Book of abstracts

FEAST

27–29 June, 2023

Bergen, Norway

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Department of Linguistics and Modern Languages
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The FEAST conference series

FEAST (*Formal and Experimental Advances in Sign Language Theory*) is the regular forum to discuss formal approaches to sign language grammar (in particular in the generative tradition), experimental approaches to sign languages, and their interaction. FEAST is held as a conference series every one or two years. The next installment will take place at the University of Bergen, Norway, on **June 27th–29th, 2023**. It is organized by the Department for Linguistic, Literary and Aesthetic Studies at the University of Bergen (UiB), and co-organized by the Western Norway University of Applied Sciences (HVL) and The Centre for Sign Linguistics and Deaf Studies of Chinese University of Hong Kong.

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Program

Day 1: Tuesday June 27th

Time	Event
9:00 – 9:30	**Registration & Coffee**
9:30 – 9:45	**Opening**
9:45 – 10:45	**Keynote 1** Kate Rowley: *What factors are important for skilled reading in deaf individuals?* *Research has shown the importance of sound-based phonological skills for word recognition and reading in hearing readers. Hearing readers who struggle with literacy have deficits in sound-based phonological processing which has led to a huge shift in the teaching of phonics to hearing children in the last 20 years. Teaching strategies used there are often applied to deaf children. However, a plethora of research shows that both deaf children and adults do not always utilise sound-based phonological information processing during word recognition and reading. What does this mean for reading development in deaf children? What factors predict reading success in deaf individuals? Research findings from my PhD work will be discussed, in which I explored sound-based phonological processing in deaf adults who are skilled readers. I will present preliminary findings from a UK pilot study on phonics and vocabulary intervention for deaf and hearing children between the ages of four and six (the first two years of British formal education). I will share our findings from my current research about exploring comprehension skills in British Sign Language (BSL) and printed English. Finally, I will identify some gaps in UK-based research and future directions.*
10:45 – 11:30	**On-stage** Yuko Asada: *Shallow resultatives in sign language*
11:30 – 12:00	**Mini-presentations** • Laura Volpato: *A preliminary description of haptices in Italian social-haptic communication: a phonological perspective* • Door Spruijt, Pamela Perniss & Petra Schumacher: *The contribution of individual parameters to perceived iconicity and transparency in gesture-sign pairs* • Philomène Perin, Santiago Herrera, Frédéric Isel & Caroline Bogliotti: *FLexSign: a lexical database in French Sign Language (LSF)*
12:00 – 13:00	**Lunch**

13:00 – 13:45	**On-stage** Elena Fornasiero, Charlotte Hauser & Chiara Branchini: *The comprehension of SRCs and ORCs in LIS: an eye-tracking study*
13:45 – 14:30	**On-stage** Julia Krebs, Ronnie B. Wilbur, Evie Malaia, Isabella Fessl, Hans-Peter Wiesinger, Hermann Schwameder & Dietmar Roehm: *Event structure reflected in muscle activation differences in Austrian Sign Language (ÖGS) verbs: First evidence from surface electromyography*
14:30 – 15:00	**Coffee break**
15:00 – 15:30	**Mini-presentations** • Dietmar Roehm, Julia Krebs & Evie Malaia: *Visual boundaries in sign motion: processing with and without mouthing cues* • Chiara Luna Rivolta, Brendan Costello, Mikel Lizarazu & Manuel Carreiras: *Language-brain entrainment: a crossmodal comparison of spoken and signed languages* • Shengyun Gu: *Processing weak drop by signers and non-signers of Shanghai Sign Language* • Jennifer Sander, Amy Lieberman & Caroline Rowland: *Exploring Joint Attention in American Sign Language: The Influence of Sign Familiarity*
15:30 – 16:15	**On-stage** Anne Wienholz & Annika Herrmann: *Investigating mental rotation and screen arrangement using eye tracking*
16:15 – 17:00	**On-stage** Brendan Costello, Anique Schüller & Marcel Giezen: *Lexical indices in sign language: familiarity and iconicity do not go hand in hand*

Day 2: Wednesday June 28th

Time	Event
9:00 – 10:00	**Keynote 2** Jeremy Kuhn: *Iconicity, scope, and the grammar* *Sign language communicates meaning not only through a combinatorial grammar but also through iconicity – structure-preserving mappings between form and meaning. How do iconicity and the grammar interact? The simplest possible answer is that they interact very little: both communicate meanings, but these meanings are combined intersectively at the level of discourse, like distinct propositions. I will argue that this simple hypothesis is incorrect: at least some iconic meanings are not combined via intersection, and iconic meaning must in general be integrated throughout grammatical composition. I will argue that an illuminating way to think about iconicity is in terms of semantic scope: like logical operators, iconic meanings can take scope at different levels in a logical form. Depending on where the iconic meaning takes scope, it may have different effects on the overall meaning of a sentence, sometimes seeming to disappear completely. I motivate this perspective with data from two different domains: first, iconic modifications of verbs, including pluractional verbs; second, the use of loci to organize discourse referents.*
10:00 – 10:30	**Coffee break**
10:30 – 11:15	**On-stage** Jessica Lettieri, Mirko Santoro & Carlo Geraci: *On Elicited Data in Sign Language Syntax*
11:15 – 12:00	**Mini-presentations** • Kathryn Davidson & Hao Lin: *Polar questions via contraries in Chinese Sign Language* • Marianthi Koraka, Thomas Finkbeiner, Markus Steinbach & Nina-Kristin Meister: *The imperative speech act of command in German Sign Language (DGS)* • Ronnie Wilbur & Sandra Wood: *Experiencer object (EO) constructions in ASL: Another myth bites the dust!* • Basel Rayan, Svetlana Dachkovsky & Rose Stamp: *"Quantifying" in a Young Sign Language*
12:00 – 13:00	**Lunch**

Time	Event
13:00 – 13:45	**On-stage** Guilherme Lourenço & Lorena Mariano Borges de Figueiredo: *Inherently reciprocal verbs in Brazilian Sign Language*
13:45 – 14:30	**Mini-presentations** • Gautam Ottur: *Form and function in serial verb constructions – insights from German Sign Language* • Elena Benedicto: *Agents. What Motion Predicates in ASL reveal about the structural properties of Agent-adding devices* • Sarah Schwarzenberg & Annika Herrmann: *The head for thinking, the eyes for seeing? Investigating the relationship between place of articulation (PoA) and two semantic domains in German Sign Language (DGS)* • Campbell McDermid, Anita Harding & Carrie Humphrey: *Interpretation and the Explicitation Process* • Laurence Gagnon & Anne-Marie Parisot: *Analyzing the relationship between phonological and semantic features in a corpus of astronomical neologisms in LSQ*
14:30 – 15:00	**Coffee break**
15:00 – 15:45	**On-stage** Cindy van Boven: *An experimental approach to sign language reduplication: From function to form*
15:45 – 16:30	**On-stage** Raquel Veiga Busto: *The meaning of reduplication with movement in LSC*
18:00 – late	**Dinner** Café Opera

Day 3: Thursday June 29th

Time	Event
9:00 – 9:15	**Opening, special session: *Non-manuals***
9:15 – 10:00	**On-stage** Martin Dale-Hench & Uiko Yano: *Intuitions of native Japanese Sign Language signers on mouthing words with multiple pronunciations*
10:00 – 10:30	**Coffee break**
10:30 – 11:15	**On-stage** Lyke Esselink, Marloes Oomen & Floris Roelofsen: *Measuring facial non-manual markers with a depth sensing camera: A case-study on polar questions in NGT*
11:15 – 12:00	**Mini-presentations** • Desirée Kirst: *Grammatical and affective layering in ASL: A preliminary study* • Marloes Oomen & Floris Roelofsen: *Biased polar question forms in NGT: The function of headshake* • Nicky Macias: *Mouthing Constructions as Social Indexes in ASL Pronouns*
12:00 – 13:00	**Lunch**
13:00 – 13:45	**On-stage** Clara Lombart: *Manual and non-manual cues used for the prosodic encoding of contrastive focus in LSFB (French Belgian Sign Language)*
13:45 – 14:30	**On-stage** David Blunier & Evgeniia Khristoforova: *Indexicals under role shift in Sign Language of the Netherlands: experimental insights*
14:30 – 15:00	**Coffee break**
15:00 – 15:45	**On-stage** Marloes Oomen, Mirko Santoro & Carlo Geraci: *Neg-raising in three sign languages*
15:45 – 16:45	**Business meeting**
16:45 – 17:00	**Closing**

Abstracts

Day 1

Tuesday, June 27

Keynote 1: Kate Rowley

What factors are important for skilled reading in deaf individuals?

Research has shown the importance of sound-based phonological skills for word recognition and reading in hearing readers. Hearing readers who struggle with literacy have deficits in sound-based phonological processing which has led to a huge shift in the teaching of phonics to hearing children in the last 20 years. Teaching strategies used there are often applied to deaf children. However, a plethora of research shows that both deaf children and adults do not always utilise sound-based phonological information processing during word recognition and reading. What does this mean for reading development in deaf children? What factors predict reading success in deaf individuals? Research findings from my PhD work will be discussed, in which I explored sound-based phonological processing in deaf adults who are skilled readers. I will present preliminary findings from a UK pilot study on phonics and vocabulary intervention for deaf and hearing children between the ages of four and six (the first two years of British formal education). I will share our findings from my current research about exploring comprehension skills in British Sign Language (BSL) and printed English. Finally, I will identify some gaps in UK-based research and future directions.

Shallow resultatives in sign language Yuko Asada (Showa Women's University)

Research questions. It has been reported that sign languages (**SLs**) allow resultative constructions with the word order S(ubject)-O(bject)-V(erb)-R(esult) (**SOVR**) (see Loos [2] for German SL (**DGS**), Pasalskaya [3], Kimmelman et al. 2020 for Russian SL (**RSL**)). Japanese SL (**JSL**), an SOV language, also exhibits this order to express a result state, as illustrated in (1a–b). However, upon closer examination, these data raise two research questions (**RQ**):

RQ1: Typological studies of resultatives in spoken languages (Nedjalkov 1988, Haider 2016) have shown that SOV languages have the **SORV** order, and the **SOVR** does not seem to be attested. If **SOVR** is observed only in SLs, it raises the question of why this should be so.

