)	up	Up	up	up	down	up	up	up	up
Movement (DH)	upwards left	Upwards Left	upwards left	upwards left	up	up + left	up + left	up + left	up + left
Movement (NDH)			slight bobbing left to right	slight left	up + left	slight down			
Non-manual features									

Figure 7: Comparison Table

The data was then converted into a spreadsheet in Microsoft Excel to form a comparison table so that each participant and each sign could be compared.

Using this comparison table, I was able to make comparisons focusing on each specific feature as well as create a graph to represent the overall data.

As I have studied SASL for 3 years as an undergraduate and 1 year as a postgraduate I find that I am adequately proficient in the language and was therefore able to create the list, understand and analyse the given signs without the need of an interpreter. However, if I had needed assistance, I would have been able to consult a qualified interpreter, consult more experienced SASL users and consult the native SASL user used in as the control in the study at the University of the Witwatersrand at any time. All my transcribed data as well as the performance videos collected were reviewed and validated by my supervisor, Dr Michiko Kaneko, of the SASL department of the University of the Witwatersrand.

3.5. Ethical considerations

This research essay received ethical clearance from the human research ethics committee of the University of the Witwatersrand with protocol number **H22/06/04**, and was carried out in compliance with the ethical considerations of the University of the Witwatersrand. As mentioned above, each participant received an information sheet, video consent form and consent form over email to be read through and signed before the commencement of their participation in the research study. These forms were typed in English and explained the research study to the participants as well as what would be expected of them as participants in this study.

Chapter 4: Findings and Discussion

In this chapter I will present my findings to the research question and sub-questions posed, by focusing on analysing the use of joints between native signers and hearing adult learners of South African Sign Language (SASL). The chapter begins by summarizing the joint patterns observed in 20 different signs across the participants. The chapter proceeds to discuss each sign in detail, highlighting the joint manipulations observed in the participants' productions. The chapter then addresses two sub-questions related to joint manipulations: the extent of proximalisation, distalisation, addition, and omission, and whether proximalisation is the only type of joint manipulation present. Furthermore, the chapter explores the frequency and patterns of joint manipulations in iconic and arbitrary signs. Lastly, the chapter examines the level at which proximalisation and distalisation can occur. In conclusion, the chapter provides a comprehensive analysis of the joint manipulations observed in the sign productions of hearing adult learners of SASL. It highlights the variations in joint use across different signs and participants, shedding light on the individual differences and complexities involved in the acquisition of sign language. The analysis will then be followed by a discussion on the findings of the data. For a compilation of all the tables and graphs in this section, see Appendix 8.

This chapter is structured as follows: I will first simply describe the formational features of each sign, as well as the joints used, by the native signer and by the four participants (both their first and second attempts). After that, I will focus on the use of joints and compare that of a native signer (citation form) and of participants, to see if participants (hearing adult signers) proximalise or distalise their signs. Then I will use my findings to discuss my research questions.

4.1 Findings: Description of 20 signs produced

AEROPLANE

A	B	C	D	E	F	G	H	I	J
Gloss	Aeroplane								
	iconic								
	Control	Participant 1		Participant 2		Participant 3		Participant 4	
		1	2	1	2	1	2	1	2
Produced Joint (DH)	1 + 2	slight 1 + 2	2	2	2	1 + 2	1 + 2	2	2
Produced Joint (NDH)			slight 2	slight 2		slight 2			
Handshape (DH)	y	Y	Y	Y	Y	Y	Y	Y	Y
Handshape (NDH)	b	Open B	Open B	B	Open B	Open B	open B	open B	open B
Location (DH)	NS torso	NS Torso	NS Torso	NS Torso		NS torso	NS torso	NS torso	NS torso
Location (NDH)	NS torso	NS Torso	NS Torso	NS Torso	NS torso	Ns torso	NS torso	NS torso	NS torso
Orientation (DH)	down	Down	down	down	NS torso	down	down	down	down
Orientation (NDH)	up	Up	up	up	down	up	up	up	up
Movement (DH)	upwards left	Upwards Left	upwards left	upwards left	up	up + left	up + left	up + left	up + left
Movement (NDH)			slight bobbing left to right	slight left	up + left	slight down			
Non-manual features									

Table 8:AEROPLANE

The table above represents the features for the sign AEROPLANE. In this table it can be seen that the control (signed by a native SASL user to ensure conformity to citation form) is signed using both hands, although the non-dominant hand remains stagnant. The joints used in the production of the sign are the shoulder and elbow joints of the dominant hand. The handshape of the dominant hand is a Y handshape while the non-dominant hand has a B handshape. The location of this sign is in the neutral space in front of the torso with the dominant hand above the non-dominant hand. The orientation of the dominant hand is palm facing down while the orientation of the non-dominant hand is palm facing up. The movement of the dominant hand is upwards at 30° while the non-dominant hand remains still. There were no non-manual features present.

<u>Participant 1</u>

The first-time Participant 1 produces this sign the handshape of the dominant hand is a Y handshape with the non-dominant hand in an open-B handshape. Both hands are located in the neutral space in front of the torso with the dominant hand above the non-dominant hand. The orientation of the dominant hand is palm facing down while the non-dominant hands orientation is palm facing up. The movement of the dominant hand is upwards at 30° using the shoulder and the elbow joints while the non-dominant hand remains still.

The second time Participant 1 produces this sign, s/he produces it in exactly the same manner as his/her first attempt. S/he uses the same joints, which are the shoulder and elbow but the signer also adds slight movement to the non-dominant hand by bobbing it slightly left and right therefore making use of the elbow joint.

Participant 2

The first-time Participant 2 produces this sign they use a Y handshape for the dominant hand while the non-dominant hand us in a B handshape. The sign is produced in the neutral space in front of the torso with the dominant hand above the non-dominant hand. The orientation of the dominant hand is palm facing down while the non-dominant hand is in the orientation of palm facing up. The movement of the dominant hand is upwards at 30° using the shoulder and elbow joints while the non-dominant hand moves slightly to the left making use of the elbow joint.

In his/her second attempt, Participant 2 produces this sign in an identical manner. The signer still uses the shoulder and elbow joints. The only slight difference is that the non-dominant hand does not move and no joint is used this time.

Participant 3

The first-time Participant 3 produces this sign they use a Y handshape for the dominant hand and an open-B for the non-dominant hand. The sign is produced in the neutral space in front of the torso with the dominant hand above the non-dominant hand. The orientation of the dominant hand is palm facing down and the non-dominant hand is in the orientation of palm facing up. The dominant hand is moved upwards at 30° using the shoulder and elbow joints while the non-dominant hand is moved slightly downwards making use of the elbow joint.

The second time Participant 3 produces this sign; it was produced more or less the same. However, there is only movement of the dominant hand this time (still using the shoulder and elbow) with the non-dominant hand remaining still.

Participant 4

The first-time this sign is produced by Participant 4 the handshape of the dominant hand is in a Y handshape with the non-dominant hand in an open-B handshape. The location of the sign is produced in the neutral space in front of the torso with the dominant hand above the non-

dominant hand. The orientation of the dominant hand is that of palm facing downwards while the non-dominant hand is in the orientation of palm facing upwards. The movement of the dominant hand is upwards at 30° using the shoulder and elbow joints and there is no movement of the non-dominant hand.

This participant produces this sign in exactly the same way in his/her second attempt. The movement of the dominant hand uses the shoulder and elbow joints and there is still no movement of the non-dominant hand.

BEAUTIFUL

Beautiful								
arbitrary/iconic								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
4	1+2+4	2+4	3+4	2+3+4	2+3+4	2+3+4	2+4	2+4
5 - flat O	5 Hand - flat O	5 - Flat O	5 - Flat o	5 - flat O	5 - flat O	5 - flat O	X - 5 - A	X - 5 - A
NS face	NS Face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face
towards	Facing in	towards	towards	towards	towards	towards	towards	towards
clockwise around face	Clockwise around face	clockwise around face	clockwise around face	clockwise around face	clockwise around face	circular around face + handshape change	clockwise around face	clockwise around face

Table 9: BEAUTIFUL

The image above represents the comparison table of the sign BEAUTIFUL. This table shows that the control produced this sign using 1 hand only. The handshape of the sign starts as a 5 handshape and transitions into a Flat-O handshape. The location of the sign is in front of the face with the orientation being that of palm facing towards the signer. The movement of the sign is a clockwise movement around the face as well as a change is handshape. This movement makes use of the shoulder, elbow, wrist, and metacarpophalangeal joints. There are no non-manual features present in the production of this sign.

<u>Participant 1</u>

The first production of this sign is produced using a 5 handshape to a Flat-O handshape located in front of the face. The orientation of the sign is palm facing towards the signer with the movement being a clockwise movement around the face with a handshape change. This

signer made use of the shoulder, elbow and metacarpophalangeal joints in the production of this sign.

The second production of this sign is very similar to the first one, except that the joints used in this movement are now the elbow and metacarpophalangeal joints.

Participant 2

The first production of the sign by Participant 2 uses a 5 to Flat-O handshape with the location in front of the face. The orientation of the sign is palm towards signer with the movement of clockwise around the face with a change in handshape, this movement makes use of the wrist and metacarpophalangeal joints.

The second production of this sign by this participant is exactly the same as the first attempt, except that the use of joints is now extended to the elbow, wrist and metacarpophalangeal joints.

Participant 3

The first production of this sign by Participant 3 uses a 5 handshape to a Flat-O handshape in the neutral space in front of the face. The palm orientation faces towards the signer with a movement around the face as well as a handshape change. This movement makes use of the elbow, wrist and metacarpophalangeal joints.

The second production of this sign by the participant is not changed in any way to the first time it was produced.

Participant 4

Participant 4 produces this sign transitioning from an X handshape to a 5 handshape to an A handshape. This sign is located in front of the signer's face with an orientation of palm towards signer. The movement of this sign is a clockwise movement around the signers face

as well as a handshape change. This movement makes use of the elbow and metacarpophalangeal joints.

The second production of this sign by the participant is produced the same way as the first production with no changes.

BOOK

Book								
iconic								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
3	3	2 + 3	3	3	2 + 3	2 + 3	3	3
3	3	2 + 3	3	3	2 + 3	2 + 3	3	3
open B	Open B	Open B	Open B	open B	flat B	flat B	open B	openB
open B	Open B	Open B	Open B	open B	flat B	flat B	open B	open B
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
left-up	left - up	left - up	left - up	left - up	left - up	left - up	left - up	left - up
right - up	right - up	right - up	right - up	right - up	right - up	right - up	right - up	right - up
opening	opening	opening	opening away	opening	opening	opening	opening	opening
opening	opening	opening	opening away	opening	opening	opening	opening	opening

Table10: BOOK

In this table it can be seen that the control signed this sign using two hands, both in Open-B handshapes. This sign is located in the neutral space in front of the torso. The orientation of the domain hand transitions from palm facing left to palm facing up while the orientation of the non-dominant hand transitions from palm facing right to palm facing up. At the beginning of the sign, both palms are together, after which the hands are twisted at the wrists in an opening movement while the sides of the little fingers are held together. This movement makes use of the wrist joints.

<u>Participant 1</u>

The first production of this sign by the participant is identical to that of the native signer. It makes use of an Open-B handshape on both the dominant and non-dominant hand, located in the neutral space in front of the torso. The orientation of the sign transitions once again, the dominant hand transitioning from palm facing left to palm facing right and the non-

dominant hand transitioning from palm facing right to palm facing up. The orientation change results in an opening movement making use of the wrist joints.

The second production of this sign by this participant remains the same with only a change in the joints used in the movement. In this production the participant adds the elbow joints to wrist joints in the movement.

Participant 2

The first production of this sign by Participant 2 makes use of an Open-B handshape on both the dominant and non-dominant hand, located in the neutral space in front of the torso. The orientation of the palms is identical to that of the native signer. The orientation change results in an opening movement making use of the wrist joints. Again, the production is identical to that of the native signer.

The second production of this sign does not change in any way.

Participant 3

The first production of this sign by Participant 3 is very similar to the native signer. It makes use of a Flat-B handshape on both the dominant and non-dominant hand, located in the neutral space in front of the torso. The orientation of the palm, once again, is identical to that of the native signer. The orientation change results in an opening movement making use of the elbow and wrist joints.

The second production of this sign does not change in any way.

Participant 4

In the first production of this sign the participant makes use of an Open-B handshape on both the dominant and non-dominant hand, located in the neutral space in front of the torso. The orientation of the palms is the same as the native signer as well as other participants. The

orientation change results in in an opening movement making use of the wrist joints. Once again, this production is identical to that of the native signer.

The second production of this sign is not changed in any way.

BUS

Bus								
arbitrary								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2
cup hand	Cup hand	cup	cup	cup	cup	cup	cup	cup
cup hand	Cup hand	cup	cup	cup	cup	cup	cup	cup
NS forehead	NS Forehead	NS forehead	NS Forehead	NS forehead	NS forehead	NS forehead	NS forehead	NS forehead
NS forehead	NS Forehead	NS forehead	NS Forehead	NS forehead	NS forehead	NS forehead	NS forehead	NS forehead
left	left	left	left	left	left	left	left	left
right	right	right	right	right	right	right	right	right
away	away	away	away	away	away	away	away	away
away	away	away	away	away	away	away	away	away

Table 11: BUS

The control sign production makes use of two hands. The handshape of both these hands is a cup handshape located in front of the forehead. The orientation of the dominant hand is palm facing left with the palm of the non-dominant hand facing right. The movement of both hands is away from the signer making use of the elbow joints. There are no non-manual features present in the production of this sign.

<u>Participant 1</u>

Participant 1 first produces this sign using cup handshape on both hands located in front of the forehead. The dominant hand has a palm orientation facing left while the non-dominant hand has a palm orientation facing right. The movement of this sign is away from the signer making use of the elbow joints. The production is identical to that of the native signer.

There is no change in the way the sign is produced in the second production by the participant.

Participant 2

The first production of this sign by the participant is also identical to that of the native signer. It makes use of a cup handshape on both the dominant and non-dominant hands, located in front of the forehead, and move away from the signer making use of the elbow joints.

There is no change in the production of the sign when produced the second time.

Participant 3

The third participant first produces this sign in an identical manner as that of the native signer.

There is no change in production when produced again.

Participant 4

The fourth participant also produces this sign in an identical manner as that of the native signer, and there are no changes in production when asked to produce the sign again.

CAT

Cat								
iconic								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
2+5	5	2+5	2+4+5	2+5	2	1+2+5	1+2+4+5	2+5
2+5	2+5	2+5	2+4+5	2+5	2	1+2+5	1+2+4+5	2+5
5- 5 claw	5 - 5 claw	5 - 5 claw	5 - 5 claw - bent B	5 - claw	5 claw	5 - 5 claw	06-May	5 - open 6
5 - 5 claw	5 - 5 claw	5 - 5 claw	5 - 5 claw - bent B	5 - claw	5 claw	5 - 5 claw	06-May	5 - open 6
NS face	NS Face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face
NS face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face	NS face
towards	towards	towards	towards	towards	towards	towards	towards	towards
towards	towards	towards	towards	towards	towards	towards	towards	towards
right	right	right	right	right	slight forwards + back	tight	right	right
left	left	left	left	left	slight forwards + back	left	left	left
pulled mouth					squint eyes + bared teeth			squint eyes scunched nose

Table 12: CAT

This table shows that the control production of this sign is produced using two hands. The handshape of both hands' transitions from a 5 handshape to a 5-claw handshape and is located on the face with the right hand in front of the right cheek and the left hand in front

of the left cheek. The orientation of both hands is palm facing towards the signer. The movement of the right hand is right with a handshape transition and the left hand moves left with a handshape transition. The movement of both hands makes use of the elbow and interphalangeal joints. The non-manual feature of this sign is the mouth pulled in a line.

Participant 1

The first production of this sign by the participant makes use of the 5-handshape to a 5-claw handshape located on the respective cheeks, as seen in the native signer's production. The palm orientation of both hands is towards the signer with only the internal movement of hands resulting in a handshape change in both hands. This movement makes use of interphalangeal joints only. There are no non-manual features present in this production.

In the second production of this sign by the participant is very similar to his/her first attempt. However, this time, the movement makes use of the elbow as well as the interphalangeal joints. There are again no non-manuals present in this production.

Participant 2

The participant first produces this sign with both hands transitioning from a 5 handshape to a 5-claw to a bent-B handshape located on the respective cheeks of the face. The orientation of both hands is palm facing towards signer with the movement of the right hand to the right and the left hand to the left with the handshape changes. This movement makes use of the elbow, metacarpophalangeal and interphalangeal joints. The signer makes no use of non-manual features.

In the second production of the sign the participant makes use of a 5-handshape transitioning to a 5-claw handshape. The location and palm orientation remain the same. The movement this time makes use of the elbow and interphalangeal joints.

Participant 3

The participant first produces this sign using a 5-claw handshape only, located on the respective cheeks of face. The orientation of both hands is palm facing towards the signer with the movement of both hands moving slightly away from the signer and back towards the signer. This movement makes use of the elbow joints and the non-manual features present in the production of this sign are squint eyes with bared teeth.

In the second production of this sign by the participant s/he makes use of a 5-handshape transitioning to a 5-claw handshape. It involves an internal movement of the change in handshape, and makes use of the shoulder, elbow and interphalangeal joints. There is no use of non-manuals in this production.

Participant 4

The first production of the sign by the participant makes use of 5-handhape to an open-6 handshape located on the cheeks of the face. The orientation of both hands is palm facing towards signer with movement of the right hand moving right and the left hand moving left with a handshape change. This movement makes use of the shoulder, elbow, metacarpophalangeal and interphalangeal joints. There are no non-manuals in this production of the sign.

The second production of this sign by the participant is very similar to the first attempt. The movement, however, is produced using only the elbow and interphalangeal joints. The non-manuals of the sign are squinted eyes and scrunched nose.

CUP

Cup								
iconic								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
2	2	2	2	2	2	2	2	1+2+3
	3	C	C	C	C	2	C	C
C	C	Open B	Flat B	Open B	open B	C	open B	open B
Flat B	Open B	NS Torso + on NDH	NS torso +ontop NDH	NS torso + on NDH	NS torso	open B	NS torso on NDH	NS torso on NDH
NS torso	NS Torso + On NDH	NS torso	NS torso	NS torso	NS torso	NS torso on NDH	NS torso	NS torso
NS torso	NS Torso	towards	towards	towards	towards	NS torso	towards slight left	towards
towards	Towards	up	up	up	up	towards	up	up
up	Up	up + down	up + down	up + down	up + down	up	up + down	up
up	Up + Down			slight up and down (impact movement)	slight up + down (impact movement)	up + down on NDH	slight up + down (impact movement)	
	slight up + down					slight up + down (impact movement)		

Table 13: CUP

The sign CUP is produced as a two-handed sign by the native signer. The handshape of the dominant hand is a C-handshape while the non-dominant hand is a flat-B handshape. Both hands are located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand. The palm orientation of the dominant hand is palm towards signer with the palm orientation of the non-dominant hand being palm facing upwards. The movement of the sign is dominant hand moving up while the non-dominant hand remains still. This movement is created using the elbow joint of the dominant hand. There are no non-manual features present in the production of this sign.

<u>Participant 1</u>

In the first production of the sign by the participant the dominant handshape is a C-handshape with the non-dominant hand in an open-B handshape. This sign is located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand. The orientation of the dominant hand is palm towards signer with the palm orientation of the non-dominant hand facing upwards. The movement of the sign is dominant hand moving up and down with the non-dominant hand also moving slightly up and down. This movement results in the dominant hand using the elbow joint while the non-dominant hand uses the wrist joint to move.

The handshape, location, and orientation remain the same in the second production of this sign. The movement of the sign is dominant hand moving up and down using the elbow joint while the non-dominant hand remains still.

Participant 2

In the first production of this sign by the participant they use a C-handshape on the dominant hand and a flat-B handshape on the non-dominant hand. The location and orientation are the same as those produced by the native signer. The movement of the sign is dominant hand moving up and down using the elbow joint with the non-dominant remaining still.

The second time this sign is produced by the participant the handshape of the dominant hand is a C-handshape with the non-dominant hand in an open-B handshape. The location and orientation are the same as in its first production. The movement of the sign is dominant hand moving up and down using the elbow joint, pressing down the non-dominant hand, making it also move slightly up and down using the elbow joint.

Participant 3

The first time this sign is produced by the participant they use a C-handshape for the dominant hand and an open-B handshape for the non-dominant hand. The location and orientation are the same as those in the native signer's production. The movement of the dominant hand is up and down using the elbow joint pressing down the non-dominant hand which slightly moves up and down from the elbow joint.

In the second production of this sign the participant produces it the same way as before.

Participant 4

The first production of this sign by the participant the handshape of the dominant hand is a C-handshape with the non-dominant hand in an open-B handshape. The location and orientation are the same as those in the native signer's production. The dominant hand moves up and down using the elbow joint, once again pressing down the non-dominant hand, resulting in it moving slightly up and down from the embow joint.

The second production of this sign by the participant is identical to the first attempt, except that the up and down movement of the dominant hand is created using the shoulder, elbow and wrist joints while the non-dominant hand remains still.

EAT

Eat								
iconic								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
2	2	2	2	2	2	2	2	3
flat o	Flat O	flat o	Flat O	Flat O	Flat O	flat O	flat O	flat O
NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS face	NS mouth
towards	towards	towards	towards	towards	towards	towards	towards	towards
back and forwards	back + forward	forwards and back	forwards +back	slight forwards + back	forwards + back	slight back + forward	slight forwards + cack	slight back and forwards

Table 14: EAT

The table above shows that the production of the control sign for EAT is signed using the dominant hand in a flat-O handshape. This sign is located in front of the mouth with the palm orientation towards the signer. The movement of the sign is back and forwards using the elbow joint. There are no non-manual features produced for this sign.

Participant 1

The first production of this sign by the participant is identical to that of the native signer, and the second production of this sign is the same as in the first production.

Participant 2

The first production of this sign by the participant is identical to that of the native signer, and the second production of this sign is the same as in the first production.

Participant 3

The first production of this sign by the participant is identical to that of the native signer, and the second production of this sign is the same as in the first production.

Participant 4

The first production of this sign by the participant is identical to that of the native signer.

The second production of this sign by the participant is identical to the first one, except that it is using the wrist joint.

GAUTENG

Gauteng arbitrary								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
2+3+4	2+3+4	2+3+4	2+3+4	2+3+4	2+3	1+2+3	1+2+4	2+3+4
	2 (relax)							
S - Index	S - index	s - index	s - index	S - index	index	G	A - index	T - index
S - Index	S	s	s	S	S	S	index	open S
NS torso	NS Torso	NS torso	NS torso	NS torso above NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
left	towards	towards	left - towards	towards - away - towards	away - down - towards	down - toward	towards	towards
right	towards	towards	towards	towards	towards	towards	towards	towards
handshape change + up	Up with change handshape	up	up + handshape change	handshape change + up	orientation change + up	orientation change + up	handshape change + up	handshape change + up
	down (relax)							

Table 15: GAUTENG

The production of this sign GAUTENG is produced using two hands with the dominant hand transitioning from an S-handshape to an index handshape while the non-dominant hand remains in an S-handshape. This sign is located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand. The orientation of the dominant hand is palm transitioning from facing left to towards signer while the non-dominant hand remains with palm facing signer. The movement of the dominant hand is upwards with a handshape and orientation change. This movement makes use of the elbow, wrist and metacarpophalangeal joints. The non-dominant hand remains still. There are no non-manual features in the production of this sign.

Participant 1

The first production of this sign by the participant uses the same handshape and location as the native signer's production. The orientation of the dominant and non-dominant hand is palm facing towards signer. The movement of the dominant hand is the change in handshape while moving up making use of the elbow, wrist and metacarpophalangeal joints while the non-dominant hand moves slightly downwards making use of the elbow joint.

The second production of the sign by the participant is identical to the first one, except that non-dominant hand remains still.

Participant 2

The first production of the sign by this participant is identical to that of the native signer.
The second production of this sign is almost identical to that of the first attempt, with a minor change in the orientation of the dominant transitioning from towards the signer to the left and back towards the signer.

Participant 3

The first time this participant signs this sign they use an index handshape for the dominant hand and an S-handshape for the non-dominant hand. This sign is located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand in an orientation transitioning from away to down and towards signer while the orientation of the non-dominant hand remains in palm facing towards signer. The movement of the dominant hand is a change in orientation while moving upwards making use of the elbow and wrist joint while the non-dominant hand remains still.

In the second production of the sign by the participant they use the G-handshape for the dominant hand and an S-handshape for the non-dominant hand. The location remains the same. An orientation transitions from down and then towards the signer while the orientation of the non-dominant hand remains in palm facing towards signer. The movement of the dominant hand makes use of the shoulder, elbow and wrist joint while the non-dominant hand remains still.

Participant 4

In the first production of this sign by the participant it transitions from an A-handshape to an index handshape on the dominant hand and an index handshape on the non-dominant hand. The location of this sign is in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand. The orientation of the dominant and the non-dominant hand remains towards the signer with the movement of the dominant hand being a change in handshape while moving up making use of the shoulder, elbow and metacarpophalangeal joints. T the non-dominant hand remains still.

In the second production of the sign the participant transitions from a T-handshape to an index handshape on the dominant hand and an open-S on the non-dominant hand. The location and the orientation remain the same. The movement of the dominant hand is an upwards movement with a change in handshape, which makes use of the elbow, wrist and metacarpophalangeal joints. There is no movement of the non-dominant hand.

LANGUAGE

Language								
iconic								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
2	2	2	2	2	2	2	2	2 + 4
2	2	2	2	2	2	2	2	2 + 4
L	L	L	L	L	L	L	L	G- L
L	L	L	L	L	L	L	L	G - L
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
away	down	away	away	away	away	away	away	away
away	down	away	away	away	away	away	away	away
right	right	right	right	right	right	right	right	right
left	left	left	left	left	left	left	left	left

Table 16: LANGUAGE

The sign for LANGUAGE is signed using two hands. Both hands are in an L-handshape and orientated facing away from the signer. The location of the sign is in the neutral space in front of the torso with a movement of the right hand moves right and the left hand moves left,

moving away from each other. This movement makes use of the elbow joints. There are no non-manual features in the production of this sign.

Participant 1

The first production of this sign is produced using an L -handshape on both hands with the orientation downwards. The sign is located in the neutral space in front of the torso with the movement of the right hand moving right and the left hand moving left, this makes use of the elbow joints.

The second time this sign is produced the participant uses an L-handshape on both hands with the orientation away from the signer. The sign is still located in the neutral space in front of the torso with the same movement and same use of elbow joints.

Participant 2

The first time the participant produces this sign in exactly the same manner as the native signer, and no changes are made at the second attempt.

Participant 3

The first time the participant produces this sign in exactly the same manner as the native signer, and no changes are made at the second attempt.

Participant 4

The first time the participant produces this sign in exactly the same manner as the native signer.

In the second production of this sign the participant transitions from a G-handshape to an L-handshape on both hands with their orientation remaining facing away from the signer. The

location and movement remain the same, except that it makes use of the elbow and metacarpophalangeal joints.

NORMAL

Normal arbitrary								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3
v	v	V	V	V	V	V	V	V
v	v	V	V	V	V	V	V	V
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
LEFT	left	left	left	left	left	left	left	left
right	right	right	right	right	right	right	right	right
quater clock down	quater clock down	quater clock down	quater clock up + down	quater clock up + down	quater clock up + down	quater clock up + down	quateer clock up + down	quater clock up + down
quater clock down	quater clock down	quater clock down	quater clock up + down	quater clock up + down	quater clock up + down	quater clock up + down	quater clock up + down	quater clock up + down

Table 17: NORMAL

The production of this sign by the control uses 2 hands with the V-handshape on both hands. The sign is located in the neutral space in front of the torso with left hand orientated right and the right-hand orientated left. The movement of both hands is a 40° downwards using the wrist joints.

Participant 1

The participant produces this sign in exactly the same way as the citation form, and there are no changes when produced the second time.

Participant 2

The Participant 2 also managed to produce this sign in accordance with the citation form. There are no changes when produced the second time.

Participant 3

Participant 3 produced this sign accurately as in the citation form. There are no changes when produced the second time.

Participant 4

Participant 4 also managed to produce this sign accurately as in the citation form. There are no changes when produced the second time.

POLITICS

Politics								
arbitrary								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
2	2	2	2	2	1 + 2	1 + 2	1 + 2	2 + 3
2	2	2	2	2	1 + 2	1 + 2	1 + 2	2 + 3
3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
left	Left	left	left	left	towards	left	left	left
right	Right	right	right	right	towards	right	up	right
up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt
up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt

Table 18: POLITICS

The image above represents the comparison table of the sign POLITICS. This is a 2-handed sign produced by the control using a 3-handshape on both hands with the right-hand orientated left and the left-hand orientated right. This sign is located in the neutral space in front of the torso with an alternating up and down movement making use of the elbow joints. There are no non-manuals in the production of this sign.

Participant 1

The participant managed to produce this sign in accordance with the citation form. There are no changes in the production of the sign when produced again.

Participant 2

The participant managed to produce this sign in accordance with the citation form. There are no changes in the production of the sig when produced again.

Participant 3

The participant also managed to produce this sign very closely to the citation form in his/her first attempt. However, the signer makes use of the shoulder and elbow joints.

There are no changes in the production of the sig when produced again.

Participant 4

Similar to Participant 3, the signer produces this sign mostly in accordance with the citation form, except that the signer makes use of the shoulder and elbow joints. The second time this sign is produced, making use of the elbow and wrist joints.