RQ2: In **SOVR** sentences in JSL, resultative predicates can appear recursively (see (1a–b)) to describe one single change-of-state event (not conjoined separate events). However, the unbounded occurrences of resultative expressions are not subject to Tenny's (1994) ([4]) "single delimiting constraint," stating that the event described by a verb may be delimited only once, which bans examples such as (2) in English. What explains this violation?

Inchoative sentences in JSL. JSL has inchoative/implicit causative sentences that express temporarily telic events such as (3), in which adjectival predicates appear in clause-final position without an overt verb such as BECOME or MAKE. Importantly, the predicates in this construction may occur recursively as shown in (3), in a similar manner to the **SOVR** examples in (1a–b). There are two other similarities with **SOVR** sentences. First, the two constructions require non-manual markers (NMMs) that mark the degree or intensity of the result state of the event, such as widened eyes and eyebrow furrowing, as shown in (3)–(4). Second, both inchoative and **SOVR** sentences typically occur with sentence-final pointing (IX) that refers to the theme argument of a change-of-state event (and not the causer subject), as seen in (3)–(4). These observations suggest that the two constructions are related.

Analysis. Adopting the functional layering approach to resultatives (Embick 2004, Folli & Harley 2020), I propose that **SOVR** sentences in JSL are structurally analyzed as VoiceP-vP$_{\text{CAUSE}}$ coordination as shown in (5). The first conjunct, VoiceP, represents the manner of a causing event such as *painting the car*. The second conjunct is headed by v$_{\text{CAUSE}}$, which selects a small clause Res(ult)P to represent a caused change-of-state event such as *the car becoming red*. This apparently "heavy" coordinate structure is not as heavy when realized in phonology. This is because Voice and v$_{\text{CAUSE}}$ heads and the predicative coordinator & may be covert in JSL, and crucially, signers can consecutively represent the direct object of the causing verb in VoiceP, which becomes the subject of the result predicate in ResP, using a well-known strategy in SLs: weak hand (h2) holds. As shown in (6), the theme argument in the vP that appears on the h2 may be held as a classifier or a fragment buoy (Liddell 2003) until it reaches the end of the clause. The proposed bi-phrasal analysis is supported by two observations: i) **SOVR** allows both narrow and wide scope readings with the repetitive modifier AGAIN (7), which can take the whole resultative event in its scope (in the context "the man painted the car red before.") or scope solely over the causing event ("the man painted the car before.") (cf. Hopperdietzel 2021); ii) the rightward *wh*-movement of a subject across VoiceP and vP$_{\text{CAUSE}}$ is available (8), just as we expect (this type of *wh*-movement is also possible in DGS ([2]) and RSL ([3])).

Answer to RQ2. This proposal captures the recursion of result states, as found in (1a–b), because these examples are instances of coordination, in which resultative predicates can be adjoined unboundedly. In this sense, these **SOVR** sentences differ from "standard" resultative constructions of the type *He painted the car red* in English, generally assumed to be mono-clausal, as analyzed as in (9) (Ramchand 2008, Folli & Harley 2020, Hopperdietzel 2021). The violation to Tenny's generalization in **SOVR** examples (1a–b) is therefore not surprising.

Answer to RQ1. Why are **SOVR** sentences attested in SLs? While further cross-linguistic investigations are needed, as a tentative answer to this question, I would attribute the presence of **SOVR** in SLs to the general preference for shallow structures in the process of linearization in the visual modality. It has been argued that center-embedding of heavy constituents in SLs is substituted for other strategies such as the use of signing space, role shift, or movement to the right or left periphery to reduce the processing overload (Geraci et al. 2008, [1], and others). I suggest that coordination, such as in JSL resultatives proposed here, is another option to flatten an otherwise heavier **SORV** structure into a shallower, bi-phrasal one. In the case of **SOVR** in JSL, I do not adopt the movement analysis that moves the predicate in ResP out of the VoiceP to its right as in **SORVR**, based on evidence such as scope interpretation data (see (7)).

SOVR in spoken languages. Why, then, is the **SOVR** order not attested in spoken languages? A bi-clausal structure as in (5) should be available in all languages, but I would argue that in spoken languages, this type of structure does not yield an **SOVR** surface order but instead to a longer **SOV&ORV** sequence of the type "The man painted the car **and turned it** in red." because they lack phonologically null forms of elements in this construction, such as a theme argument or a causative verb. In contrast, in sign languages, these elements may remain covert since multiple articulators such as h2 or NMMs are available to recover the semantics of the null elements. As seen above, in JSL (6), the theme argument in the first conjunct, 'the car,' becomes covert in the second conjunct, but the weak hand hold of this sign helps to convey the meaning. The causative verb v_{CAUSE} is also covert, but the clause-final NMMs deliver the telic, resultative reading of the sentence. Spoken languages do not have these strategies. This is why phonologically shorter—more economical—**SORV** sentences are selected for resultatives.

How deep we can go. The proposed analysis has implications for the exact structural "depth" permitted for complementation to survive the process of externalization in the SL modality without resorting to rescue strategies such as role shift or movement. Previous studies provide evidence that in several SLs, the number of phase-defining functional heads (henceforth, **F-heads**) permitted inside a complement of a VoiceP is limited to one, as shown in (11)–(12) from Italian SL (see also Göksel & Kelepir 2016 for Turkish SL, Loos 2018 for DGS), assuming that F-heads include C, Voice, v_{CAUSE}, and Res. Interestingly, this threshold depth—one F-head inside a complement of a VoiceP—also seems to apply to **SOVR** in JSL: instead of a complementation structure embedded inside an **SORV**, resultatives opt out for a coordination structure that can contain two F-heads, v_{CAUSE} and Res. The question of whether this restriction generally holds with other complementation phenomena in SLs is left for further research.

Data (based on unanimous judgments by four native signers in one-on-one interviews)

(1) a. MAN CAR PAINT RED, (BRIGHT, CLEAR). 'The man painted the car red, (bright, clear).'
    b. WOMAN CLOTH WASH CLEAN, (WHITE). 'The woman washed the clothes clean, (white).'

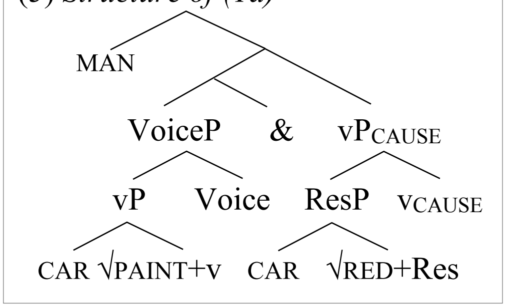
(2) *John washed the clothes clean white. ([4]:154)

(3) ***Inchoative*** eye widening
    TWO DAYS LATER CAR RED, BRIGHT, IX(*man/car).
    (The man had been painting the car and…)
    'Two days later, the car became red, bright.'

(4) ***SOVR*** eye widening
    MAN CAR PAINT RED, BRIGHT, IX(*man/car).
    'The man painted the car red, bright.'

(6) h1: MAN CAR PAINT CAR RED (IX(car))
    h2: CAR CAR.CL------------------------
    'The man painted the car red.'

(5) *Structure of (1a)*



Shaded signs are phonologically covert.

(7) IX3 CAR AGAIN PAINT RED. 'He painted the car red again.' <wide & narrow readings>

(8) WHO CAR PAINT RED WHO? 'Who painted the car red?' (NMMs omitted)

(9) [$_{VoiceP}$ he [$_{Voice'}$ **Voice** [$_{vPCAUSE}$ **VCAUSE** +√paint [$_{ResultP}$ the car [$_{Res'}$ [**Res** [$_{aP}$ red]]]]]]]

(10) MAN CAR RED (BRIGHT) PAINT. 'The man painted the car to turn it in red, (bright).'

(11) *[**VoiceP** GIANNI [**CP** [**VoiceP** PIERO BIKE FALL]] TELL]. (cf. [PIERO BIKE FALL] GIANNI TELL.)
    'Gianni said that Piero fell off the bike.' <*sentential-like complement*> ([1]: 103)

(12) a. [**VoiceP** COOK [**VoiceP** MARIA [$_{vP}$ MEAT EAT]] FORCE].
    'The cook forced Maria to eat meat.' <*object control complement*> ([1]: 105)
    b. *[**VoiceP** GIANNI [**VoiceP** MARIA [**VoiceP** MARIA MILK BUY] WARN] FORGET].
    'Gianni forgot to remind Maria to buy milk.' <*sentential-like complement*> ([1]: 109)

Selected references

[1] Geraci, C., & V. Aristodemo. 2016. An in-depth tour into sentential complementation in Italian Sign Language. In *A matter of complexity: Subordination in sign languages,* 95–150. Berlin: De Gruyter Mouton.

[2] Loos, C. 2017. The syntax and semantics of resultative constructions in Deutsche Gebärdensprache and American Sign Language. PhD. dissertation.

[3] Pasalskaya, E. 2018. Syntactic properties of resultative constructions in Russian Sign Language. In *SLE 2018 Book of abstracts*, 311.

[4] Tenny, C. L. 1994. *Aspectual roles and the syntax-semantics interface.* Dordrecht: Kluwer Academic Publishers.

Abstract FEAST 2023
Laura Volpato, PhD at Ca’ Foscari University of Venice

Title: A preliminary description of haptices in Italian social-haptic communication: a phonological perspective

Type of contribution: mini-presentation

This contribution discusses the “phonological” structure of haptices, i.e., the components of social-haptic communication used by deafblind individuals and their caretakers, and their interpreters.

According to the Nordic definition, deafblindness is a combined vision and hearing impairment of such severity that it is hard for the impaired senses to compensate for each other. To varying degrees, deafblindness limits activities and restricts full participation in society (World Federation of the Deafblind). Deafblind people use a wide variety of communication methods, mostly based on touch.