RESTAURANT

Resturant								
iconic								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
3	2 + 3	3	2 + 3	2	2 + 3	2 + 3	2 + 3	3
3	2 + 3	3	2 + 3	2	2 + 3	2 + 3	2 + 3	3
v	V	V	V	V	V	V	V	V
v	V	V	V	V	V	V	V	V
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
towards	towards	towards	towards	towards	towards	towards	towards	towards
towards	towards	towards	towards	towards	towards	towards	towards	towards
up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt
up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt

Table 19: RESTAURANT

The image above represents the comparison table of the sign RESTAURANT. This sign is signed using two hands. The control produces this sign using a V-handshape on both hands and is located in front of the torso. The orientation of both hands is towards the signer with an alternating up and down movement. This movement makes use of the wrist joints. There are no non-manual features in the production of this sign.

Participant 1

In the first production of this sign the participant produces the sign in accordance with the citation form, except that the signer makes use of the elbow and wrist joints. The second production of this sign by the participant makes use of the wrist joints only.

Participant 2

Similar to Participant 1, the participant produces the sign mostly in accordance with the citation form, except making use of the elbow and wrist joints. In the second production of this sign by the participant the signer makes use of the shoulder joints only.

Participant 3

Similar to Participant 1 and 2, the participant produces the sign mostly in accordance with the citation form, except making use of the elbow and wrist joints.
In the second production of this sign by the participant there are no changes made.

Participant 4

Once again, the participant produces the sign in an identical manner to the native signer except making use of the elbow and wrist joints.
In the second production of this sign the participant makes use of the wrist joints only.

RUN

Run								
icnoic								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
2	2	2	2	5+4	1+2	1+2	1+2	1+2
2	2	2	2	5+4	1+2	1+2	1+2	1+2
S	A	A	a	S	A	A	a	A
S	A	A	a	S	A	A	a	A
NS torso	NS Torso	NS Torso + close to sides	NS Torso + tight sides	NS torso	NS torso sides	NS torso close sides	NS torso close to sides	NS torso close to sides
NS torso	NS Torso	NS torso + close to sides	NS torso + tight sides	NS torso	NS torso sides	NS torso close sides	NS torso close to sides	NS torso close to sides
left	left	left	left	left	left	left	left	left
right	right	right	right	right	right	right	right	right
forwards backwards circular	towards backwards circular alt	up and down alt	circular forwards + back	forwards backwards circular	circular alt	up + down circular alt	circular up and down alt	circular up + down alt
forwards backwards circular	towards backwards circular alt	up and down alt	circular forwards + back	forwards backwards circular	circular alt	up + down circular alt	circular up + down alt	circular up + down alt

Table 20: RUN

RUN is a two-handed sign. The control production of this sign is produced using an S-handshape on both hands located with elbows tucked against sides and hands in the neutral space in front of the torso. The left hand is orientated right while the right hand is orientated left. The hands alternate in a circular motion making use of the elbow joints. There are no non-manual features present in the production of this sign.

Participant 1

In the first production of this sign the participant uses an A-handshape for both hands located with elbows tucked against sides and hands in the neutral space in front of the torso. The left hand is orientated right while the right hand is orientated left. The hands alternate in a circular motion making use of the elbow joints.

There is no change in the production of the sign when asked to produce it again.

Participant 2

This participant produces this sign in exactly the same way as Participant 1 in the first attempt, making use of the elbow joints.

In the second production of this sign the participant uses the shoulder and elbow joints.

Participant 3

In the first production of this sign the participant uses an A-handshape for both hands. The location and the orientation are the same as the citation form. The hands alternate in a circular motion making use of the shoulder and elbow joints. There are no changes when asked to produce the sign again.

Participant 4

In the first production of this sign the participant produced this sign in the same manner as Participant 3.

There are no changes when asked to produce the sign the second time.

RURAL

Rural								
arbitrary								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
3	2 + 3	3	3	3	2 + 3	3	3	3
T	T	T	T	T	X	X	T	T
index	Index	index	index	index	X	X	S	C
NS face	NS Torso elbow on NDH	NS torso +elbow on NDH	NS elbow on NDH	S torso on ND	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
towards	towards	towards	away	left	left	towards	towards	towards
towards	towards	towards	towards	towards	towards	towards	towards	up
circular	circular	1x circle - forwards and back	circular	circular	circular	back + forwards circular	back and fowards	back and forwards
						back + forwards circular		

Table 21: RURAL

The image above represents the comparison table of the sign RURAL. This is a 2-handed sign produced by the control using a T-handshape on the dominant hand and an index handshape on the non-dominant hand. The dominant hand of the sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The orientation of both the dominant and non-dominant hand is towards the signer with the movement of the dominant hand in a circular motion using the wrist while the non-dominant hand remains still. There are no non-manual features in the production of this sign.

<u>Participant 1</u>

In the first production of this sign by the participant they use a T-handshape on the dominant hand and an index handshape on the non-dominant hand. The dominant hand of the sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The orientation of both the dominant and non-dominant hand is towards the signer with the movement of the dominant hand in a circular motion using the shoulder and wrist joints while the non-dominant hand remains still.

The second time this sign is produced the participant they use a T-handshape on the dominant hand and an index handshape on the non-dominant hand. The dominant hand of the sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The orientation of both the dominant and non-dominant hand is towards the signer with the movement of the dominant hand in one circular motion and then switches to a forwards and backwards motion using the wrist joints while the non-dominant hand remains still.

Participant 2

In the first production of this sign the participant uses a T-handshape on the dominant hand and an index handshape on the non-dominant hand. The dominant hand of the sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The orientation of the dominant hand is away while the non-dominant hand is towards the signer with the movement of the dominant hand in a circular motion using the wrist joints while the non-dominant hand remains still.

In the second production of this sign the participant uses a T-handshape on the dominant hand and an index handshape on the non-dominant hand. The dominant hand of the sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The orientation of the dominant hand is left while the non-dominant hand is towards the signer with the movement of the dominant hand in a circular motion using the wrist joints while the non-dominant hand remains still.

Participant 3

In the first production of this sign by the participant they use an X-handshape on both hands with the orientation of the right hand left and the left hand towards the signer. The sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The movement of the dominant hand is a circular motion using the elbow and wrist joints while the non-dominant hand remains still.

In the second production of the sign, the participant uses an X-handshape on both hands with the orientation of the right hand left and the left hand towards the signer. The sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The movement of the dominant hand is a circular, forwards and backwards motion using the wrist joints while the non-dominant hand remains still.

Participant 4

The first time the participant produces this sign they use a T-handshape for the dominant hand and an S-handshape for the non-dominant hand. The orientation of both hands is towards the signer. The sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The movement of the dominant hand is back and forwards making use ofc the wrist joint while the non-dominant hand remains still.

In the second production of the sign, the participant uses a T-handshape for the dominant hand in the palm orientation towards the signer and a C-handshape for the non-dominant hand in a palm orientation upwards. The sign is located in the neutral space at face level with the elbow on the non-dominant hand which is located in the neutral space in front of the torso. The movement of the dominant hand is back and forwards making use ofc the wrist joint while the non-dominant hand remains still.

SPRING

Spring								
iconic								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
2 + 4	2 + 4	2 + 4	2 + 4	2 + 4	2 + 4	2 + 4 + 5	2 + 4	1 + 2 + 4
		slight 2		slight 5			slight 2	slight 2
flat o - 5	Flat O + 5	flat o - 5	Flat O - 5	Flat O - 5	E - 5	S - 5	S - 5	S - 5
c	C	C	C	C	C	C	C	C
NS torso	NS Torso	NS torso through NDH	NS torso in NDH	NS torso in NDH	NS torso	NS torso in NDH	NS torso in NDH	NS torso in NDH
NS torso	Torso around	NS torso around DH	NS torso	NS torso	NS torso	NS torso on DH	NS torso on DH	NS torso
towards	towards	towards	towards	towards	towards	towards	towards	towards
towards	towards	towards	towards	towards	towards	towards	towards	towards
up	p through ND	up	up through NDH	up + handshape change	up + handhsape change	handshape change + up	handshape change + up	handshape change + up
		slight down		slight opening			slight up + down	slight down (impact movment)

Table 22: SPRING

The image above represents the comparison table of the sign SPRING. This is a 2-handed sign signed by the control using a transition from a flat-O handshape to a 5 handshape on the dominant hand and a C-handshape on the non-dominant hand. Both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand. This movement makes use of the elbow and metacarpophalangeal joints. There are no non-manual features in this sign production.

Participant 1

The first time this sign is produced the signer makes use of a flat-O handshape to a 5-handshape on the dominant hand and a C-handshape on the non-dominant hand, both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand. This movement makes use of the elbow and metacarpophalangeal joints.

When asked to produce this sign again the participant makes use of a flat-O handshape to a 5-handshape on the dominant hand and a C-handshape on the non-dominant hand and both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand making it move slightly downwards. This movement of the dominant hand makes use of the elbow and metacarpophalangeal joints while the non-dominant hand uses the elbow joint.

Participant 2

The first time this sign is produced the signer makes use of a flat-O handshape to a 5-handshape on the dominant hand and a C-handshape on the non-dominant hand and both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand. This movement makes use of the elbow and metacarpophalangeal joints.

In the second production of this sign the participant makes use of a flat-O handshape to a 5-handshape on the dominant hand and a C-handshape on the non-dominant hand, both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand making it open slightly. This movement of the dominant hand makes use of the elbow and metacarpophalangeal joints while the non-dominant hand makes use of the interphalangeal joints.

Participant 3

The first time this sign is produced the signer makes use of a E-handshape to a 5-handshape on the dominant hand and a C-handshape on the non-dominant hand, both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand. This movement makes use of the elbow and metacarpophalangeal joints.

When the participant produces this sign again, they transition from an S-handshape to a 5-handshape on the dominant hand and a C-handshape on the non-dominant hand, both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand. This movement makes use of the elbow and metacarpophalangeal joints.

Participant 4

In the first production of this sign the participant transitions from an S-handshape to a 5-handshape on the dominant hand and a C-handshape on the non-dominant hand and both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand while the non-dominant hand moves slightly up and down. This movement of the dominant hand makes use of the elbow and metacarpophalangeal joints while the movement of the non-dominant hand makes use of the elbow joint.

In the second production of the sign the participant transitions from an S-handshape to a 5-handshape on the dominant hand and a C-handshape on the non-dominant hand, both hands are orientated towards the signer. The sign is located in the neutral space in front of the torso with the dominant hand moving up and through the C of the non-dominant hand while the non-dominant hand moves slightly up and down. This movement of the dominant hand makes use of the shoulder, elbow and metacarpophalangeal joints while the movement of the non-dominant hand makes use of the elbow joint.

TOMORROW

Tomorrow arbitrary								
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
3	2 + 3	2 + 3	3	3	2 + 3	1 + 2 + 3	1 + 2 + 3	1 + 2 + 3
6	6	6	6	6	6	6	6	6
cheeck	thumb on cheek upper lip	thumb on cheek	cheeck side lip	cheeck above lip	cheek above lip	cheek above lip	cheek above lip	cheek above lip
away-towards	away - towards	away - towards	towards - away	away - towards	away - towards	away - towards	away - towards	away - towards
palm rotate	rotating palm away - towards	rotate	palm towards - away	orientation change	rotate palm change	palm change rotate	orientation change	orientation change

Table 23: TOMORROW

The image above represents the comparison table of the sign TOMORROW. This is a 1-handed sign produced by the control using a 6-handshape on the dominant hand, located with the thumb on the cheek of the dominant side of the signer with a rotation movement transitioning the orientation from away, down and towards to signer. This movement is created using the wrist joint. There are no non-manual features in the production of this sign.

<u>Participant 1</u>

In the first production of this sign the participant uses a 6-handshape located with the thumb on the cheek. The rotational movement results in an orientation transition from away, down and towards and is created using the elbow and wrist joints.

The participant produces this sign without any changes when asked to produce the sign again.

<u>Participant 2</u>

In the first production of this sign the participant uses a 6-handshape located with the thumb on the cheek. The rotational movement results in an orientation transition from away, down and towards and is created using the wrist joints.

There are no changes in the second production of this sign.

Participant 3

In the first production of this sign the participant uses a 6-handshape located with the thumb on the cheek. The rotational movement results in an orientation transition from away, down and towards and is created using the elbow and wrist joints.

In the second production of the sign the participant produces this sign using a 6-handshape located with the thumb on the cheek. The rotational movement results in an orientation transition from away, down and towards and is created using the shoulder, elbow and wrist joints.

Participant 4

The first time this sign is produced the participant uses a 6-handshape located with the thumb on the cheek. The rotational movement results in an orientation transition from away, down and towards and is created using the shoulder, elbow and wrist joints.

When this sign is produced again the participant makes no changes.

VISIT

Visit								
iconic								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
2	2	2	2	2	2	2	2 + 3	3
2	2	2	2	2	2	2	2 + 3	3
V	V	V	V	V	V	V	V	V
V	V	V	V	V	V	V	V	V
ns face	NS Torso	NS torso	NS face	NS face	NS face	NS face	NS face	NS face
ns face	NS Torso	NS torso	NS face	NS face	NS face in fron of DH	NS face in front of DH	NS face	NS face
left	left	left	left	left	left	left	left	left
right	right	right	right	right	right	right	right	right
away	away	away	away	away	away	away	away	away
away	away	away	away	away	away	away	away	away

Table 24: VISIT

The image above represents the comparison table of the sign VISIT. This is a 2-handed sign produced by the control using a V-handshape on both hands. Each hand is located in the neutral space in front of their respective cheeks with the right-hand orientated left and the left-hand orientated right. The movement of the hands is away from the signer using the elbow joints. There are no non-manuals in the production of this sign.

Participant 1

In the first production of this sign the participant uses a V-handshape on both hands. Each hand is located in the neutral space in front of their respective cheeks with the right-hand orientated left and the left-hand orientated right. The movement of the hands is away from the signer using the elbow joints.

There are no changes when the sign is produced again.

Participant 2

In the first production of this sign the participant uses a V-handshape on both hands. Each hand is located in the neutral space in front of their respective cheeks with the right-hand orientated left and the left-hand orientated right. The movement of the hands is away from the signer using the elbow joints.

There are no changes when the sign is produced again.

Participant 3

In the first production of this sign the participant uses a V-handshape on both hands. The hands are located in the neutral space in front of the nose with the right hand in front of the left hand with the right-hand orientated left and the left-hand orientated right. The movement of the hands is away from the signer using the elbow joints.

There are no changes when the sign is produced again.

Participant 4

In the first production of this sign the participant uses a V-handshape on both hands. Each hand is located in the neutral space in front of their respective cheeks with the right-hand orientated left and the left-hand orientated right. The movement of the hands is away from the signer using the elbow and wrist joints.