Social-haptic communication (SHC) is a communication method consisting of brief tactile messages performed on the body of the deafblind person to convey environmental information and the emotional feedback of the interlocutor (Raanes & Berge, 2017; 2021). Social-haptic messages (*haptices* or *haptic signals*) are articulated on different body areas (mostly back, upper arm, hand, leg/knee, and foot – Bjørge et. al. 2015). SHC can help deafblind people to understand better what happens around them and, hence, to be more in control of the situation. SHC can be used by any deafblind person, disregarding the preferred communication method.

SHC originated in the 90s in Northern Europe from the negotiation between deafblind individuals and their communication partners (e.g., interpreters, family members, etc.). Since then, different countries developed and spread different SHC codes (e.g., Denmark, Finland, Norway, Sweden, the Netherlands, etc.), while remaining mostly unknown in many other countries. Within the Erasmus+ project *Social Haptic Signs for Deaf and Blind in Education*, new haptices were created in Italy, where only a few haptic signals existed and were informally used in home environments. The Italian deafblind community was involved since the very beginning of the project as co-creator of the project outcomes (inspired by Community-based participatory research - CBPR -, Coughlin et al. 2017). 9 deafblind individuals with different degrees of residual hearing/sight, coming from the North of Italy, were involved in the collection and co-creation of haptices. Despite COVID-19, training sessions about SHC were provided, followed by online negotiation meetings, resulting in a first in-person test of the haptices in Summer 2022. The negotiated haptices are now 87.

Even if social-haptic communication is attested as a method of communication and not as a natural language, a phonological-like structure can be observed if we consider the smallest units of touch individuated by Lahtinen (2008) called *haptemes* (handshape, place of articulation, pressure, duration, speed, movement, and size of movement). Haptemes can create minimal contrast in haptices.

In this contribution, the haptices will be discussed from a “phonological” perspective. In particular, haptemes such as the place of articulation and the handshape will be analyzed, illustrating the factors that may possibly influence their choice. Handshapes will be described adopting the same coding used for the handshapes in Italian sign language. Amongst others, ergonomics and touch sensitivity will be addressed as possible factors determining the selection of a specific place of articulation and a specific handshape.

Touch sensitivity seems to play an important role in the choice of both the place of articulation and the handshape. Different body surfaces have different density of tactile receptors (Corniani & Saal, 2020; Gallace & Spence, 2014), therefore the degree of perception that a handshape can guarantee on different body areas is a relevant factor in the phonology of haptices. For instance, handshape 5 (all five fingers – spread, not spread, flat closed, curved open, closed) (Branchini & Mantovan 2020) was repeatedly selected, possibly due to the large contact surface that it offers – hence the clearer perception that it permits. Instead, G handshape (the index finger is extended and other fingers are closed) offers a more limited contact surface and has been chosen for a lower number of haptices (usually when a precise line needs to be drawn).

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Bjørge, H. K., Rehder, K. G., Øverås, M., & Helen Keller National Center. (2015). *Haptic Communication: The Helen Keller National Center's American Edition of the Original Title Haptisk Kommunikasjon*. Helen Keller National Center.

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The contribution of individual parameters to perceived iconicity and transparency in gesture-sign pairs – mini-presentation

Door Spruijt[a], Pamela Perniss[a], Petra Schumacher[a]
[a] University of Cologne

Introduction Sign languages are characterized by a high degree of iconicity in the lexicon, such that many signs can be described in terms of a resemblance relationship between form and meaning. The iconicity of signs is accessible to both signers and non-signers, and studies have shown that the language-specific knowledge of signers and the gestural repertoire of hearing non-signers influences the perception of iconicity in lexical signs[3][5][6][7]. Knowledge of the phonological structure of signs (e.g. knowing that the non-selected fingers are unlikely to be iconically mapped)[7] as well as knowledge of the etymology of signs[8] and of the structure of lexical networks within a sign language[3] may differentially influence judgements about the degree of iconicity as measured by iconicity ratings. While mappings on the level of sublexical elements seem to contribute to these judgments, the degree to which separate phonological characteristics of signs are perceived as iconic remains largely unclear[1][2]. Furthermore, while the gestural repertoires of sign-naïve adults are often cited as influencing the perception of iconicity in signs, there has been little systematic investigation of how this is mediated by the iconicity of (silent) gestures[4][5][6][7]. We propose a study that applies a combination of existing methodologies to the domain of perceived iconicity, taking into account both formational properties of the item and the gestural knowledge of the rater. This will result in a database of gestures that are pervasive in the gestural repertoires of speakers, the signs corresponding to the same concepts, and iconicity ratings for each of these items. **Embedding** This study is part of a larger project investigating the roles of iconicity, phonology and gestural knowledge in lexical learning in L2M2 (second language, second modality) acquisition of DGS (*Deutsche Gebärdensprache,* German Sign Language) by German hearing adults. As a proxy for the actual learners' gestural repertoire, we elicited silent gestures from 16-20 different German sign-naïve adults[1]. We matched pervasive gestures (i.e. gestures produced by >50% of the participants) to corresponding DGS signs to create a database of a total of 120 sign-gesture pairs across six conditions, determined by the degree of formal overlap between sign-gesture pairs (high-low) and the parameter (handshape-location-movement) which overlaps or not[5]. To be able to control for the characteristics (including formal features and iconicity) of the (DGS) items in the larger L2M2 acquisition study, the current study creates norming data by eliciting transparency and iconicity judgments made by sign-naïve adults for all items (i.e. 120 signs and 120 corresponding silent gestures for the same concepts). **Task** The task will consist of two parts. In the first part, participants will be asked to guess the meaning of the items (gesture or sign) as a measure of transparency. In the second part, they will be shown items alongside their meaning and asked to rate the degree to which the form evokes the meaning (measuring iconicity) on a 7-point Likert-scale. Participants will provide four ratings for each item: one for the whole gesture/sign, and one for each of the three parameters (handshape, location and movement). **Participants** We aim to obtain ratings by 320 German sign-naïve hearing adults so that each item will be rated 40 times. To achieve this, we will construct an online experiment consisting of subsets of items.[10] Each participant will be shown 60 items (30 meaning guesses and 30 iconicity judgements). **Analysis** Since the primary goal is to norm the stimuli set, we will foremost use the data to assign average ratings to the items. However, several predicting factors can be identified, and will be tested in statistical analysis: item type (gesture-sign), formational overlap between signs and gestures (high-low), parameter overlap (handshape-location-movement). **Expectations** The gestures to be rated were selected from

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1 Partially collected by the authors, partially in another ongoing project in the same lab.

the previously collected data set based on being produced in a similar way by >50% of participants in a silent gesture task[5]. We expect this systematicity (or agreement) to be reflected in the iconicity ratings for the silent gestures[9], with more correct meaning guesses for items with more agreement and a positive correlation between ratings and the amount of agreement (i.e. between 50%-100%). For DGS signs, we may expect lower iconicity ratings in comparison, due to phonological changes abstracting away from iconicity[5]. Since gesture-sign overlap influences the perception of iconicity[5], high-overlap signs are expected to be rated higher than low-overlap signs. For the same reason, we expect the iconicity ratings for the individual parameters to correlate positively with overlap between gesture and sign in this parameter. **Limitations** A potential limitation of this study is given by the selection of the items. Representational gestures, as produced for concepts in silent gesture tasks, are assumed to be highly iconic[9]. Since we are interested in gesture-sign pairs that differ in formal overlap, we can expect that the signs with high formational overlap with silent gestures will also be highly iconic. Even the low-overlap signs (note: we specifically do not use no-overlap signs) will contain iconic elements, as they are selected to have one overlapping parameter with the gesture. Considering this, our item set may be skewed towards the iconic range of the spectrum. This may be a less ecologically valid representation of sign language lexicons, but it enables us to determine the relative iconicity of gestures and signs. **Conclusion** With the proposed methodology, we expect to (i) reveal the contribution of individual parameters in the perception of iconicity by sign-naïve adults, and (ii) quantify the iconicity of gestures relative to (iconic) signs for the same concepts. The data will result in a normed database of pervasively used silent gestures and corresponding signs, as well as a task that can be reused for different studies.

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FLexSign: a lexical database in French Sign Language (LSF)

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Keywords: LSF, lexical database, frequency, concreteness, iconicity

In psycholinguistics, few studies have been conducted on sign languages to understand language processing mechanisms, whether in reception or in production. To do so, researchers need to have accurate psycholinguistic information about the linguistic material they use. They can then observe behavioral or neurophysiological responses and thus the associated language processing mechanisms. This is the case independently of the modality of the studied language, both in spoken language (Ellis, 2002; Adorni and Proverbio, 2012; Barber et al., 2013) and sign language (Bosworth and Emmorey, 2010; Emmorey et al., 2020). Among the normed sign lexical databases, two seem particularly interesting for psycholinguistic research and for us because of their interface and the way the data were collected: in American Sign Language, ASL-Lex (Caselli et al., 2017) with nearly 3000 signs and in Spanish Sign Language, LSE-Sign (Gutierrez-Sigut et al., 2016) for nearly 2400 signs.
The present study aims to propose the first interactive lexical database, inspired by ASL-Lex (Caselli et al., 2017), for LSF: FlexSign. The FlexSign database includes familiarity, concreteness and iconicity data for 550 signs of LSF. We chose to focus on these three factors which are known to influence the speed or the accuracy of lexical processing. Familiarity is known to generate a robust facilitative effect on sign processing in ASL: according to Emmorey et al. (1991), highly familiar ASL signs elicit significantly faster responses than less familiar signs. Moreover, familiarity and lexical frequency are known to be correlated (in English: Stadthagen-Gonzalez and Davis, 2006). Concreteness also has a documented role in lexical processing: as in spoken language with concrete and abstract words, Emmorey et al., (2020) report that concrete signs in ASL are recognized and processed faster than abstract signs in a lexical decision task. The last factor is the sign iconicity, a complex but central notion of signed languages which plays a crucial role in the creation and organization of sign language lexicons. Therefore, having information on the iconicity of LSF signs would help to better understand its role in lexical processing.
These previous findings largely encouraged us to develop a LSF lexicon database with familiarity, concreteness and iconicity data. For this work, we solicited 41 raters, all deaf people, which distinguishes us from other lexical sign databases. Ratings for each factor were collected through an online questionnaire using a 5-point Likert scale. Raw scores are provided with their normalized values as well. The sign videos were produced and provided by us.
Having norms on these three factors on a part of LSF lexicon is a necessary step before one can design and conduct psycholinguistic experiments on lexical access in LSF.
We know that this database will be of great use to sign language researchers as it provides linguistic information that has not been unavailable until now. This FLexSign database will be open to future contributions and allow many opportunities on both experimental and clinical levels.

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The comprehension of SRCs and ORCs in LIS: an eye-tracking study

Elena Fornasiero, Charlotte Hauser, Chiara Branchini

Introduction. The literature supporting the universality of the subject advantage predicted by the Noun Phrase Accessibility Hierarchy (Keenan & Comrie 1977) mainly includes studies investigating the processing of subject (SRCs) and object relative clauses (ORCs) in L1 speakers of Indo-European languages (see Lau & Tanaka 2021 for overview) displaying externally headed relative clauses (EHRCs). Interestingly, the scarce literature addressing the production of relative clauses in children and adult L2 learners of languages displaying both EHRCs and internally headed relative clauses (IHRCs), such as Korean (e.g. Kim 1987; Jeon & Kim 2007) and Cantonese (e.g. Yip & Matthews 2007), casts doubt on the validity of the subject advantage across languages, relative clause types and populations, by showing that the internally headed strategy is selected to avoid the complexity of ORCs, while EHRCs are used for SRCs. These studies suggest a correlation between relative clause typology and syntactic complexity, assuming that the internally headed typology is syntactically easier, thus asymmetries between SRCs and ORCs are less expected or can be harder to detect. The pioneering study by Hauser et al. (2021) sheds new light on this domain by comparing the comprehension of SRCs and ORCs across three populations of Deaf signers (natives, early and late learners) through a picture-matching task in three typologically different sign languages: French Sign Language (LSF) displaying EHRCs, Italian Sign Language (LIS) and Catalan Sign Language (LSC) featuring IHRCs. Results reveal a clear subject advantage in LSF and LSC, while in LIS the asymmetry only surfaces in Deaf late signers (exposed to LIS between 6 and 15 yo). All in all, these findings show that the subject advantage might be harder to detect in IHRCs since it surfaced only in "special" populations. Therefore, more experiments adopting different methods and involving different populations are needed. Further research on this domain can also contribute to the theoretical debate about the source (e.g. cue-based or structure-based) of the subject-object asymmetry. The present study aims at filling these gaps by investigating the processing of internally headed SRCs and ORCs in LIS, through a time-sensitive method, across three populations of adults: Deaf native signers (exposed to LIS from birth), Deaf non-native signers (exposed to LIS after 1 yo), and LIS/Italian CODAs (Children of Deaf Adults), namely hearing individuals who acquired LIS (from their Deaf parents) and Italian from birth. CODAs' linguistic abilities are particularly interesting to study since LIS and Italian vary greatly in their grammars: LIS is a SOV language featuring IHRCs, while Italian is a SVO language displaying EHRCs.

Goals. The goal of this study is two-fold: (i) to assess the asymmetry between subject and object relative clauses in a sign language displaying the internally headed strategy using an eye-tracking paradigm; (ii) to investigate whether the asymmetry is found across different populations of signers.

The study. The study adopts the eye-tracking Visual-only World Paradigm adapted to sign language by Hauser & Pozniak (2019). In this paradigm, the participant simultaneously sees two pictures representing the same event involving the same referents (albeit with inverted theta roles) and a slowed-down video of a signed subject or object relative clause on a computer screen. (1) and (2) exemplify the LIS relative clauses that we used as stimuli.

(1) SRC: IX$_2$ PRINCESS LOOK_AT. [PRINCESS$_i$ FENCER DRAW PE$_i$] (IX$_2$) CHOOSE

'Please find the correct princess, that is the princess that draws the fencer.'

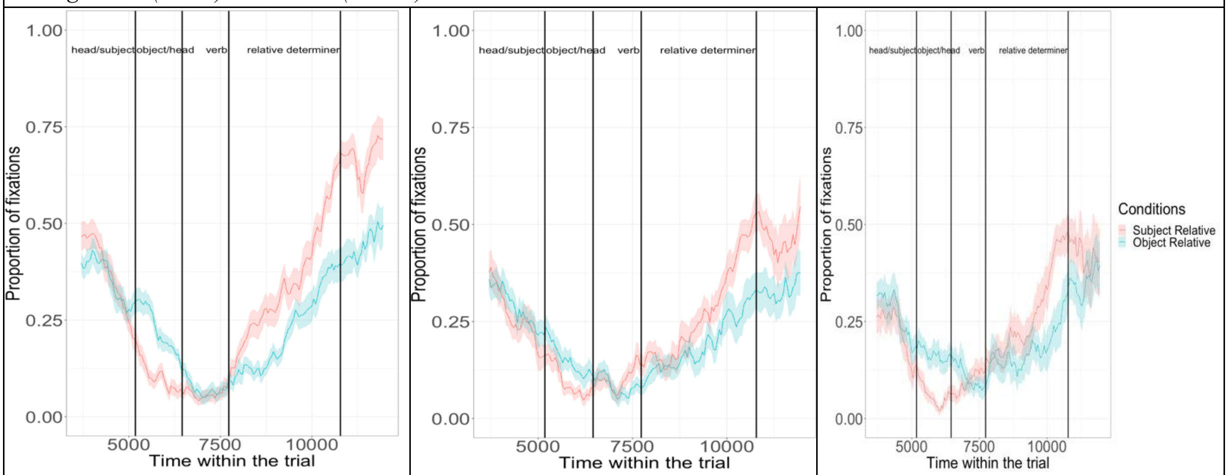
(2) ORC: IX2 PRINCESS LOOK_AT. [FENCER PRINCESS$_i$ DRAW PE$_i$] (IX2) CHOOSE
‘Please find the correct princess, that is the princess that the fencer draws.’

Participants are asked to select the correct picture corresponding to the video stimulus by fixating the gaze on it as soon as they are certain of the correct answer, and to confirm their answer by pressing the left or right button on a response device once the video ends. In so doing, both online (eye data - recording starts at the onset of the relative clause and ends at the offset of the relative determiner “PE”) and offline (button accuracy) responses are recorded. We collected data from 17 Deaf native signers (mean age: 35,57 yo; SD: 9,34), 13 Deaf non-native signers (mean age: 36,73 yo; SD: 8.81), and 21 CODAs (mean age: 38,23 yo; SD: 11,51).

Results. The eye-tracking data show a clear difference across RC types for CODAs (interaction between Time and relative clauses type: Est.= 0.01, t=25.05, $p<1.25^{e-137}$), with the correct answer being fixated earlier and more accurately in SRCs than ORCs (Tab. 1a), whereas no asymmetry is observed in Deaf native (Tab. 1b) and non-native signers (Tab. 1c).

Tab. 1 Eye-tracking data

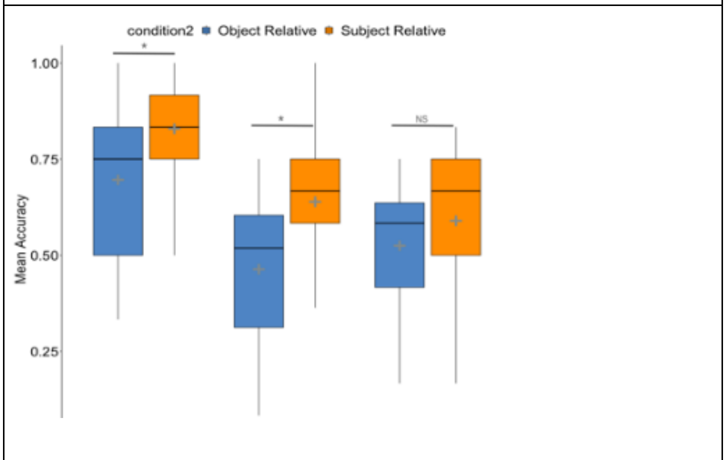
Black bars indicate mean position of sentence elements for both SRC and ORC, from left to right: head$_{(src)}$/subject$_{(orc)}$; object$_{(src)}$/head$_{(orc)}$; verb; relative determiner. Time is sequenced in 50ms time bins within which the proportion of fixations to different areas is calculated: each data point represents the proportion of fixations that the correct picture received when seeing a SRC (in red) or an ORC (in blue).



a. CODAs	**b.** Deaf native signers	**c.** Deaf non-native signers

As for accuracy (Tab. 2), we found an asymmetry between the two conditions SRC and ORC across populations that is significative for CODAs (Est.=0.77, t=3.42, p<0.0006) and native signers (Est.=0.79, t=3.59, p<0.0003), with CODAs (Tab. 2a) outperforming both Deaf native (Tab. 2b) and non-native signers (Tab 2c).

Tab. 2 Accuracy data *(a: CODAs; b: Deaf native signers; c: Deaf non-native signers)*



a.	**b.**	**c.**

Discussion. The data show that a subject advantage is indeed detected in LIS internally headed relative clauses, albeit being more consistent and salient in CODAs, thus showing that the predictions of the Noun Phrase Accessibility Hierarchy hold across relative clause typologies (EHRC and IHRC), modalities (spoken and signed) and populations (here, CODAs and Deaf native signers). From a theoretical perspective, these findings show that the subject advantage in LIS cannot be explained by considering canonicity effects (e.g. Sekerina 2003) or linear distance (e.g. King & Just 1991), since ORCs are more difficult to understand despite displaying unmarked SOV word order and a shorter linear distance between the head and the head-marker PE (which identifies the head noun by spatially agreeing with it). Rather, our data provide evidence for the validity of structural accounts ascribing the source of the asymmetry between SRCs and ORCs to the structural distance between the head noun and the gap, and the dependency created through (overt or covert) movement of the head (e.g. Cole 1987; O'Grady et al. 2003). Indeed, although LIS relative clauses do not involve the overt movement of the noun head, they display the overt movement of the determiner PE from an adnominal position, next to the head noun (a clause-internal D-position), to a clause-external C-position in the right periphery of the relative clause (Branchini & Donati 2009; Branchini 2014). The dependency created by the movement of PE is longer and the structural position of the gap left by PE is more embedded when the head is the object, thus making ORCs more complex even within the internally headed type. To explain CODAs' better performances, we could look into so-called bilingualism-related cognitive advantages, such as enhanced cognitive and attentional control or faster attention swift (e.g. Bialystok et al. 2004; Sorace 2010; Ostadghafour & Bialystok 2021), that can make them better at performing such a complex task (here participants had to make decisions while watching simultaneously two sets of three characters plus a signed video). Additionally, bimodal bilingualism might also provide CODAs with the ability to transfer the metalinguistic knowledge of their spoken language (that they develop at school) to analyze the structures at play in their signed language in a more systematic way as compared to Deaf people, whose exposition to one or both languages is often delayed or reduced because of the lack of a bimodal bilingual (here, LIS-Italian) input in both private and socio-educational contexts.