When produced the second time the participant uses a V-handshape on both hands. Each hand is located in the neutral space in front of their respective cheeks with the right-hand orientated left and the left-hand orientated right. The movement of the hands is away from the signer using the wrist joints

WEEK

week								
arbitrary								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
2	2	2	2	2	1 + 2	1 + 2	2 + 3	1 + 2
					2	slight 2		
6	A	6	6	6	open E + 6	open E + 6	6	6
open B	Flat B	Flat B	open B	open B	open B	open B	open B	open B
NS torso on NDH	NS Torso	NS torso + palm NDH	NS torso + on NDH	NS torso on NDH	NS torso	NS torso on NDH	NS torso on NDH	NS torso on NDH
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
away	down	down	away	away	away	away	away	away
towards	right	right	towards	towards	towards	towards	towards	towards
right across NDH	away across NDH	forward on NDH	across right NDH	right across NDH	right across NDH	right across NDH	right across NDH	right across NDH
					slight left	slight left		

Table 25: WEEK

The image above represents the comparison table of the sign WEEK. This is a 2-handed sign produced by the control using a 6-handshape on the dominant hand and an open-B handshape on the non-dominant hand. The sign is located in the neutral space in front of the torso with the dominant hand – orientated away from signer – on the non-dominant hand which is orientated towards the signer. The movement of the dominant hand is across the non-dominant hand using the elbow joint while the non-dominant hand remains still. There are no non-manuals in the production of this sign.

Participant 1

The first time the participant produces this sign they use an A-handshape orientated down for the dominant hand and a flat-B handshape orientated right for the non-dominant hand. The sign is located in the neutral space in front of the torso with the thumb of the dominant hand moving across on the non-dominant hand while it remains still. This movement is created using the elbow joint.

When the participant produces this sign again, they use a 6-handshape orientated down for the dominant hand and a flat-B handshape orientated right for the non-dominant hand. The sign is located in the neutral space in front of the torso with the thumb of the dominant hand moving across on the non-dominant hand while it remains still. This movement is created using the elbow joint.

Participant 2

The first time the participant produces this sign they use a 6-handshape orientated away for the dominant hand and an open-B handshape orientated towards for the non-dominant hand. The sign is located in the neutral space in front of the torso with the thumb of the dominant hand moving across on the non-dominant hand while it remains still. This movement is created using the elbow joint.

There are no changes when the participant reproduces this sign again.

Participant 3

The first production of this sign by the participant uses an open-E handshape transitioning to a 6-handshape orientated away on the dominant hand and an open-B handshape orientated towards the signer for the non-dominant hand. The sign is located in the neutral space in front of the torso with the thumb of the dominant hand moving across on the non-dominant hand while it moves slightly left. This movement of the dominant hand is created using the shoulder and elbow joint while the movement of the non-dominant hand is created using the elbow joint.

There are no changes when the participant produces the sign again.

Participant 4

The first time the participant produces this sign they use a 6-handshape orientated away for the dominant hand and an open-B handshape orientated towards the signer for the non-dominant hand. The sign is located in the neutral space in front of the torso with the thumb of the dominant hand moving across on the non-dominant hand while it remains still. This movement is created using the elbow and wrist joint.

When the participant produces this sign again, they use a 6-handshape orientated away for the dominant hand and an open-B handshape orientated towards the signer for the non-dominant hand. The sign is located in the neutral space in front of the torso with the thumb of the dominant hand moving across on the non-dominant hand while it remains still. This movement is created using the shoulder and elbow joint

WIND

Wind								
iconic								
Control	**Participant 1**		**Participant 2**		**Participant 3**		**Participant 4**	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
2 + 3	2	2	2	2	1 + 2	1 + 2	3	3
2 + 3	2	2	2	2	1 + 2	1 + 2	3	3
W	W	W	W	W	W	W	W	W
W	W	W	W	W	W	W	W	W
ns torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
ns torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
left	left	left	left	left	left	left	left	left
right	right	right	right	right	right	right	right	right
left to right	left to right	left and right	left to right	left to right	left to right	left - right	left to right	left to right
left to right	left to right	left and right	left to right	left to right	left to right	left - right	left to right	left to right

Table 26: WIND

The image above represents the comparison table of the sign WIND. This sign is produced by the control using two hands and is located in the neutral space in front of the torso, both in a W-handshape. The left hand is orientated with the palm facing right while the right hand is orientated with the palm facing left. The movement of the sign is left to right using the elbow and wrist joints. There are no non-manual features in the production of this sign.

Participant 1

In the first production of this sign by the participant they use a W-handshape on both hands with the right-hand orientated left and the left-hand orientated right. The sign is located in the neutral space in front of the torso with a left to right movement, making use of only the elbow joints.

There are no changes in the second production of this sign.

Participant 2

In the first production of this sign by the participant they use a W-handshape on both hands with the right-hand orientated left and the left-hand orientated right. The sign is located in the neutral space in front of the torso with a left to right movement, making use of only the elbow joints.

There are no changes in the second production of this sign.

Participant 3

In the first production of this sign by the participant they use a W-handshape on both hands with the right-hand orientated left and the left-hand orientated right. The sign is located in the neutral space in front of the torso with a left to right movement, making use of the shoulder and elbow joints.

There are no changes in the second production of this sign.

Participant 4

In the first production of this sign by the participant they use a W-handshape on both hands with the right-hand orientated left and the left-hand orientated right. The sign is located in the neutral space in front of the torso with a left to right movement, making use of only the wrist joints.

There are no changes in the second production of this sign.

WORK

Work								
	arbitrary							
Control	Participant 1		Participant 2		Participant 3		Participant 4	
	1	2	1	2	1	2	1	2
2	2	2	2	2	2	2	2	3
	slight 3				2	slight 2	slight 2	slight 2
B	B	B	Open B	open B	open B	open B	flat B	flat B
B	B	B	Open B	open B	open B	open B	flat B	flat B
NS torso	NS Torso ontop of NDH	NS torso +on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH
NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso
left	towards	towards	left	left	towards slight left	towards slight left	towards	towards slight left
towards	right	right	towards	towards	towards slight right	towards slight left	right	towards slight right
up and down	up and down	up and down	up + down tapping on NDH	up + down on NDH	up + down on NDH	up + down on NDH	up + down on NDH	up + down on NDH
	slight up and down	slight up and down			slight up + down	slight up + down	slight up + down (impact movement)	slight up + down (impact movement)
puckerd lips								

Table 27: WORK

The image above represents the comparison table of the sign WORK. In this 2-handed sign produced by the control the handshapes on both hands are a B-handshape. This sign is located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand with the dominant hand orientated left and the non-dominant hand orientated towards

the signer. The dominant hand moves up and down making use of the elbow joint while the non-dominant hand remains still. The sign is also produced with puckered lips.

Participant 1

In the first production of this sign by the participant they make use of a B-handshape on both hands with the dominant hand orientated towards the signer while the non-dominant hand is orientated to the right. This sign is located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand. The dominant hand moves up and down using the elbow joint while the non-dominant hand also moves slightly up and down using the wrist joint. The participant does not make use of non-manual features in their production.

When producing the sign again the participant makes use of a B-handshape on both hands with the dominant hand orientated towards the signer while the non-dominant hand is orientated to the right. This sign is located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand. The dominant hand moves up and down using the elbow joint while the non-dominant hand remains still.

Participant 2

In the first production of this sign by the participant they make use of an open-B handshape on both hands with the dominant hand orientated left while the non-dominant hand is orientated to the towards the signer. This sign is located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand. The dominant hand moves up and down using the elbow joint while the non-dominant hand remains still. The participant does not make use of non-manual features in their production.

There are no changes when producing the sign again.

Participant 3

In the first production of this sign by the participant they make use of an open-B handshape on both hands with the dominant hand orientated slightly left while still towards the signer while the non-dominant hand is orientated slightly right while still towards the signer. This sign is located in the neutral space in front of the torso with the dominant hand on top of the non-dominant hand. The dominant hand moves up and down using the elbow joint while the non-dominant hand also moves slightly up and down using the elbow joint. The participant does not make use of non-manual features in their production.

There are no changes when producing the sign again.

Participant 4

In the first production of this sign, the participant uses a flat-B handshape on both hands with the right hand orientated towards the signer while the left hand is orientated right. This sign is located in the neutral area of the torso with the dominant hand on top of the non-dominant hand. The dominant hand moves up and down using the elbow joint but creates an impact movement of and down on the non-dominant hand using the elbow joint as well. The signer makes no use of non-manual features in their production.

When produced for the second time the participant uses a flat-B handshape on both hands with the right hand orientated towards the signer while the left hand is orientated right. This sign is located in the neutral area in front of the torso with the dominant hand on top of the non-dominant hand. The dominant hand moves up and down using the wrist joint but creates an impact movement of and down on the non-dominant hand using the elbow joint.

4.2 Findings: The use of joints in 20 signs

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Control	P1	P1	P2	P2	P3	P3	P4	P4	Ommisiion	Addition	Proximalised	Distalised	100% Same	same
Aeroplane	1+2	1+2	1+2	2	2	1+2	1+2	2	2	4					4
Beautiful	1+2+4	1+2+4	2+4	3+4	2+3+4	2+3+4	2+3+4	2+4	2+4	7	3				1
Book	3	3	2+3	3	3	2+3	2+3	3	3						
	3	3	2+3	3	3	2+3	2+3	3	3		3				5
Bus	2	2	2	2	2	2	2	2	2						
	2	2	2	2	2	2	2	2	2		0				8
Cat	2+5	2+5	2+5	2+4+5	2+5	2	1+2+5	1+2+4+5	2+5						
	2+5	2+5	2+5	2+4+5	2+5	2	1+2+5	1+2+4+5	2+5	1	3				4
Cup	2	2	2	2	2	2	2	2	1+2+3						
		3					2				3				5
Eat	2	2	2	2	2	2	2	2	3		0				7
Gauteng	2+3+4	2+3+4	2+3+4	2+3+4	2+3+4	2+3	1+2+3	1+2+4	2+3+4						
										3	2				5
Language	2	2	2	2	2	2	2	2	2+4						
	2	2	2	2	2	2	2	2	2+4		1				7
Normal	3	3	3	3	3	3	3	3	3						
	3	3	3	3	3	3	3	3	3		0				8
Politics	2	2	2	2	2	1+2	1+2	1+2	2+3						
	2	2	2	2	2	1+2	1+2	1+2	2+3		4				4
Restaurant	3	2+3	3	2+3	2	2+3	2+3	2+3	3						
	3	2+3	3	2+3	2	2+3	2+3	2+3	3		5				2
Run	2	2	2	2	1+2	1+2	1+2	1+2	1+2						
	2	2	2	2	1+2	1+2	1+2	1+2	1+2		4				3
Rural	3	2+3	3	3	3	2+3	3	3	3		2				6
Spring	2+4	2+4	2+4	2+4	2+4	2+4	2+4+5	2+4	1+2+4						
			2		2			2	2		4				6
Tomorrow	3	2+3	2+3	3	3	2+3	1+2+3	1+2+3	1+2+3		6				2
Visit	2	2	2	2	2	2	2	2+3	3						
	2	2	2	2	2	2	2	2+3	3		1				6
Week	2	2	2	2	2	1+2	1+2	2+3	1+2						
						2	2				4				4
Wind	2+3	2	2	2	2	1+2	1+2	3	3						
	2+3	2	2	2	2	1+2	1+2	3	3	8	2				0
Work	2	2	2	2	2	2	2	2	3						
		3				2	2	2	2		5				3
		6	4	5	6	12	13	13	13	23	52				90

Table 28: Joint summary table

The table above summarises the use of joints between the native signer (citation form) and participants. I will briefly illustrate the joints used in each of the 20 signs across different participants.

The sign AEROPLANE, which is signed using both the shoulder and elbow joint in the citation form, is signed by both Participant 2 and Participant 4 using only the elbow joint. Therefore, omitting the shoulder joint completely in both their first and second production of the sign.

The sign BEAUTIFUL is produced using the shoulder, elbow and metacarpophalangeal joints in the citation form. It is only signed correctly by Participant 1 in their first production. On their second production of the sign, as well as Participant 4's first and second production, the sign is produced using only the elbow and metacarpophalangeal joints therefore omitting the shoulder joint. In the first production of the sign by Participant 2 we see the sign is distalised as the elbow joint is replaced with the wrist joint and there is also omission of the shoulder joint. In the second production of this sign by Participant 2 as well as in the first and second

production by Participant 3 the participants again omit the shoulder and distalise it by adding the wrist joint to the production.

The sign BOOK is produced using the wrist joint on both hands in citation form. Participant 2 and 4 produce it correctly in both their first and second productions with Participant 1 only producing it correctly in their first production. In the first participant's second production as well as the third participant's first and second production, they produce it using the wrist and adding the elbow joint as well.

In the production of the sign BUS, all the participants produce it in line with citation form using the elbow joints of both hands.

The sign CAT is produced using the elbow and interphalangeal joints of both hands. It is correctly produced by Participant 1 in both their first and second production and Participant 2 and 4 in their second production. In Participant 2's second production they add the metacarpophalangeal joints while Participant 3 omits the interphalangeal joints in their first production. In Participant 3's second production they add the shoulder joint to the elbow and interphalangeal joints.

In the production of the citation form of CUP, the elbow joint of the dominant hand is used. All the participants except Participant 4 in their second production produce this sign correctly. Participant 4 produces this sign by adding the shoulder as well as the wrist joint in their second production. Participant 1 also adds the wrist joint to their non-dominant hand while Participant 3 adds an elbow joint to their non-dominant hand in their production.

In the findings for the sign EAT, which is produced using the elbow joint in the citation form, only Participant 4, in their second production, produces it by distalising the elbow joint for the wrist joint. The rest was identical to the citation form.

The sign GAUTENG is produced using the elbow, wrist and metacarpophalangeal joints in the citation form. Participant 1 and Participant 2 produce this sign in accordance with the citation form in both productions while Participant 4 only produces it correctly in their second

production. In the first production by Participant 3 they use only the elbow and wrist joints, omitting the metacarpophalangeal joints. In the second production of the sign by Participant 3 they omit the metacarpophalangeal joints and add the shoulder joint. In the first production of the sign by Participant 4, they omit the wrist joint and add the shoulder joint to the production.

The findings show that the sign LANGUAGE is produced using the elbow joint of both hands in the citation form. Only Participant 4 produces this sign by adding the metacarpophalangeal joints in their second production of the sign while all other participants produce it in accordance with the citation form.

The findings for the sign NORMAL show that all participants produced it in accordance with the citation form using the wrist joints of both hands.

The findings for the sign POLITICS, show that Participant 1 and Participant 2 produced this sign in accordance with the citation form in both productions, using the elbow joints of both hands. Participant 3, in both productions and Participant 4 in their first production produces this sign by adding the shoulder joint to the elbow joint. In Participant 4's second production they produce it using the elbow joint and adding the wrist joint as well.

The sign RESTAURANT, which is produced using the wrist joints in the citation form and is produced correctly by Participant 1 and Participant 4 on their second productions, is proximalised by Participant 2 in their second production by using the elbow joints instead. Participant 1, Participant 2 and Participant 4 in their first productions and Participant 3 in both productions, produce the sign using the wrist and adding the elbow joint.

The sign RUN, which is produced using the elbow joins of both hands in the citation form, is correctly produced by Participant 1 in both productions and Participant 2 in their second production. In the second production by Participant 2 an in both productions by Participant 3 and Participant 4 the elbow joint is used and the shoulder joint is added.