Conclusions. This is the first eye-tracking study assessing the subject-object asymmetry in a sign language featuring IHRCs and the first study to test the comprehension of complex structures in bilingual CODAs. Our results confirm the predictions of the Noun Phrase Accessibility Hierarchy advanced for spoken languages and the validity of structural accounts to explain the subject-object asymmetry, while also raising interesting questions regarding a possible advantage of bimodal-bilingualism in understanding complex sentences.

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Event structure reflected in muscle activation differences in Austrian Sign Language (ÖGS) verbs: First evidence from surface electromyography.

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For different sign languages, specific linguistic structures have been described as showing more tensed or accentuated articulation, or characterized by specific dynamic qualities or manner of movement (Klima & Bellugi, 1979). For Austrian Sign Language (ÖGS), such specificity has been noted for imperative sentences or intensified adjectives (e.g., *very cold*) (unpublished data). Qualitative descriptions of manner of movement are mainly based on visual inspection of 2D video material. In the present work, we used electromyographic (EMG) measurements to evaluate arm muscle activation for two verb types in ÖGS, i.e. telic verbs (involving an endpoint, such as *arrive*) and atelic verbs (lacking an endpoint, such as *analyse*). Based on 2D video analysis, Schalber (2006) noted that the two verb types differ in phonological structure. Telics show a rapid movement (deceleration) to a complete stop (EndState morpheme) which is realized in changes of the shape and orientation of the hand(s) or changes of setting (cf. Wilbur, 2008). Kinematic data analysis (motion capture) confirmed this observation and showed that telic verbs are characterized by shorter duration, higher accelerations and jerks, and higher deceleration at the end of the sign compared to atelic verbs (Krebs et al., 2021).

The telic and atelic signs (10 per category) were produced individually by a Deaf fluent signer (EMG data was collected simultaneously with kinematic data reported in Krebs et al., 2021). EMG electrodes were placed according to SENIAM (http://www.seniam.org/) guidelines at four arm muscles (m. extensor digitorum, m. flexor digitorum, m. biceps brachii and m. triceps brachii) of the dominant (right) arm and connected to a sensor unit of the EMG System (Ultium™ EMG, Noraxon). Data was collected at 2000 Hz; filtered (Butterworth low at 300 Hz, then high at 10 Hz), and smoothed (root mean square with a moving window of 151 data points (0.0755 s)). EMG mean (averaged EMG signal), EMG max (peak in EMG signal) and EMG integral (area under the EMG signal curve) were analyzed for sign phase (time interval between sign onset and sign offset) as well as hold phase (time interval after sign movement ended and the hands were held in space, i.e. before sign offset). Sign onset was defined as the video frame when the target handshape reached target location from where sign movement started (Wilbur & Malaia, 2008). Sign offset was defined as the video frame when the hand changed its shape or orientation or moved away from the final position.
Additionally, the phonological form of the signs was analyzed, whereby movement type (path or local) movement direction, repetition, handedness, finger flexion, contact of hands and sign location was examined. Verbs were selected based on interview data from Deaf fluent signers (conjunction

test, Borik, 2006). The telic verbs used in the study were THROW, CATCH-UP, TAKE, DISAPPEAR, CHANGE, ARRIVE, DIE, RELAX, STEAL, SUGGEST. The atelic verbs used in the study were TRAVEL, COLLECT, SHAVE, CHASE, WRITE, PAINT, SEW, EXAMINE, ANALYZE, and SWIM.

WRITE

THROW

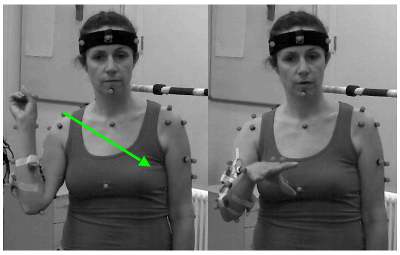

Figure 1. Examples for atelics (WRITE) and telics (THROW) in ÖGS. The atelic sign WRITE shows a repeated circular path movement; the telic sign THROW shows a single linear path movement as well as a handshape change (close -> open).

Data analysis revealed that the upper arm muscles showed significantly higher muscular activity in telic than atelic verbs: more activation was revealed in EMG max and EMG mean in the biceps in the sign phase; more activation was shown by EMG mean value in the hold phase after the sign in the triceps (see Table 1). For atelics, higher muscular activity was revealed in the forearm: higher activation was observed in the EMG integral in the extensor and flexor digitorum in the sign phase. Combining EMG results with the available kinematic data and the information about the phonological structure of the signs indicates that endpoint marking in telic signs, which is characterized by higher acceleration, jerk and deceleration at the end of a sign, is produced via higher activation in upper arm muscles in the sign and hold interval in telics as compared to atelics. It is further observed that the repeated arm/hand movement involved in the majority of the atelics (n=8), but absent in telics, requires more intense muscle activation in the forearm in the production of atelics compared to telics.

To the best of our knowledge, this is the first EMG analysis investigating muscle activation during sign language production. The presented data provide insight into the muscles involved in producing the difference in sign articulator dynamics between event types in ÖGS. EMG analysis provides new insight into how sign production is generated and helps to understand the muscle activation that affects linguistically relevant distinctions in sign languages. Research in this field not only informs about the grammar of sign languages, but also can contribute to the development of training methods and approaches for sign language learning.

Muscles (time interval)	**Upper arm muscles**			**Forearm muscles**	
	biceps - EMG max (sign phase)	biceps - EMG mean (sign phase)	triceps - EMG mean (hold phase)	extensor digitorum - EMG integral (sign phase)	flexor digitorum - EMG integral (sign phase)
atelics	33.4 (14.0)	15.7 (6.3)	2.2 (0.9)	46.6 (19.0)	20.4 (11.5)
telics	51.2 (26.3)	21.7 (7.8)	3.0 (0.4)	25.1 (7.1)	8.7 (2.7)
p-value	0.08	0.07	0.03	0.01	0.01

Table 1. Muscle activation. EMG-values in %; standard deviations in parentheses

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Visual boundaries in sign motion: processing with and without mouthing cues

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Sign languages allow investigation of the hypothesis that language processing builds on neural circuitry underlying general, non-linguistic abilities – such as the ability to identify, parse, and interpret actions. Sign languages utilize articulator motion profiles similar to motion profiles of observed events, conveying event-based semantics and constructing grammatical features such as aspect. Studies of unrelated sign languages indicate that event structure, expressed by verbs and their arguments, is overtly expressed in verb sign dynamics, manifesting Event Visibility (cf. Malaia & Milković, 2021). For instance, signs denoting an event with an endpoint (telic verbs, e.g. English ‘fall’) have a sharper final movement with rapid deceleration to a stop. In contrast, verbs denoting an ongoing event, or one without an inherent endpoint (atelic verbs, e.g. English ‘sleep’), might be conveyed by a steady movement without rapid acceleration profile (Wilbur 2008). Remarkably, visual event structures of sign language verbs are recognized by hearing non-signers without any knowledge of sign language. In an alternative-forced-choice task, hearing non-signers were found to associate unfamiliar (pseudo-)signs involving a dynamic visual boundary with telic events (Strickland et al. 2015). Non-signers also were found to neurally process the perceptual-kinematic difference between atelic and telic verbs in American Sign Language (Malaia et al. 2012). In this study, we first assessed the timeline of neural processing mechanisms in non-signers processing telic/atelic signs to understand the pathways for incorporation of physical-perceptual motion features into the linguistic system. Experiment 2 further probed the possible impact of visual information provided by mouthing (speech decoding based on visual information from the face of the speaker, most importantly, the lips) on the processing of telic/atelic signs in non-signers. Hearing German speaking non-signers (N=27) were presented with telic and atelic verb signs unfamiliar to them, which they had to classify in a two-choice decision task (cf. Strickland et al. 2015). The stimuli consisted of signs from unrelated sign languages (Turkish, Italian, Croatian and Dutch). Behavioral data analysis confirmed that non-signers could classify