The findings for the sign RURAL which is signed using the wrist joint of the dominant hand in the citation form, show that Participant 2 and Participant 4 produce this sign in accordance with the citation form in both productions while Participant 1 and Participant 3 only produce it correctly in the second production. In the first production by Participant 1 and Participant 3 the wrist joint is used and the elbow joint is added to the production.

The findings for the sign SPRING, which is signed using the elbow and metacarpophalangeal joints of the dominant hand in the citation form, show that Participant 1 and Participant 2 produce the sign in accordance with the citation form in both productions while Participant 3 and Participant 4 produce it correctly in their first production. In Participant 1's second production they add the elbow joint in the movement of their non-dominant hand. In the second production by Participant 3 they add the interphalangeal joints to the movement of their dominant hand. Participant 4 adds the shoulder joint in their movement of the dominant hand.

The findings for the sign TOMORROW – produced using the wrist joint in the citation form – show that only Participant 2 produces it in accordance with the citation form. Participant 1 in both productions and Participant 3 in their first production add the elbow joint to the wrist joint. In both productions by Participant 4 and in the second production by Participant 3 they add the shoulder and elbow joint to the wrist joint.

The findings for the sign VISIT – produced using the elbow joints of both hands in the citation form – show that all the participants produced it in accordance with the citation form except Participant 4. In the first production of the sign by Participant 4 they added the wrist joint to the elbow joint but in their second production they distalise by using the wrist joint instead of the elbow joint.

The findings for the sign WEEK – produced using the elbow joint of the dominant hand in the citation form – show that only Participant 1 and Participant 2 produced this sign in accordance with the citation form in both productions. Participant 3 in both productions and Participant 4 in their second production produced this sign by adding the shoulder to the elbow joint. In the first production of the sign by Participant 3 they add the wrist joint to the elbow joint.

The findings for the sign WIND – produced using the elbow and wrist joins of both hands in the citation form – show that none of the participants produced it in accordance with the citation form. Participant 1 and Participant 2 produced this sign omitting the wrist joint and only using the elbow joint in both productions, while Participant 4 produced this sign omitting the elbow joints and only using the wrist joints in both productions. In both productions of the sign by Participant 3 they use the elbow joint and proximalise the wrist joint for the shoulder joint.

The findings for the sign WORK – produced using the elbow joint on the dominant hand in the citation form – show that both of Participant 2's productions and Participant 1's second production are signed in accordance with the citation form. In Participant 1's first production they add the wrist joint to the non-dominant hand, while in both of Participant 3's productions and Participant 4's first production they add the elbow joint to the non-dominant hand. In Participant 4's second production they distalise the elbow joint for the wrist joint of the dominant hand and add the elbow joint to the non-dominant hand.

The extent of proximalisation, distalisation, addition and omission

This section addresses two of the sub-questions posed earlier:

1. What is the extent (%) of proximalisation by hearing adult signers learning SASL?
2. Is proximalisation the only type of joint manipulation present? If not, what is present and to what extent?
    a. Distalisation
    b. Joint omission
    c. Joint addition

Overall, the participants produced the signs correctly 88/160 times or 55%. In other words, 72 out of 160 instances (45%) are produced with an error in joint use. In terms of the signs, 2/20 or 10% of signs were produced correctly by all the participants 100% of the time, these being BUS and NORMAL.

Looking at individuals, Participant 1 produced joint errors 25% of the time (10 out of 40 signs produced altogether). Participant 2 produced joint errors 27.5% of the time (11 out of 40).

Participant 3 produced joint errors 62.5% of the time (25 out of 40). Participant 4 produced joint errors 65% of the time (26 out of 40). This suggests that there are individual differences among the learners.

There is some evidence of both proximalisation and distalisation in the production of signs by hearing learners. Once again, proximalisation is to *replace* a smaller joint with a larger (more proximal) joint and distalisation is to *replace* a larger joint with a smaller (more distal) joint. The findings show that 2/20 or 10% of signs show instances of proximalisation, these being RESTAURANT which was proximalised by 1/4 of the participants 1/2 times and WIND which was proximalised by 1/4 participants 2/2 times. In contrast, 4/20 or 20% of the signs show examples of distalisation, these being BOOK which was distalised by 1/4 participants 1/2 times, EAT which was distalised by 1/4 participants 1/2 times, VISIT which was distalised by 1/4 participants 1/2 times and WORK which was distalised by 1/4 participants 1/2 times.

Apart from pure proximalisation and distalisation, the participants often *added* or *omitted* joints (which I did not count as either as proximalisation or distalisation as they did not replace the original joint). They added joints 52/160 times or 32.5% in the following signs: BEAUTIFUL, BOOK, CAT, CUP, GAUTENG, LANGUAGE, POLITICS, RESTAURANT, RUN, RURAL, SPRING, TOMORROW, VISIT, WEEK, WIND and WORK. They omitted joints 23/160 times or 14.38% in the following signs: AEROPLANE, BEAUTIFUL, CAT, GAUTENG and WIND.

The findings also show evidence of multiple joint errors occurring in one sign. For example, the sign BEAUTIFUL showed evidence of omission, addition and distalisation while the sign WIND showed evidence of omission, addition and proximalisation and the signs CAT and GAUTENG showed evidence of both addition and omission. This means that signs are not partial to their joint errors but it is rather reliant on each individual signer

My findings reveal that proximalisation did not take place very frequently, and in fact, distalisation was more common in learners' production that proximalisation. This is somewhat contradictory to the previous research findings. Having said that, addition and omission of joints do take place frequently in learners' production of signs. In my research they are not considered as examples of proximalisation or distalisation (because they do not

replace the target joint) but they suggest learner's use of joints is very often different from that of a native signer.

What signs were more commonly proximalised

This section addresses the sub question 3 of which signs are the most commonly proximalised - iconic or arbitrary signs.

The 20 signs used in this research are a mixture of iconic and arbitrary signs. Iconic signs include: AEROPLANE, BOOK, CAT, CUP, EAT, RESTAURANT, RUN, VISIT, and so on. Arbitrary signs include: BEAUTIFUL, GAUTENG, LANGUAGE, NORMAL, POLITICS, RURAL, WORK, and so on.

While proximalisation did not occur as frequently as expected, and thus the number is too small for any valid conclusion, both signs that were proximalised were iconic signs (RESTAURANT and WIND). While distalisation occurred in three iconic signs (BOOK, EAT and VISIT) and one arbitrary sign (WORK). The signs that had joints omitted occurred in three iconic signs and two arbitrary signs. The signs that had joints added occurred in nine iconic signs and seven arbitrary signs. These findings seem to suggest that the use of different joints from the citation form (be it proximalisation, distalisation, addition or omission) tend to occur more with iconic signs than arbitrary signs.

One-handed or Two-handed (incidental findings)

The list of signs used contain five one-handed signs (two of them are accompanied by passive non-dominant hand) and 15 two-handed signs. While this uneven number makes it difficult to compare, it seems that two-handed signs tend to be affected by joint alternation. For example, addition of joints occurred in 14 two-handed signs and only in two one-handed signs.

At what joint level can proximalisation and distalisation occur?

This section addresses the sub-question 4: Does proximalisation occur only with one joint up or can it take place with a joint that is more than one level up?

One or more joints

The findings show that the different use of joints between the citation form and the learners' forms is not as straightforward as expected. It is not simply to replace the target joint with one closer to or further away from the body. The findings for proximalisation and distalisation show that these phenomena are not limited to one joint above or one joint below the designated joint but can also occur up to two joints away. An example of this is if the sign requires the shoulder joint to create a circular movement but it is rather substituted for the wrist joint. The sign BEAUTIFUL shows evidence of this in Participant 2 and Participant 3's distalisation of the sign. Addition of the joints also complicates the matter. This means that, for example, when a sign was produced using the elbow joint in the citation form, the participant added the wrist joint to their production (while still using the elbow).

Most Commonly Used Joint(s)

A	B	C	D	E	F	G	H	I	J	K
Joints	**Control**	**P1**	**P1**	**P2**	**P2**	**P3**	**P3**	**P4**	**P4**	**Total used**
1	2	2	1	0	2	8	12	8	6	**41**
2	22	26	26	23	25	30	30	25	19	**226**
3	11	11	9	10	8	10	10	13	18	**100**
4	3	3	3	5	3	2	2	4	5	**30**
5	2	2	2	2	2	0	3	2	0	**15**
most used	2	2	2	2	2	2	2	2	2	
2nd	3	3	3	3	3	3	1	3	3	
3rd	4	4	4	4	4	1	3	1	1	
4th	1 +5	1+5	5	5	1+5	4	5	4	4	
5th			1	1		5	4	5	5	

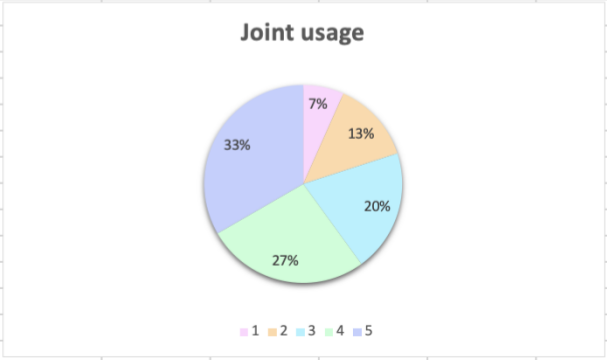

Table 29: Most commonly used joints by participants

This table shows the most commonly used joints in sign production. It shows that in the citation form of the signs the elbow joint was most commonly used, followed by the wrist joint, metacarpophalangeal joints and then the shoulder and interphalangeal joints were favoured equally. Since participants are copying these citation forms, their use of joints also followed the similar pattern.

Do the participants improve once made aware of the importance of joint usage

This section addresses sub question 5: Do learners improve their performance in relation to proximalisation when they are told to concentrate on their use of joints in their second production?

These findings show that the participants do not improve their production in relation to proximalisation, distalisation, omission and addition of joints even when made aware of the importance of the use of joints. The findings show that Participant 1 produced joint errors in 6/20 signs in their first production and 4/20 in their second production. Participant 2 produced joint errors in 5/20 signs in their first production and 6/20 in their second production. Participant 3 produced joint errors in 12/20 signs in their first production and 13/20 in their second production. Finally, Participant 4 produced joint errors in 13/20 signs in their first production and 13/20 in their second production. This shows that only Participant 1 slightly improved once made aware of joint importance while Participant 2 and 3 had more differences and Participant 4 remained the same. As a while, this suggests that metalinguistic awareness of the joint use does not lead to more accurate production of active joints.

While there was no evidence of improvement in terms of the joint use, some of the parameters exhibit increased accuracy after the participants were told to pay attention to the joints.

Below, I address sub-question 2.1 by going through each parameter and explaining if its accuracy improved (incidental findings).

A	B	C	D	E	F	G	H	I	J	K	L
	Control	P1	P1	P2	P2	P3	P3	P4	P4	Same	Different
1. Aeroplane	y	Y	Y	Y	Y	Y	Y	Y	Y	8	
	B	Open B	Open B	B	Open B	Open B	open B	open B	open B	1	7
2. Beautiful	5 - flat O	5 - flat O	5 - Flat O	5 - Flat o	5 - flat O	5 - flat O	5 - flat O	X - 5 - A	X - 5 - A	6	2
3. Book	open B	Open B	Open B	Open B	open B	flat B	flat B	open B	openB	6	2
	open B	Open B	Open B	Open B	open B	flat B	flat B	open B	open B	6	2
4. Bus	cup	Cup	cup	cup	cup	cup	cup	cup	cup	8	
	cup	Cup	cup	cup	cup	cup	cup	cup	cup	8	
5. Cat	5- 5 claw	5 - 5 claw	5 - 5 claw	5 - 5 claw - bent B	5 - claw	5 claw	5 - 5 claw	5 - open 6	5 - open 6	5	3
	5 - 5 claw	5 - 5 claw	5 - 5 claw	5 - 5 claw - bent B	5 - claw	5 claw	5 - 5 claw	5 - open 6	5 - open 6	5	3
1. Cup	C	C	C	C	C	C	C	C	C	8	
	Flat B	Open B	Open B	Flat B	Open B	open B	open B	open B	open B	1	7
2. Eat	flat o	Flat O	flat o	Flat O	Flat O	Flat O	flat O	flat O	flat O	8	
3. Gauteng	S - Index	S - index	s - index	s - index	S - index	index	G	A - index	T - index	4	4
	S - Index	S	s	s	S	S	S	index	open S	0	8
4. Language	L	L	L	L	L	L	L	L	G- L	7	1
	L	L	L	L	L	L	L	L	G - L	7	1
5. Normal	v	v	V	V	V	V	V	V	V	8	
	v	v	V	V	V	V	V	V	V	8	
6. Politics	3	3	3	3	3	3	3	3	3	8	
	3	3	3	3	3	3	3	3	3	8	
7. Restaurant	v	V	V	V	V	V	V	V	V	8	
	v	V	V	V	V	V	V	V	V	8	
8. Run	S	A	A	a	S	A	A	a	A	1	7
	S	A	A	a	S	A	A	a	A	1	7
9. Rural	T	T	T	T	T	X	X	T	T	6	2
	index	Index	index	index	index	X	X	S	C	4	4
10. Spring	flat o - 5	Flat O - 5	flat o - 5	Flat O - 5	Flat O - 5	E - 5	S - 5	S - 5	S - 5	4	4
	c	C	C	C	C	C	C	C	C	8	
11. Tomorrow	6	6	6	6	6	6	6	6	6	8	
12. Visit	V	V	V	V	V	V	V	V	V	8	
	V	V	V	V	V	V	V	V	V	8	
13. Week	6	A	6	6	6	open E + 6	open E + 6	6	6	5	3
	open B	Flat B	Flat B	open B	open B	open B	open B	open B	open B	6	2
14. Wind	W	W	W	W	W	W	W	W	W	8	
	W	W	W	W	W	W	W	W	W	8	
15. Work	B	B	B	Open B	open B	open B	open B	flat B	flat B	2	6
	B	B	B	Open B	open B	open B	open B	flat B	flat B	2	6
		7	6	7	5	14	14	13	15	215	81
									Total handhsapes	296	

Table 30: Handshape comparison table

The table above presents the data on the use of handshapes produced by the participants. There are a total of 37 handshapes – given that three signs are produced purely by one hand, while the rest (17) are produced by both hands (and handshape was analysed for each hand). Participant 1 produced 7/37 errors in handshape in their first production and 6/37 errors in their second production. Participant 2 produced 7/37 errors in their first production and 5/37 errors in their second production. Participant 3 produced 14/37 errors in their first and second production while Participant 4 produced 13/37 errors in their first production and 15/37 errors in their second production. This shows that 27.4% of handshapes produced were not the same as that of the citation form and 72.6% were. These findings show that Participant 1 and Participant 2 slightly improved their use of handshape in their second attempt, while Participant 3 remains the same and Participant 4 actually made more errors in the second production. Therefore, conscious effort in accurate production did not improve handshape production significantly.

A	B	C	D	E	F	G	H	I	J	K	L
	Control	P1	P1	P2	P2	P3	P3	P4	P4	Same	Different
1. Aeroplane	down	Down	down	down	down	down	down	down	down	8	
	up	Up	up	up	up	up	up	up	up	8	
2. Beautiful	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
3. Book	left-up	left - up	left - up	left - up	left - up	left - up	left - up	left - up	left - up	8	
	right - up	right - up	right - up	right - up	right - up	right - up	right - up	right - up	right - up	8	
4. Bus	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
5. Cat	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
1. Cup	towards	towards	towards	towards	towards	towards	towards	towards slight left	towards	7	1
	up	Up	up	up	up	up	up	up	up	8	
2. Eat	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
3. Gauteng	left	towards	towards	left - towards	towards - away - towards	away - down - towards	down - toward	towards	towards		8
	right	towards	towards	towards	towards	towards	towards	towards	towards		8
4. Language	away	down	away	away	away	away	away	away	away	7	1
	away	down	away	away	away	away	away	away	away	7	1
5. Normal	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
6. Politics	left	Left	left	left	left	towards	left	left	left	8	
	right	Right	right	right	right	towards	right	up	right	8	
7. Restaurant	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
8. Run	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
9. Rural	towards	towards	towards	away	left	left	towards	towards	towards	5	3
	towards	towards	towards	towards	towards	towards	towards	towards	up	7	1
10. Spring	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
11. Tomorrow	away-towards	away - towards	away - towards	towards - away	away - towards	away - towards	away - towards	away - towards	away - towards	7	1
12. Visit	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
13. Week	away	down	down	away	away	away	away	away	away	6	2
	towards	right	right	towards	towards	towards	towards	towards	towards	6	2
14. Wind	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
15. Work	left	towards	towards	left	left	towards slight left	towards slight left	towards	towards slight left	2	6
	towards	right	right	towards	towards	towards slight right	towards slight left	right	towards slight right	2	6
		8	6	4	3	5	4	5	5	256	40
										296	

Table 31: Orientation comparison table

The image above shows the findings for the palm orientation in the sign production. This table shows that Participant 1 produced 8/37 palm errors in their first production and 6/37 errors in their second production. Participant 2 produced 4/37 errors in their first production and 3/37 errors in their second production. Participant 3 produced 5/37 errors in their first production and 4/37 errors in their second production while Participant 4 produced 5/37 errors in their first and second production of the signs. Overall, errors in orientation are 13.5%, much lower than handshape, and the findings show that three participants improved on their second production (once they were made aware of the joint use) while the other remained the same.

A	B	C	D	E	F	G	H	I	J	K	L
	Control	P1	P1	P2	P2	P3	P3	P4	P4	same	different
1. Aeroplane	NS torso	NS Torso	NS Torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS Torso	NS Torso	NS torso	Ns torso	NS torso	NS torso	NS torso	8	
2. Beautiful	NS face	NS Face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face	8	
3. Book	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
4. Bus	NS forehead	NS Forehead	NS forehead	NS Forehead	NS forehead	NS forehead	NS forehead	NS forehead	NS forehead	8	
	NS forehead	NS Forehead	NS forehead	NS Forehead	NS forehead	NS forehead	NS forehead	NS forehead	NS forehead	8	
5. Cat	NS face	NS Face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face	8	
	NS face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face	NS face	8	
1. Cup	NS torso + on NDH	NS Torso + On NDH	NS Torso + on NDH	NS torso +on NDH	NS torso + on NDH	NS torso + on NDH	NS torso + on NDH	NS torso+ on NDH	NS torso + on NDH	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
2. Eat	NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS face	NS mouth	8	
3. Gauteng	NS torso on NDH	NS Torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
4. Language	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
5. Normal	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
6. Politics	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
7. Restaurant	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
8. Run	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close sides	NS torso close to sides	NS torso close to sides	8	
	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close sides	NS torso close to sides	NS torso close to sides	8	
9. Rural	NS torso +elbow on NDH	NS Torso elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	8	
	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
10. Spring	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	8	
	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	8	
11. Tomorrow	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	8	
12. Visit	ns face	NS Torso	NS torso	NS face	NS face	NS face	NS face	NS face	NS face	8	
	ns face	NS Torso	NS torso	NS face	NS face	NS face in fron of DH	NS face in front of DH	NS face	NS face	7	1
13. Week	NS torso on NDH	NS Torso	NS torso + palm NDH	NS torso + on NDH	NS torso on NDH	NS torso	NS torso on NDH	NS torso on NDH	NS torso on NDH		8
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
14. Wind	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
15. Work	NS torso	NS Torso ontop of NDH	NS torso +on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH		8
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
		2	2	2	2	2	3	2	2	279	17
										296	

Table 32: Location comparison table

The image above shows the findings for the location of the signs. Participant 1, Participant 2 and Participant 4 produced 2/30 errors in location in both productions while Participant 3 produced 2/30 errors in their first production and 3/30 errors in their second production. This results in 5.7% location errors, and 94.3% of the signs being produced in accordance with the location of the citation form. This seems to suggest that location is the easiest parameter for learners to accurately produce. Since the number of errors is so small, we cannot conclude whether they improved in their production of locations after being told that they must pay attention to their joints.

A	B	C	D	E	F	G	H	I	J	K	L
	Control	P1	P1	P2	P2	P3	P3	P4	P4	same	different
1. Aeroplane	upwards left	Upwards Left	upwards left	upwards left	up + left	up + left	up + left	up + left	up + left	8	
			slight bobbing left to right	slight left		slight down					3
2. Beautiful	clockwise around face	Clockwise around face	clockwise around face	clockwise around face	clockwise around face	clockwise around face	circular around face + handshape change	clockwise around face	clockwise around face	8	
3. Book	opening	opening	opening	opening away	opening	opening	opening	opening	opening	8	
	opening	opening	opening	opening away	opening	opening	opening	opening	opening	8	
4. Bus	away	away	away	away	away	away	away	away	away	8	
	away	away	away	away	away	away	away	away	away	8	
5. Cat	right	right	right	right	right	slight forwards + back	tight	right	right	7	1
	left	left	left	left	left	slight forwards + back	left	left	left	7	1
1. Cup	up	Up + Down	up + down	up + down	up + down	up + down	up + down	up + down	up + down		8
		slight up + down			slight up and down (impact movement)	slight up + down (impact movement)	slight up + down (impact movement)	slight up + down (impact movement)			5
2. Eat	back and forwards	back + forward	forwards and back	forwards +back	slight forwards + back	forwards + back	slight back + forward	slight forwards + cack	slight back and forwards	8	
3. Gauteng	handshape change + up	Up with change handshape	up	up + handshape change	handshape change + up	orientation change + up	orientation change + up	handshape change + up	handshape change + up	5	3
		down (relax)									1
4. Language	right	right	right	right	right	right	right	right	right	8	
	left	left	left	left	left	left	left	left	left	8	
5. Normal	quater clock down	quater clock down	quater clock down	quater clock up + down	quater clock up + down	quater clock up + down	quater clock up + down	quateer clock up + down	quater clock up + down	8	
	quater clock down	quater clock down	quater clock down	quater clock up + down	quater clock up + down	quater clock up + down	quater clock up + down	quater clock up + down	quater clock up + down	8	
6. Politics	up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	8	
	up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	8	
7. Restaurant	up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	8	
	up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	8	
8. Run	forwards backwards circular	forwards backwards circular	up and down alt	circular forwards + back	forwards backwards circular	circular alt	up + down circular alt	circular up and down alt	circular up + down alt	2	6
	forwards backwards circular	forwards backwards circular	up and down alt	circular forwards + back	forwards backwards circular	circular alt	up + down circular alt	circular up + down alt	circular up + down alt	2	6
9. Rural	circular	circular	1x circle - forwards and back	circular	circular	circular	back + forwards circular	back and fowards	back and forwards	4	4
10. Spring	up + handshape change	up + handshape change	up + handshape change	up + handshape change	up + handshape change	up + handshape change	handshape change + up	handshape change + up	handshape change + up	8	
			slight down		slight opening			slight up + down	slight down (impact movment)		4
11. Tomorrow	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	8	
12. Visit	away	away	away	away	away	away	away	away	away	8	
	away	away	away	away	away	away	away	away	away	8	
13. Week	right across NDH	away across NDH	forward on NDH	across right NDH	right across NDH	right across NDH	right across NDH	right across NDH	right across NDH	8	
						slight left	slight left				2
14. Wind	left to right	left to right	left and right	left to right	left to right	left to right	left - right	left to right	left to right	8	
	left to right	left to right	left and right	left to right	left to right	left to right	left - right	left to right	left to right	8	
15. Work	up and down	up and down	up and down	up + down tapping on NDH	up + down on NDH	up + down on NDH	up + down on NDH	up + down on NDH	up + down on NDH	8	
		slight up and down	slight up and down			slight up + down	slight up + down	slight up + down (impact movement)	slight up + down (impact movement)		6
		4	8	4	3	8	8	6	5	211	50
										261	

Figure 33: Movement comparison table

The image of the table above shows the findings for the movement of the signs produced by the participants. Participant 1 produces 4/30 errors in their first production and 8/30 errors in their second production. Participant 2 produces 4/30 errors in their first production and 3/30 errors in their second production. Participant 3 produces 8/30 errors in both their first and second production while Participant 4 produces 6/30 errors in their first production and 5/30 errors in their second production. Overall, 19.2% of the time, errors in movement were observed and 80.8% of movement were in accordance with the citation form. It is interesting to see that Participant 1 (who generally performed the best among the four) produced twice as many errors in movement in the second attempt than in the first attempt, while others remained the same or slightly improved. When this participant was made aware of the joint use, her/his accuracy in movements were impacted negatively.

The findings for non-manual features showed that only two signs had clear non-manual features in the citation form, CAT and WORK. Therefore, no meaningful observation can be made.

4.3 Discussion

The purpose of this research was to investigate whether or not proximalisation is present in the production of signs by adult hearing learners. In order to do this, I had to specifically look at the use of joints in their production and compare it to the use of joints in the citation form (which was signed by a native Deaf person). In order to break down this purpose I have looked at the extent of proximalisation and distalisation, what signs were more commonly proximalised, iconic or arbitrary, at what joint level can proximalisation and distalisation occur and whether or not the participants improve once made aware of the importance of joint usage. This section will summarise the findings presented above as well as my analysis on those findings.

Let me start with general observations. Learners managed to produce the 'correct' joints for 55% of the time. Errors occurred 45% of the time. This suggests that joint errors are common among hearing learners. The findings also show that the elbow joint is most often used in sign production followed by the wrist, shoulder, metacarpophalangeal joints and interphalangeal joints respectively.

Looking at the presence of proximalisation, it was found that only two signs were proximalised showing a significantly lower than expected outcome for this research study (as existing studies, such as Mirus et al. 2001, suggested the presence of proximalisation in hearing adult learners). There was rather a greater presence of distalisation. This shows a favouring for more distal joints in the sign production. However, my results show unexpectedly large number of omission (subtraction) and the addition of joints in the participants' sign production. Five signs exhibit instances of omissions and 16 show instances of additions of joints. This shows that 'pure' forms of proximalisation or distalisation (*replacement* of one joint with another) are rare and most of the time joints are added while keeping the joint(s) used in the citation form.

It is important to note that signs were not singular in their evidence of an error, meaning that one sign may have experienced evidence of multiple errors, each by a different participant. This means that there was evidence of addition, omission and distalisation in one sign or

addition and proximalisation of another, meaning that joint changes are reliant completely on the sign producer and different signers may produce the sign in different ways.

Looking at the findings for which signs were most commonly affected – iconic or arbitrary- overall, it showed some evidence of more iconic signs being affected by joint errors compared to arbitrary signs. However, the numbers are too small to determine the correlation. An additional noteworthy finding is that of the number of hands used in the production of signs. It was found that two-handed signs seemed to be more affected than one-handed signs, although once again, the numbers are too small, to make any conclusive remark.

When looking at the joint level where these errors may occur proximalisation and distalisation showed evidence of being able to occur multiple joints away while the signer still produces a recognisable sign. When adding a joint the additional joint usually appears one joint away from the target joint while still being recognisable.

When looking at the participants first production versus their second production once made aware of the importance of these joints, only one participant showed evidence of improvement and it was not significant. The other participants remained the same or produced more errors on their second production. This shows that consciousness towards the use of joint may not necessarily improve the actual production in terms of joints.

These findings, based on Napoli et al., (2014), can be understood as due to ease of articulation. The participants may have produced these errors based on their joint comfort and movement ease as well as to reserve energy. As proximal joints such as the shoulder require a larger amount of energy as well as result in a much larger movement it makes sense as to why we see the more common use of distal joints or the complete omission of the larger joint. While looking at the extreme distal joints of the metacarpophalangeal joint and interphalangeal joints, the use of these joints would more commonly be used in small intricate movements which require advanced control in sign formation, and it would therefore make sense as to why we would not see the use of them unless a handshape change was necessary. This may have also led to the decision to add joints to the production which were easier to manipulate and made the energy flow more freely in the movement of the sign. These ease

of articulation changes may have happened consciously or subconsciously with the main aim of the participants producing a sign that is recognisable and yet low energy consuming.

This research also led to additional findings being made in respect to the five parameters of the signs – handshape, orientation, location, movement and nonmanual features. The findings show that errors occur in all of these parameters; handshape (27.4%) followed by movement (19.2%), orientation (13.5%) and location (5.7%) while the evidence of nonmanual features was lacking as only two signs had nonmanual features in their citation form and only one of those signs had nonmanual features produced by two participants, though incorrectly.

The reasons for these errors can be summed up too many reasons, unfamiliarity with the signs, still in early acquisition stage of the language, unfamiliarity in signing in a formal environment, lack of comfort or confidence with the language, and ease of articulation. The errors in parameter can be linked to the use of joints. Especially handshapes may also require a certain usage of the joints that the signer is not yet confident in which may result in the incorrect construction of the handshape (Anderson et al., 2022). Errors in movement may be due to similar reasons, as movement of the sign requires a certain manipulation and control of joints which result in different kinds of movement - movement path and internal movement (Sandler, 2011). Producing these joints accurately requires familiarity with the sign, concentration and comfort in using them correctly, therefore movement may falter (fall short), differ and change completely depending on the usage of the joints. The location of the signs was most accurately produced, as many of the signs occur in the neutral space in front of the torso. When there are errors in location, they often occur due to the errors in movement. These errors in movement result in the sign 'landing' in the wrong place. However, when a sign is located in the wrong position before movement even takes place it is often not a large location shift. This means that the location is very close to the target location with only slight variation such as a two-handed sign that is meant to be signed with parallel to each other rather being signed with the one hand in front of the other. Orientation of the sign is heavily influenced by the location and movement of the sign. If the sign perhaps uses the wrist joint the movement may end or begin in a position that does not match the target citation form. An extremely limited finding on nonmanual features suggest that learners often focus on the manual features in the production of the sign including the joints

(especially in their second attempt when they were told to focus on them), not much on nonmanual features, which may result in the participants not analysing and comprehending the sign in full.