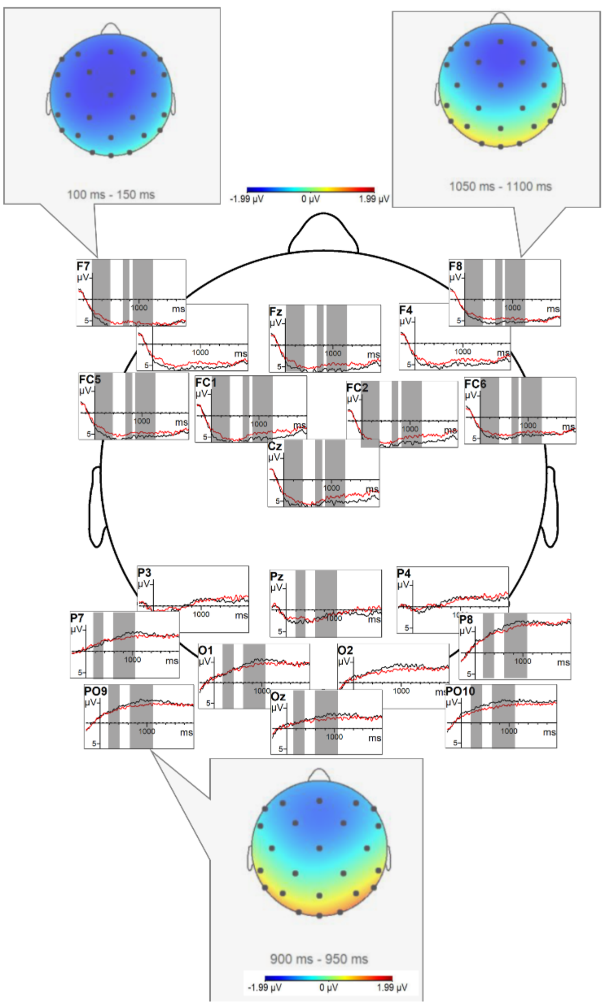

Figure 1. Telic/atelic sign processing without non-manual cues

telic/atelic verbs, whereby telics were easier to classify than atelics. Processing differences for atelic compared to telic sign stimuli were revealed at the neurophysiological level (Figure 1). Beginning from sign onset (i.e. target handshape positioned in target location), statistically significant neural differences in processing appeared anteriorly (0-200ms, 650-800ms, 850-1300ms), posteriorly (600-1050ms), and in a broadly distributed manner (200-400ms). The timing and distribution of ERP effects appear to reflect both the differences in perceptual processing of verb types and the integration of perceptual and linguistic processing required by the task. These findings suggest that non-signers use visual-perceptual features of signs while engaging higher cognitive processing for classifying the percepts linguistically. Non-signers appear to segment visual sign language input into discrete events as they try to map the observed sign language form to a linguistic concept that might represent the sign. The mechanism might be indicative of the potential pathway for co-optation of perceptual features into the linguistic structure of sign languages. In Experiment 2, the participants were presented with telic and atelic signs of Austrian Sign Language (ÖGS), which both evidence a distinct telic/atelic motion profile (Krebs et al. 2021), and are accompanied by mouthing information (movement of the mouth forming (part of) the German corresponding word). In general, in ÖGS mouthing is relatively common (Schalber, 2015). Behavioral data revealed that participants responded more accurately, faster, and with more certainty to the classification task. ERP findings differ from those of Experiment 1: ERP effects for telic compared to atelic signs started in later time windows, extended into later time windows, and showed a primarily posterior distribution (Figure 2). The findings suggest that non-signers rely on information provided by mouthing, if available. In this case non-signers pay more attention to mouthing (as self-reported after the experiment), as opposed to tracking visual motion profiles in the stimuli. Because linguistic information provided by lip movement is part of audio-visual spoken language processing, it was easier for non-signers to classify the signs in Experiment 2 compared to Experiment 1. The ERP effects for telics vs. atelics observed in Experiment 2 also reflected the qualitatively different mapping/ integration processes for telic compared to atelic verbs. However, a different strategy was used by the participants in the two experiments, leading to different ERP patterns in both experiments. In line with previous work (e.g. Malaia et al. 2009; Ji & Papafragou 2020), the differences in ERP effects during processing of telic vs. atelic stimuli observed in both experiments appear to indicate easier event segmentation in response to telic stimuli.

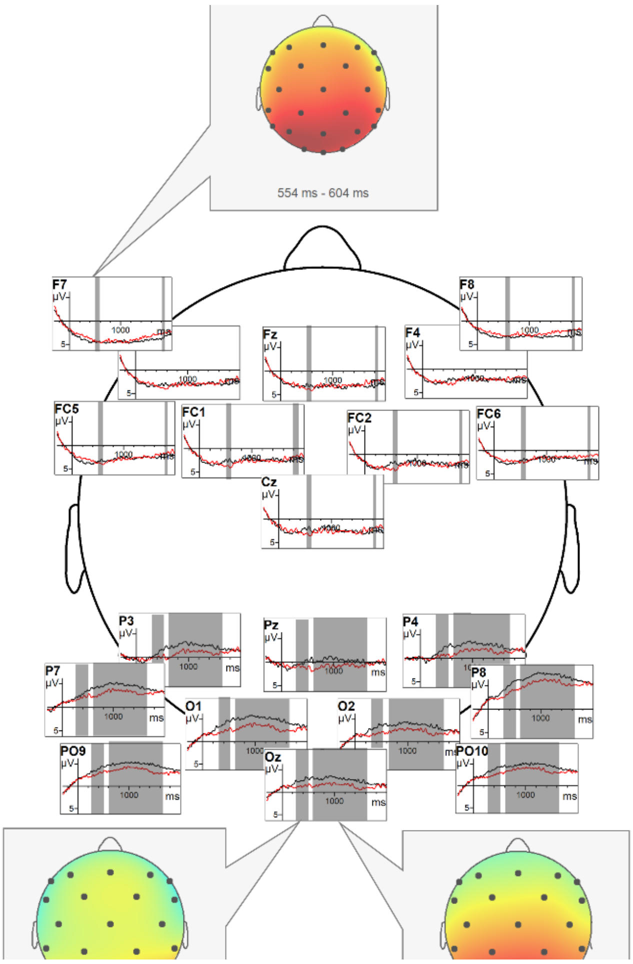

Figure 2. Telic/atelic sign processing with non-manual cues

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Language-brain entrainment: a crossmodal comparison of spoken and signed languages.

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Signed and spoken languages use the visual and acoustic modalities, respectively, for the transmission of linguistic information. The modality used deeply influences the temporal organization of the linguistic signal: in spoken language, information is presented in a predominantly sequential fashion, while sign language is characterized by a multi-layered and parallel presentation of information (Sandler, 2018). The temporal structure of speech is characterized by quasi-periodic components both at the level of production and perception (Walsh & Smith, 2022; Meyer, 2018). This is reflected in language processing as well: language-brain entrainment refers to the synchronisation of the neural activity with the incoming speech signal (Obleser & Kayser, 2019). This phenomenon is widely studied in the acoustic modality, and seems to support language comprehension through the decoding of the linguistic information from the physical signal (Doelling at al., 2014). In this study we investigate whether this phenomenon is specific to spoken language, or whether it extends to a language expressed and perceived through the visual modality, such as sign language.

To characterize the temporal regularities of the visual sign language signal we used motion tracking. A custom-built Kinect setup allowed us to record videos of signers while tracking multiple points on the body and face (see figure 1). We used this motion tracking system to record videos of models signing several short (one-minute long) texts in their native language. These motion tracking data were used to extract the speed vectors of various articulators, including the hands, the head, the right (dominant) shoulder and the torso during sign language production, and thus to characterize the kinematic and temporal properties of the sign signal. These motion-tracked recordings were used as stimuli in the following experiment.

We used magnetoencephalography (MEG) to record the neurophysiological activity of two groups of hearing participants – 15 expert signers and 15 individuals with no knowledge of sign language – while they watched videos of short narrative texts in a familiar spoken language (Spanish), an unfamiliar spoken language (Russian), a familiar sign language (LSE - Spanish Sign Language) and an unfamiliar sign language (RSL - Russian Sign Language). Expert signers self-rated their proficiency in LSE on a scale from 1 to 5 (mean rating 4.64, SD 0.5). This design allows us to investigate the effect on entrainment of language modality, on the one hand, and language familiarity, on the other. Each participant saw ten video texts for each language, five of which were by a male model, and five by a female model (except for RSL, for which both models were male). An orthogonal probe recognition task was used to ensure that participants paid attention to the videos (after each video participants saw two 5-second clips and had to decide which one had appeared in the video); performance on this task was good (over 70% accuracy) except for one participant from the sign-naive group, who was excluded from the analysis.

To evaluate phase synchronization between brain activity and the linguistic signal, we calculated coherence between the preprocessed MEG data and the speech envelope (for spoken language) or the speed vector of the right hand (for sign language). Based on the previous literature on entrainment in signed (Brookshire et al., 2017) and spoken languages (Bourguignon et al., 2013; Gross et al., 2013; Molinaro & Lizarazu, 2018) and a visual inspection of coherence plots, we selected two frequency bands of interest for our analysis: delta band (0.5 - 2.5 Hz) and theta band (4 - 7 Hz). To assess whether there were statistical differences in coherence values for a specific frequency band across experimental conditions, we performed cluster-based permutation tests (Maris & Oostenveld, 2007). (This nonparametric permutation analysis allows us to avoid the problem of multiple comparisons among the high number of sensors of the MEG.)

The results of this study show that entrainment takes place during signed language processing as happens with spoken language. For speech, our results replicate the typical findings of previous work: synchronisation in delta and theta frequency bands located in bilateral temporal regions (Ding, Melloni, et al., 2017; Bourguignon et al., 2013; Keitel et al., 2017). In sign language entrainment is conditioned by the specific properties of sign's temporal structure: entrainment is restricted to the delta frequency band, in line with the slower periodicity of the visual signal, and localised over right parietal areas, associated with motion processing. We find stronger entrainment in spoken languages compared to sign languages, but in both modalities familiarity with a language impacts the extent to which entrainment occurs. These findings show the interplay between language modality, structure and processing. Despite the differences in temporal structure between sign and speech, the brain leverages temporal regularities in the signal to process language.

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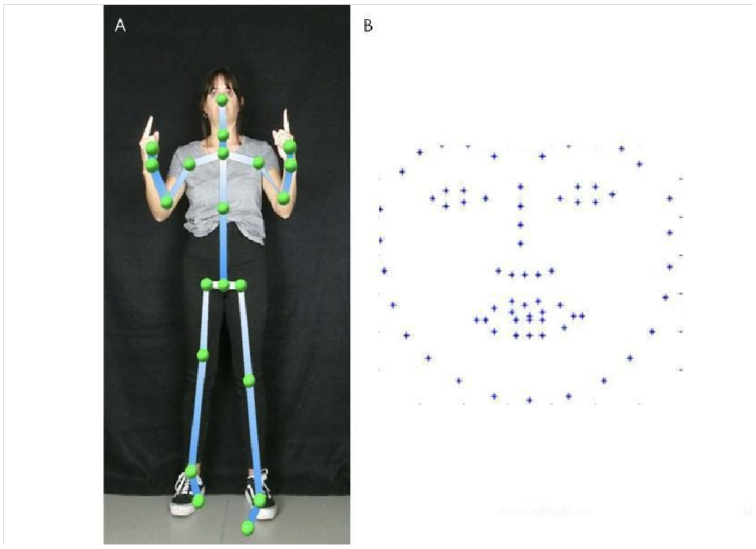

Figure 1. Body (A) and face (B) points tracked by the custom-built Kinect system.