Chapter 5: Conclusion

The purpose of this research study was to investigate whether or not proximalisation is present in the production of signs by adult hearing learners. In order to do this, I had to specifically look at the use of joints in their production and compare it to the use of joints in the citation form (which was signed by a native Deaf person). In order to break down this purpose I have looked at the extent of proximalisation and distalisation, what signs were more commonly proximalised, iconic or arbitrary, at what joint level can proximalisation and distalisation occur, whether or not the participants improve once made aware of the importance of joint usage and finally any other findings related to the usage of joints.

The findings of this research study therefore allow me to make the following conclusions: hearing, speaking learners show evidence of multiple types of joint errors, these being proximalisation, distalisation, joint omission and joint addition. While the research aimed at looking at proximalisation specifically, the presence of these additional errors could not be ignored.

The participants seemed to make joint errors with mainly iconic, 2-handed signs rather than arbitrary, 1-handed signs, while relying on the elbow joint the most followed by the wrist, shoulder, metacarpophalangeal joints and interphalangeal joints respectively. These errors were found to occur multiple joints away when looking at proximalisation and distalisation while only occurring one joint away from the target joint when adding a joint.

Overall, the participants showed little improvement when producing the signs, the second time in joint production as well as handshape, location, movement, orientation and non-manual features.

This study therefore showed that it is possible for proximalisation to be present in the signing of these hearing adult learners but it is unexpectedly more common to find the presence of distalisation, joint omission and joint addition. The reasons for these joint changes could be due to unfamiliarity with the signs, early acquisition stage of the language, nerves, laziness, unfamiliarity in signing in a formal environment, discomfort with the language or even ease

of articulation. These findings provide insights into the acquisition of sign language and could be used to improve the teaching methods and learning outcomes in the future.

Limitations and Future recommendations

Though this Masters research project aimed at having ± 20 participants, the sample size ended up being only 4 participants. This much smaller sample did not allow for a true in-depth analysis of the presence of proximalisation and distalisation in the acquisition of sign language by hearing learners. As this was a full-time Masters project (one-year degree), the time constraints did not allow for the possibility of acquiring participants over a long period of time either. Therefore, in the future I would recommend a much larger sample size. This will allow for a more in-depth analysis among a larger variety of learners preventing any chance of inaccuracies.

In the future a restructure of the study looking at ease of or errors in articulation may allow for a wider variety of research questions with a richer quantity of information obtained at this level of study. This will allow for, instead of a focus on proximalisation or distalisation, a focus on the numerous articulation errors available with the hope of discovering a few new ones. This study may also be enriched by the focus on formal verses casual register.

I would also recommend a larger sample size that makes use of learners from different years as well as looking at how these learners progress from first year to third year and how prevalent proximalisation is as they gain more fluency and confidence in the language.

In the future I would also recommend that a one-on-one in person interview be done and recorded using a camera as apps such as Zoom often experience glitches and connectivity issues resulting in recorded videos which are grainy or skip at certain points, resulting in inaccurate data and guessed outcomes.

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Appendix

Appendix 1: Consent form

SOUTH AFRICAN SIGN LANGUAGE

SCHOOL OF LITERATURE, LANGUAGE AND MEDIA

UNIVERSITY OF THE WITWATERSRAND

Participant Consent Form

Title of the Project: Proximalisation in the acquisition of sign language by hearing adult learners

Researcher's name: Dana Chambers

I, ……. (Name of participant) agree to participate in this research project.

I agree to the following (Please circle the relevant options below):

The research has been explained to me and I understand what my participation will involve.	YES	NO
I agree that my participation will not remain anonymous due to the use of images. But I understand that my name and other personal information will remain confidential	YES	NO
I agree to be video recorded	YES	NO

I agree that there will be no monetary benefit from participating in this study. YES NO

I understand that my participation is voluntary and that I may withdraw at any time before the commencement of the researcher's data analysis. YES NO

I agree that the information I provide may be used after this project has ended, for academic purposes by other researchers, subject to their own ethics clearance being obtained. YES NO

…… (Signature)

…… (name of participant)

…… (date)

Appendix 2: Information sheet

Participant Information Sheet

Dear Sir/Madam,

My Name is Dana Chambers. I am a Masters student of South African Sign Language at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Michiko Kaneko. I am conducting a study on the features of acquisition of sign language by hearing adult learners. The title of my study is Proximalisation in the acquisition of sign language by hearing adult learners. In this study I aim to observe the signing of the first-year hearing South African Sign Language (SASL) students attending the University of the Witwatersrand.

I am inviting you to be a participant in my research study by taking part in an interview. If you choose to participate in this study, you will take part in an online session with me. You will first be asked to briefly introduce yourself in SASL, followed by a task in which you will be asked to repeat the signs that are shown to you. This task will be repeated twice.

With your permission, I would like to video record the interview. This data will be stored on a password protected laptop and deleted after a period of 5 years. During this time only myself and my supervisor will have access to this data.

The interview will remain confidential however anonymity cannot be guaranteed as images from your interviews may be used in the research report. However, I will not include your name or anything else that may be used to identify you. With your permission, other researchers may use the data collected from this research study, but name and any other person information will not be passed on.

If you decide to participate in this research study, it should be because you want to volunteer. You may withdraw at any time before the commencement of the data analysis. You will not receive any direct benefits if you wish to participate and there are no disadvantages or penalties if you do not choose to participate or if you withdraw from the study. Taking part in this research will not cost you anything and you will not be paid to be a participant.

This research study will be written up as a research report which will be available on the university library website. If you would like to receive a summary or this report, I will be happy to send it to you.

If you have any questions or after this research study, feel free to contact me or my supervisor on the details listed below. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Ethics Committee (Non-Medical) +27(0)11 717 1408, email hrecnon-medical@wits.ac.za

Yours sincerely,
Dana Chambers

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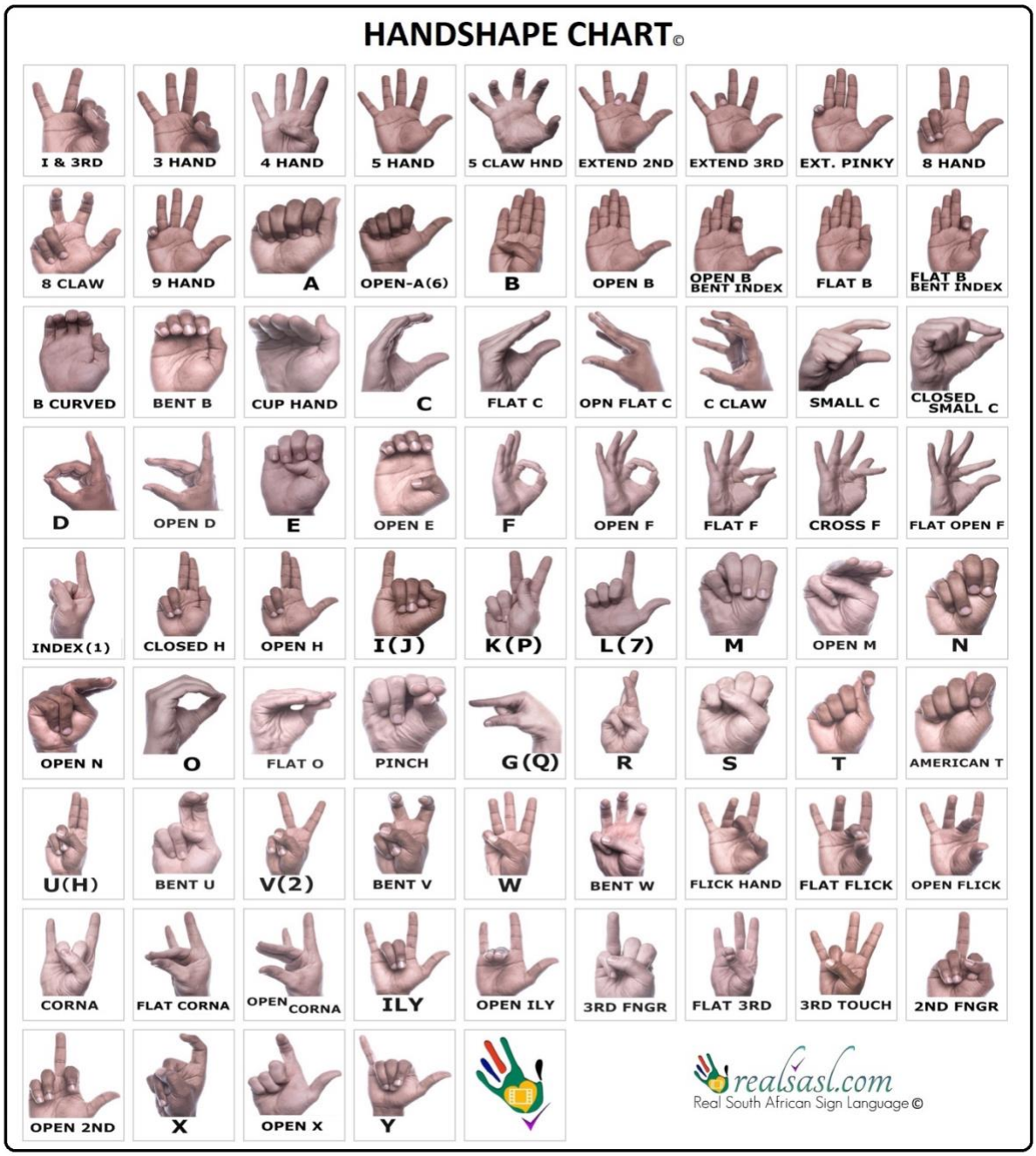
Appendix 3: List of Handshape Symbols



(Adapted from Johnston & Schembri 2012, 89)

Appendix 4: Location transcription key

t: torso

f: face

h: head

fh: forehead

c: cheeks

a: arm

ns: neutral space

ob: on body

l: left

r: right

ch: chest

Appendix 5: Orientation transcription key

2H: 2-handed

1H: 1-handed

RH: right hand

LH: left hand

r: right

l: left

u: up

d: down

m: towards signer

a: away

Appendix 6: Movement transcription key

Up

Down

Forwards

Backwards

Left

Right

Spiral

Wave

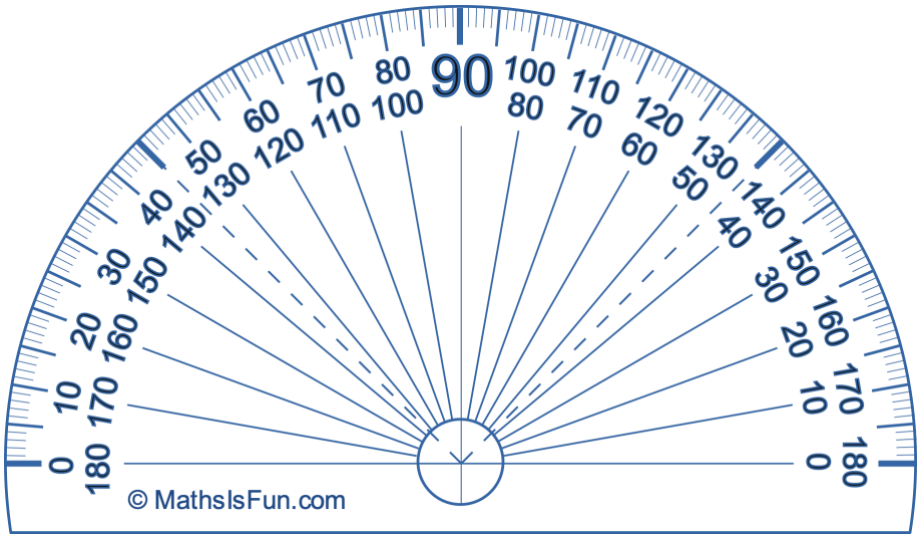
Circular

Still

Alternating

Zig zag

Arc



Appendix 7: Non-manual features transcription key

se: squint eyes

0: open mouth

-: moth pulled in line

P: puffed cheeks

om: open mouth

ce: closed eyes

we: wide eyes

s: smile

hs: head shake

Appendix 8: Excel tables

Joint findings

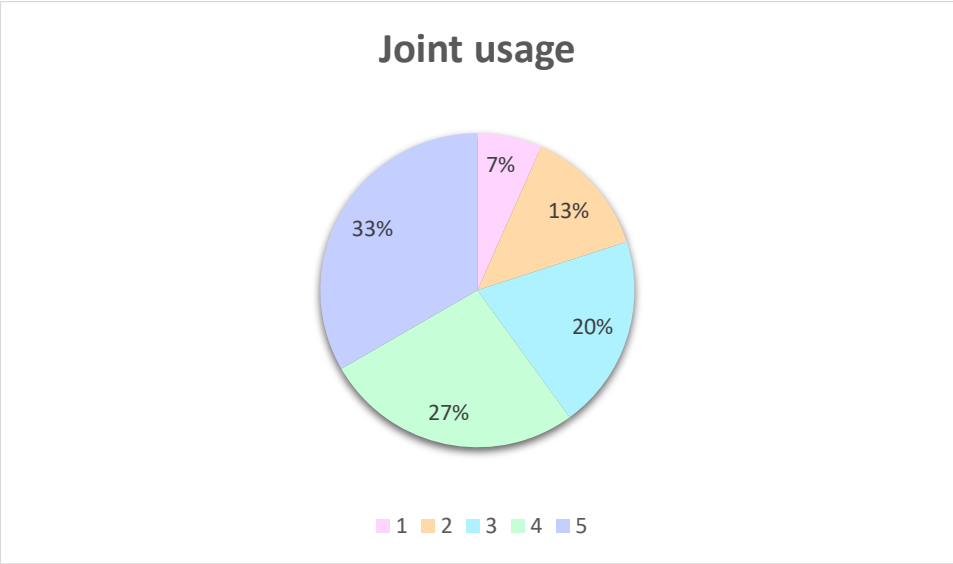
	Control	P1	P1	P2	P2	P3	P3	P4	P4	Omission	Addition	Proximalised	Distalised	100% Same	same
Aeroplane	1+2	1+2	1+2	2	2	1+2	1+2	2	2	4					4
Beautiful	1 + 2 + 4	1+2+4	2+4	3+4	2+3+4	2+3+4	2+3+4	2+4	2+4	7	3				1
Book	3	3	2+3	3	3	2+3	2+3	3	3						
	3	3	2+3	3	3	2+3	2+3	3	3		3				5
Bus	2	2	2	2	2	2	2	2	2						
	2	2	2	2	2	2	2	2	2		0				8
Cat	2 + 5	2+5	2+5	2+4+5	2+5	2	1+2+5	1+2+4+5	2+5						
	2+5	2+5	2+5	2+4+5	2+5	2	1+2+5	1+2+4+5	2+5	1	3				4
Cup	2	2	2	2	2	2	2	2	1+2+3						
		3					2				3				5
Eat	2	2	2	2	2	2	2	2	3		0				7
Gauteng	2 + 3 + 4	2+3+4	2+3+4	2+3+4	2+3+4	2+3	1+2+3	1+2+4	2+3+4						
										3	2				5
Language	2	2	2	2	2	2	2	2	2+4						
	2	2	2	2	2	2	2	2	2+4		1				7
Normal	3	3	3	3	3	3	3	3	3						
	3	3	3	3	3	3	3	3	3		0				8