Processing weak drop by signers and non-signers of Shanghai Sign Language
Shengyun Gu

Two-handed signs are divisible into balanced and unbalanced signs (van der Hulst 1996), the former having the non-dominant hand copying the dominant hand and the latter involving the non-dominant hand as location for the execution of the dominant hand. This study investigates one-handed realization of a two-handed sign, also called weak drop (WD) in Shanghai Sign Language (SHSL). Previous studies (Battison 1974; Brentari 1998; van der Kooij 2001; Nishio 2009; a.o) found that WD is phonologically constrained. Some scholars stress the role of iconicity on WD: Iconicity may facilitate WD in unbalanced signs (Becker 2022); Iconicity impedes WD (van der Kooij 2002; Vennes 2018) except for signs with a figure-ground relation on the two hands (Paligot et al. 2016). To better understand how iconicity impacts WD, I investigate deaf signers' judgment and production of WD in SHSL. Going beyond this, in determining the relevance of iconicity in/outside the grammar, I ask whether and how signers and non-signers differ in their processing. I argue that WD impedes iconicity, but the patterns vary by the subcategories of iconicity. Further, nuances in judgment and production were found between signers and non-signers, informing areas where mediation of a language grammar matters. Finally, similarity in judgment of balanced signs' WD was found across signers and non-signers, which implies that experience of another language or potentially general cognitive mechanism might help achieve partially deaf-like performance.

Participants. 15 deaf native SHSL signers and 30 hearing college ASL students have at least taken two semesters of ASL classes. None of these students were exposed to SHSL and were regarded as non-signers of SHSL. Half of these participants (N=15) were told the sign meanings, making the meaning-given group. The other half (N=15) were not told the sign meanings, making the meaning-ungiven group. **Stimuli**. Video clips of 50 SHSL monomorphemic two-handed signs (half/half balanced/unbalanced signs). To minimize the interference of ASL signs on the WD judgment by the ASL students, all the SHSL signs tested in this study are different from ASL signs in at least one aspect in their phonological form (i.e., differ in movement, handshape, or location). **Tasks**. Each participant watched stimuli in pseudorandomized order and were asked to intuitively tell whether they accepted a one-handed realization. If the sign was judged to be WD-amenable, they were instructed to naturally produce the one-handed form with the non-dominant hand down. If the sign was judged to be WD-resisting, they were asked to do forced production, imagining the non-dominant hand was holding an object and not available for full participation. All studies were conducted and recorded on Zoom. **Iconicity**. Applying the notion of two-handed iconicity categories (Lepic et al. 2016), which were proposed based on a typological study of four historically unrelated sign languages, I divided the tested SHSL signs into 5 categories: (a) Interaction: paired, interacting entities mapped onto each of the two hands (N=6); (b) Dimension: boundaries of an entity's shape/volume mapped onto the two hands (N=8); (c) Location: paired entities and their locations mapped onto each of the two hands (N=17); (d) Composition: component parts of an entity mapped onto the two hands (N=5); (e) Non-iconic (N=14).

Results & Discussion. To jointly analyze the association between WD acceptance, WD production, group (deaf, hearing meaning-given, hearing meaning-ungiven), sign form, and iconicity, I performed a logistic regression model with participant and item level random effects. All the analyses were conducted using R and package lme4. **(1) For deaf signers, iconicity impedes WD, but the impact varies by subcategories of iconicity**. When lumping the four iconic categories, namely composition, dimension, interaction, and location, into one iconic category, we found that in comparison to the non-iconic signs, WD judgments of the iconic signs by the deaf group were associated with less WD acceptance (**Table 1**). Regarding each iconic subcategory, in comparison to non-iconic signs, signs with composition, interaction, dimension, or location were all negatively associated with less WD acceptance, although only composition and interaction categories reached a level of significance (**Table 2**). **(2) Iconic effects differ between deaf signers and hearing non-signers**. Even though the iconic signs were associated with less WD acceptance in all the three groups, the strongest negative association was seen in the deaf group (**Figure 1**, **Table 1**). Further, within the iconic categories, in addition to composition and interaction, the negative association between location and WD acceptance reached a significant level for the hearing meaning-given group (**Table 2**). This indicates location iconicity has a differing impact on WD acceptance between deaf signers and hearing non-signers. **(3) Group differences in WD acceptance are seen in unbalanced signs, but not in balanced signs**. Group differences in WD acceptance were also found in sign form type. We did not find evidence for a significant difference between the deaf group and each of the hearing groups in WD judgment for balanced signs. However, significant differences in WD judgment on unbalanced signs occurred between the deaf and each hearing group, with significant differences among the two hearing groups too **(Figure 2)**. This indicates that non-signers differ from signers in WD judgment on unbalanced signs only. Access to meaning helps performance in unbalanced signs, but it is not sufficient to parallel the deaf signers. In contrast, deaf-like performance in WD acceptance of balanced signs may not require knowledge of SHSL. **(4) Deaf signers make more modulations than the non-signers in producing one-handed forms of WD-amenable signs**. We found that in producing one-handed realizations of WD-amenable signs, the corresponding one-handed WD forms are not always identical to the two-handed counterpart without the non-dominant hand. This means in the implementation of WD, phonetic adjustments occur. We also found that the deaf group made more phonetic adjustments than the two hearing groups, who seldom implemented any adjustments (**Figure 3**). And this pattern was separately identified in balanced signs and unbalanced signs as well. This suggests that although phonetic implementation is mostly subject to language-external factors, it is nonetheless mediated by knowledge of the language. **(5) Deaf signers are more reluctant than the non-signers to modulate the one-handed forms of WD-resisting signs**. An opposite pattern was seen in producing one-handed form of WD-resisting signs. The hearing groups frequently adjusted the production of signs that they judged to resist WD. In contrast, the deaf group was less willing to employ compensatory strategies to produce the ungrammatical one-handed form (**Figure 3**). This pattern was found in balanced and unbalanced signs. This suggests that while non-signers actively turn to broader semiotic systems to depict meaning, a tighter mapping from meaning to form may impede signers from repairing the already ungrammatical forms. For them, modulating the form of individual words cannot save ill-formed production.

Conclusion. I show that WD in SHSL is constrained by iconicity. Overall iconicity impedes WD, although the degree of impact varies by subcategories of iconicity. These online processing tasks of WD inform the ways deaf signers leverage grammar-external resources like iconicity in phonological processes. Moreover, by comparing deaf signers and hearing non-signers, I propose that knowledge of the sign language grammar mediates the WD judgment of a subset of signs (unbalanced signs and signs with location iconicity) and the WD production of all signs. This fine-grained analysis of nuances and parallels between signers and non-signers of SHSL helps shed light on areas where a linguistic system in the visual-manual modality comes into play.

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Table 1 Multifactor logistic regression of WD acceptance on iconicity and sign type in each group (MG: meaning-given, MU: meaning-ungiven; *p<0.05, ***p<0.001)

Factor	Reference	Deaf OR	Hearing (MG) OR	Hearing (MU) OR
Iconic (two-handed)	Non-iconic	0.106*	0.357***	0.236*
Unbalanced	Balanced	1.559	0.338***	0.069***

Table 2 Multifactor logistic regression of WD acceptance on each iconic category in deaf and hearing meaning-given groups (MG: meaning-given; **p<0.01, ***p<0.001)

Factor	Reference	Deaf OR	Hearing (MG) OR
Iconic (composition)	Non-iconic	0.004***	0.077***
Iconic (dimension)	Non-iconic	0.843	1.302
Iconic (interaction)	Non-iconic	0.039**	0.314***
Iconic (location)	Non-iconic	0.121	0.413**

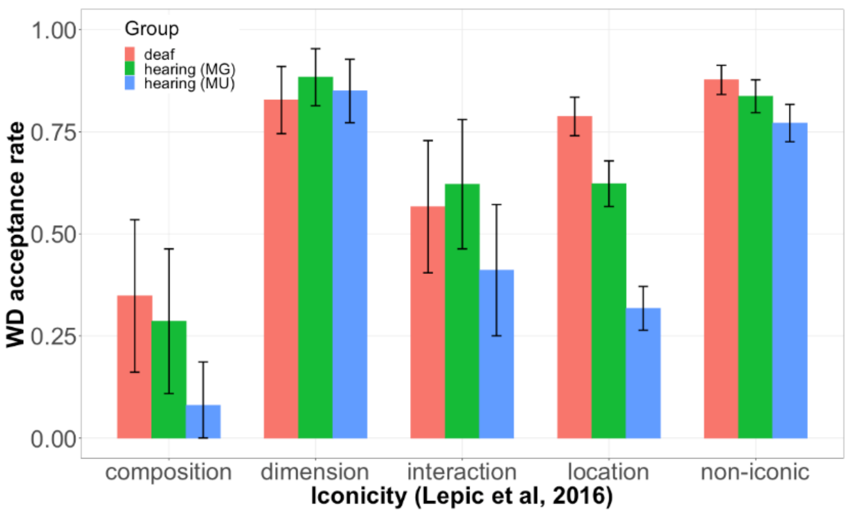

Figure 1 WD acceptance by iconicity

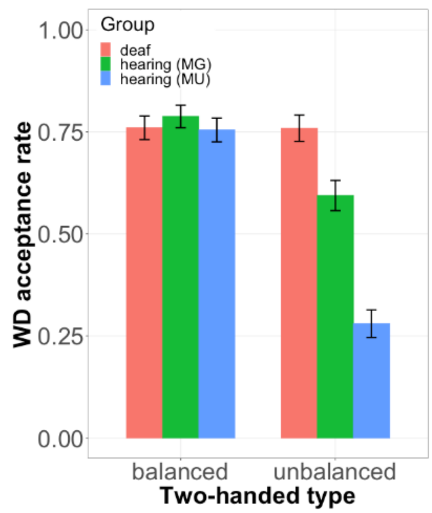

Figure 2 WD acceptance by sign form

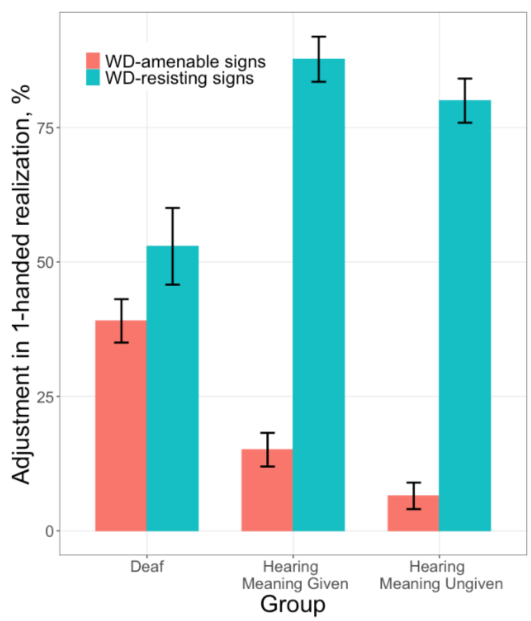

Figure 3 Adjustments in one-handed production of WD-amenable and WD-resisting signs