Politics	2	2	2	2	2	1+2	1+2	1+2	2+3						
	2	2	2	2	2	1+2	1+2	1+2	2+3		4				4
Restaurant	3	2+3	3	2+3	2	2+3	2+3	2+3	3						
	3	2+3	3	2+3	2	2+3	2+3	2+3	3		5				2
Run	2	2	2	2	1+2	1+2	1+2	1+2	1+2						
	2	2	2	2	1+2	1+2	1+2	1+2	1+2		4				3
Rural	3	2+3	3	3	3	2+3	3	3	3		2				6
Spring	2 + 4	2+4	2+4	2+4	2+4	2+4	2+4+5	2+4	1+2+4						
			2		2			2	2		4				6
Tomorrow	3	2+3	2+3	3	3	2+3	1+2+3	1+2+3	1+2+3		6				2
Visit	2	2	2	2	2	2	2	2+3	3						
	2	2	2	2	2	2	2	2+3	3		1				6
Week	2	2	2	2	2	1+2	1+2	2+3	1+2						
						2	2				4				4
Wind	2 + 3	2	2	2	2	1+2	1+2	3	3						
	2+3	2	2	2	2	1+2	1+2	3	3	8	2				0
Work	2	2	2	2	2	2	2	2	3						
		3				2	2	2	2		5				3
		6	4	5	6	12	13	13	13	23	52				90

Joint usage

Joints	Control	P1	P1	P2	P2	P3	P3	P4	P4	Total used
1	2	2	1	0	2	8	12	8	6	**41**

2	22	26	26	23	25	30	30	25	19	**226**
3	11	11	9	10	8	10	10	13	18	**100**
4	3	3	3	5	3	2	2	4	5	**30**
5	2	2	2	2	2	0	3	2	0	**15**
most used	2	2	2	2	2	2	2	2	2	
2nd	3	3	3	3	3	3	1	3	3	
3rd	4	4	4	4	4	1	3	1	1	
4th	1 +5	1+5	5	5	1+5	4	5	4	4	
5th			1	1		5	4	5	5	



Joints of each sign

	1	2	3	4	5	Most popular
Aeroplane	5	9				**2**
Beautiful	2	8	4	9		**4**
Book		6	18			**3**
Bus	18					**1**
Cat	4	18		4	16	**2**
Cup	1	10	2			**2**
Eat		8	1			**2**
Gauteng	2	9	8	7		**2**
Language		18		2		**2**
Normal			18			**3**
Politics	6	18	2			**2**
Restaurant		12	16			**3**
Run	10	18				**2**
Rural		2	9			**3**
Spring	1	13				**2**
Tomorrow	3	6	9			**3**

Visit		16	4			**2**
Week	3	11	1			**2**
Wind	4	14	6			**2**
Work		12	2			**2**
Total	59	208	100	22	16	

Handshape

	Control	P1	P1	P2	P2	P3	P3	P4	P4	Same	Different
1. Aeroplane	y	Y	Y	Y	Y	Y	Y	Y	Y	8	
	B	Open B	Open B	B	Open B	Open B	open B	open B	open B	1	7
2. Beautiful	5 - flat O	5 - flat O	5 - Flat O	5 - Flat o	5 - flat O	5 - flat O	5 - flat O	X - 5 - A	X - 5 - A	6	2
3. Book	open B	Open B	Open B	Open B	open B	flat B	flat B	open B	openB	6	2
	open B	Open B	Open B	Open B	open B	flat B	flat B	open B	open B	6	2
4. Bus	cup	Cup	cup	cup	cup	cup	cup	cup	cup	8	
	cup	Cup	Cup	cup	cup	cup	cup	cup	cup	8	

5. Cat	5- 5 claw	5 - 5 claw	5 - 5 claw	5 - 5 claw - bent B	5 - claw	5 claw	5 - 5 claw	5 - open 6	5 - open 6	5	3
	5 - 5 claw	5 - 5 claw	5 - 5 claw	5 - 5 claw - bent B	5 - claw	5 claw	5 - 5 claw	5 - open 6	5 - open 6	5	3
6. Cup	C	C	C	C	C	C	C	C	C	8	
	Flat B	Open B	Open B	Flat B	Open B	open B	open B	open B	open B	1	7
7. Eat	flat o	Flat O	flat o	Flat O	Flat O	Flat O	flat O	flat O	flat O	8	
8. Gauteng	S - Index	S - index	s – index	s - index	S - index	index	G	A - index	T - index	4	4
	S - Index	S	S	s	S	S	S	index	open S	0	8
9. Language	L	L	L	L	L	L	L	L	G- L	7	1
	L	L	L	L	L	L	L	L	G - L	7	1
10. Normal	v	v	V	V	V	V	V	V	V	8	
	v	v	V	V	V	V	V	V	V	8	
11. Politics	3	3	3	3	3	3	3	3	3	8	
	3	3	3	3	3	3	3	3	3	8	
12. Restaurant	v	V	V	V	V	V	V	V	V	8	
	v	V	V	V	V	V	V	V	V	8	
13. Run	S	A	A	a	S	A	A	a	A	1	7
	S	A	A	a	S	A	A	a	A	1	7

14. Rural	T	T	T	T	T	X	X	T	T	6	2
	index	Index	Index	index	index	X	X	S	C	4	4
15. Spring	flat o - 5	Flat O - 5	flat o – 5	Flat O - 5	Flat O - 5	E - 5	S - 5	S - 5	S - 5	4	4
	c	C	C	C	C	C	C	C	C	8	
16. Tomorrow	6	6	6	6	6	6	6	6	6	8	
17. Visit	V	V	V	V	V	V	V	V	V	8	
	V	V	V	V	V	V	V	V	V	8	
18. Week	6	A	6	6	6	open E + 6	open E + 6	6	6	5	3
	open B	Flat B	Flat B	open B	open B	open B	open B	open B	open B	6	2
19. Wind	W	W	W	W	W	W	W	W	W	8	
	W	W	W	W	W	W	W	W	W	8	
20. Work	B	B	B	Open B	open B	open B	open B	flat B	flat B	2	6
	B	B	B	Open B	open B	open B	open B	flat B	flat B	2	6
		7	6	7	5	14	14	13	15	**215**	**81**
									Total handshapes	296	

Orientation

	Control	P1	P1	P2	P2	P3	P3	P4	P4	Same	Different
1. Aeroplane	down	Down	down	down	down	down	down	down	down	8	

	up	Up	up	up	up	up	up	up	up	8	
2. Beautiful	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
3. Book	left-up	left - up	left - up	left - up	left - up	left - up	left - up	left - up	left - up	8	
	right - up	right - up	right - up	right - up	right - up	right - up	right - up	right - up	right - up	8	
4. Bus	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
5. Cat	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
6. Cup	towards	towards	towards	towards	towards	towards	towards	towards slight left	towards	7	1
	up	Up	up	up	up	up	up	up	up	8	
7. Eat	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
8. Gauteng	left	towards	towards	left - towards	towards - away - towards	away - down - towards	down - toward	towards	towards		8
	right	towards	towards	towards	towards	towards	towards	towards	towards		8
9. Language	away	down	away	away	away	away	away	away	away	7	1
	away	down	away	away	away	away	away	away	away	7	1
10. Normal	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
11. Politics	left	Left	left	left	left	towards	left	left	left	8	
	right	Right	right	right	right	towards	right	up	right	8	
12. Restaurant	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	

13. Run	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
14. Rural	towards	towards	towards	away	left	left	towards	towards	towards	5	3
	towards	towards	towards	towards	towards	towards	towards	towards	up	7	1
115. Spring	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
	towards	towards	towards	towards	towards	towards	towards	towards	towards	8	
16. Tomorrow	away-towards	away - towards	away - towards	towards - away	away - towards	away - towards	away - towards	away - towards	away - towards	7	1
17. Visit	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
18. Week	away	down	down	away	away	away	away	away	away	6	2
	towards	right	right	towards	towards	towards	towards	towards	towards	6	2
19. Wind	left	left	left	left	left	left	left	left	left	8	
	right	right	right	right	right	right	right	right	right	8	
20. Work	left	towards	towards	left	left	towards slight left	towards slight left	towards	towards slight left	2	6
	towards	right	right	towards	towards	towards slight right	towards slight left	right	towards slight right	2	6
		8	6	4	3	5	4	5	5	256	40
										296	

Location

Control	P1	P1	P2	P2	P3	P3	P4	P4	same	different
										142

1. Aeroplane	NS torso	NS Torso	NS Torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS Torso	NS Torso	NS torso	Ns torso	NS torso	NS torso	NS torso	8	
2. Beautiful	NS face	NS Face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face	8	
3. Book	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
4. Bus	NS forehead	NS Forehead	NS forehead	NS Forehead	NS forehead	NS forehead	NS forehead	NS forehead	NS forehead	8	
	NS forehead	NS Forehead	NS forehead	NS Forehead	NS forehead	NS forehead	NS forehead	NS forehead	NS forehead	8	
5. Cat	NS face	NS Face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face	8	
	NS face	NS Face	NS face	NS face	NS face	NS face	NS face	NS face	NS face	8	
6. Cup	NS torso + on NDH	NS Torso + On NDH	NS Torso + on NDH	NS torso +on NDH	NS torso + on NDH	NS torso + on NDH	NS torso + on NDH	NS torso+ on NDH	NS torso + on NDH	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
7. Eat	NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS mouth	NS face	NS mouth	8	
8. Gauteng	NS torso on NDH	NS Torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
9. Language	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
10. Normal	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
11. Politics	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
12. Restaurant	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	

13. Run	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close sides	NS torso close to sides	NS torso close to sides	8	
	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close to sides	NS torso close sides	NS torso close to sides	NS torso close to sides	8	
14. Rural	NS torso +elbow on NDH	NS Torso elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	NS torso +elbow on NDH	8	
	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
15. Spring	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	NS torso in NDH	8	
	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	NS torso around DH	8	
16. Tomorrow	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	thumb on cheek above lip	8	
17. Visit	ns face	NS Torso	NS torso	NS face	NS face	NS face	NS face	NS face	NS face	8	
	ns face	NS Torso	NS torso	NS face	NS face	NS face in front of DH	NS face in front of DH	NS face	NS face	7	
18. Week	NS torso on NDH	NS Torso	NS torso + palm NDH	NS torso + on NDH	NS torso on NDH	NS torso	NS torso on NDH	NS torso on NDH	NS torso on NDH		
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
19. Wind	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	
20. Work	NS torso	NS Torso on top of NDH	NS torso +on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH	NS torso on NDH		
	NS torso	NS Torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	NS torso	8	

	2	2	2	2	2	3	2	2	279	1	
										296	

Movement

	Control	P1	P1	P2	P2	P3	P3	P4	P4	same	different
1. Aeroplane	upwards left	Upwards Left	upwards left	upwards left	up + left	up + left	up + left	up + left	up + left	8	
			slight bobbing left to right	slight left		slight down					3
2. Beautiful	clockwise around face	Clockwise around face	clockwise around face	clockwise around face	clockwise around face	clockwise around face	circular around face + handshape change	clockwise around face	clockwise around face	8	
3. Book	opening	opening	opening	opening away	opening	opening	opening	opening	opening	8	
	opening	opening	opening	opening away	opening	opening	opening	opening	opening	8	
4. Bus	away	away	away	away	away	away	away	away	away	8	
	away	away	away	away	away	away	away	away	away	8	
5. Cat	right	right	right	right	right	slight forwards + back	tight	right	right	7	1

	left	left	left	left	left	slight forwards + back	left	left	left	7	1
6. Cup	up	Up + Down	up + down	up + down	up + down	up + down	up + down	up + down	up + down		8
		slight up + down			slight up and down (impact movement)	slight up + down (impact movement)	slight up + down (impact movement)	slight up + down (impact movement)			5
7. Eat	back and forwards	back + forward	forwards and back	forwards +back	slight forwards + back	forwards + back	slight back + forward	slight forwards + cack	slight back and forwards	8	
8. Gauteng	handshape change + up	Up with change handshape	up	up + handshape change	handshape change + up	orientation change + up	orientation change + up	handshape change + up	handshape change + up	5	3
		down (relax)									1
9. Language	right	right	right	right	right	right	right	right	right	8	
	left	left	left	left	left	left	left	left	left	8	
10. Normal	quarter clock down	quarter clock down	quarter clock down	quarter clock up + down	quarter clock up + down	quarter clock up + down	quarter clock up + down	quarter clock up + down	quarter clock up + down	8	
	quarter clock down	quarter clock down	quarter clock down	quarter clock up + down	quarter clock up + down	quarter clock up + down	quarter clock up + down	quarter clock up + down	quarter clock up + down	8	
11. Politics	up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	8	
	up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	8	
12. Restaurant	up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	8	

	up and down alt	up and down alt	up and down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	up + down alt	8	
13. Run	forwards backwards circular	forwards backwards circular	up and down alt	circular forwards + back	forwards backwards circular	circular alt	up + down circular alt	circular up and down alt	circular up + down alt	2	6
	forwards backwards circular	forwards backwards circular	up and down alt	circular forwards + back	forwards backwards circular	circular alt	up + down circular alt	circular up + down alt	circular up + down alt	2	6
15. Rural	circular	circular	1x circle - forwards and back	circular	circular	circular	back + forwards circular	back and forwards	back and forwards	4	4
15. Spring	up + handshape change	up + handshape change	up + handshape change	up + handshape change	up + handshape change	up + handshape change	handshape change + up	handshape change + up	handshape change + up	8	
			slight down		slight opening			slight up + down	slight down (impact movement)		4
16. Tomorrow	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	palm change rotate	8	
17. Visit	away	away	away	away	away	away	away	away	away	8	
	away	away	away	away	away	away	away	away	away	8	
18. Week	right across NDH	away across NDH	forward on NDH	across right NDH	right across NDH	right across NDH	right across NDH	right across NDH	right across NDH	8	
						slight left	slight left				2
19. Wind	left to right	left to right	left and right	left to right	left to right	left to right	left - right	left to right	left to right	8	

	left to right	left to right	left and right	left to right	left to right	left to right	left - right	left to right	left to right	8	
20. Work	up and down	up and down	up and down	up + down tapping on NDH	up + down on NDH	up + down on NDH	up + down on NDH	up + down on NDH	up + down on NDH	8	
		slight up and down	slight up and down			slight up + down	slight up + down	slight up + down (impact movement)	slight up + down (impact movement)		6
		4	8	4	3	8	8	6	5	211	50
											261

Non-manual features

	Control	P1	P1	P2	P2	P3	P3	P4	P4	Same	Different	
1. Aeroplane												
2. Beautiful												
3. Book												
4. Bus												
5. Cat	pulled mouth					squint eyes + bared teeth			squint eyes scrunched nose			

6. Cup												
7. Eat												
8. Gauteng												
9. Language												
10. Normal												
11. Politics												
12. Restaurant												
13. Run												
14. Rural												
15. Spring												
16. Tomorrow												
17. Visit												
18. Week												
19. Wind												

20. Work	puckered lips											