Exploring Joint Attention in American Sign Language: The Influence of Sign Familiarity

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Joint attention (JA), broadly defined as the active shared coordinated attention of a child and a caregiver on an object or an event (Gabouer & Bortfeld, 2021) has been shown to facilitate word learning and subsequent vocabulary development in young children (Abney et al., 2020; Morales et al., 2000; Yu et al., 2019). In spoken language interactions, children can direct visual attention to an object while perceiving auditory linguistic input, enabling them to perceive parallel input during JA. In contrast, during interactions in sign language, children perceive both environmental and linguistic information visually, leading to a more sequential input. As a result, JA in signed interactions requires higher sensitivity to gaze. It has been shown that signers are more sensitive to gaze cues in the input of their interactions by increased gaze-switches and mutual gaze in signers (Lieberman et al., 2014). However, how JA episodes are initiated and maintained in sign language interactions is largely unknown. It is likely that the unimodal nature of the signed input also has consequences on how JA is initiated and maintained in signed language interactions.

Although JA has been described in both spoken and signed interactions, within and across modalities there have been a wide range of approaches to defining and coding JA. The overall aim of the current study is to quantify JA between parents and children during signed interactions. A recent coding scheme developed by Gabouer and Bortfeld (2021) includes objective characterization of the social aspect of JA so that intentionality and mutual awareness of the social partners' attentional state are considered. We explored whether this coding scheme could capture the attention dynamics in interactions in American Sign Language (ASL). If so, we were interested in what possible insights it can give about the temporal organization of JA in signing dyads. With the coding scheme we successfully identified properties of JA (e.g. frequency and duration) in our ASL dataset that we then used to investigate the temporal layout of JA episodes. We predicted that interactions around novel signs would differ from those around familiar signs with regard to the timeline of JA initiation within the dyad's interaction.

Method. We analyzed an existing corpus of 12-15-minute-long parent-child interactions in ASL, the ASL-PLAY dataset (https://osf.io/3w8ka/). Children between the age of 9 months and 69 months were playing with a caregiver in one of two naturalistic play situations. In "familiar" play sessions (n =23, $\bar{x}$= 35m.o.), children were given a set of familiar objects (e.g. a fruit set). In the "novel" play sessions (n = 31, $\bar{x}$ =41m.o.), children were given both familiar as well as four novel objects (e.g. kiwi, ostrich). Signs for these four objects (that have no lexical sign in ASL) were borrowed from other signed languages and taught to the caregivers in advance so that caregivers could use the novel sign if interacting with the object during the play session.

Coding. We focused on JA around "naming events", defined as instances in which a concrete object (familiar or novel) was labelled by either the parent or child. Following the coding scheme developed by Gabouer and Bortfeld (2021), we analyzed previously coded gaze, touch, attentional behaviours and ASL signs surrounding all naming events, and identified JA episodes based on a number of criteria. As shown in Figure 1, a successful JA sequence between two interaction partners is described as a sequence consisting of 1) an initiator's bid for attention; 2) a target's response; and 3) an initiator's verification. All three parts of the sequence must be present and in a specific temporal relationship to each other to be considered a successful JA episode as further defined by the coding scheme. We identified the

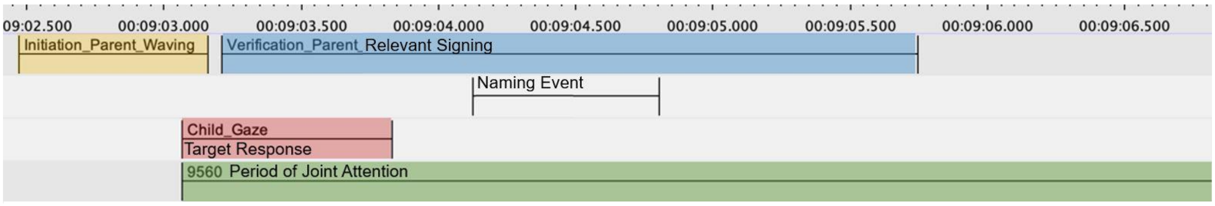

Figure 1 Application of the Gabouer & Bortfeld coding scheme onto ASL interaction data, showing a successful JA episode. Important elements (Initiation, Target Response, Verification, Naming Event and Shared Attention) are identified and can be seen in their temporal sequence. Here, the Naming Event is part of the parent's verification of the JA episode

success of each JA initiation (i.e. whether the initiation was followed by a target response and verification), the behaviours used to carry out each part of the JA sequence (e.g. signing, gaze, touch, other attentional behaviours), the timing of the naming event within the JA episode, as well as the duration and frequency of the JA episodes.

Results: We identified 587 naming events in the familiar sessions and 493 in the novel sessions. We compared the properties of JA episodes in both play sessions. While frequency and duration of JA episodes did not significantly differ for familiar vs novel naming events overall, we found significant differences in the way caregivers utilize and time JA events surrounding relevant sign events. More specifically, there were some differences in how JA was initiated: when naming familiar objects, the object label itself was frequently part of the JA initiation, but when naming novel objects, the object label was rarely part of the initiation (Figure 2). This suggests that caregivers may prioritize establishing JA *before* naming a novel object, presumably to ensure that the child is attending to them when they label the novel sign, and that caregivers time naming events within JA events carefully to maximize the chances for the child to successfully match the sign to the intended referent.

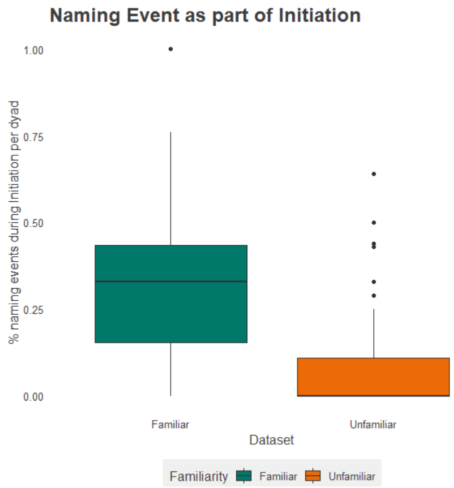

Figure 2: Frequency of naming events being part of JA initiation by familiarity of the naming sign.

Our study provides support for the JA coding scheme proposed by Gabouer and Bortfeld as a useful tool for capturing JA in signed interactions. Our results show that caregivers interacting with deaf children in ASL are sensitive to the child's prior knowledge of object labels, and shape their interactions to support their child's language acquisition.

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Investigating mental rotation and screen arrangement using eye tracking

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(Universität Hamburg)

Background: The ability to mentally rotate settings and constructions in space is part of the human cognitive ability and has been investigated for various shapes, constructions and different groups (Cooper, 1975). However, for deaf signers using visual sign languages as their native languages mental rotation has been described as an inherent part of their language system (Emmorey et al., 1998; Perniss, 2007; among others) and is, thus, used routinely in daily interactions. In this study, we examine to which extent effects of mental rotation can be observed using eye tracking and how mental rotation interacts with two-dimensional (2D) screen arrangements.

Methods: We recorded eye movements of 25 deaf early signers of German Sign Language (DGS) (*M* age = 35 years) in Exp. 1 and 17 deaf early signers (*M* age = 30 years) in Exp. 2 while they were presented with two pictures and a video stimulus. Each video stimulus consisted of a full sentence with the structure *referent-1 INDEX-1 referent-2 INDEX-2 agreement-verb* with the first referent always being placed on the right side of the signing space. The images displayed each one of the animate entities mentioned in the video. The position of the images was manipulated in relation to the placement of the referents in signing space. In the *aligned* condition, the position of the image matched the side of the referent in the signing space, thus, BOY as referent-1 is introduced on the right side in the signing space and the corresponding image is presented on the same side on the screen (Fig. 1a & c) and referent-2 is placed on the opposite side respectively. In contrast, in the *rotated* condition, the images are arranged following the mental rotation perception of the right side (Fig. 1b & d). The stimulus material was identical in Exp. 1 and 2 so that the experiments only differed in the spatial arrangement. In Exp.1, the video was presented at the bottom (Fig. 1a & b) while in Exp. 2 the video was presented at the top of the screen (Fig. 1c & d).

Data: Regarding the time course, we determined the visual search pattern for each experiment within each condition by comparing fixations to the images using a permutation-based analysis approach. For Exp. 1, adult DGS signers shift back and forth between the images and the linguistic stimuli presented in the video, but they do so irrespective of the presented condition. Thus, mental rotation seems not to be at play in the visual search pattern. However, in Exp. 2, participants' visual search patterns differ between conditions showing an effect of mental rotation. During the presentation of INDEX-1, i.e., when the first referent is expected to be fixated, they do so in both conditions but more in the aligned than in the rotated condition. Similarly, more looks to referent-2 are observed during the presentation of INDEX-2 in the aligned than in the rotated condition.

For two selected time windows, we computed mean log gaze probability ratios to examine overall fixations to the images across conditions. The first time window comprises all fixations during the presentation of INDEX-1 in the video and the second time window includes fixations during the presentation of INDEX-2. We fitted a linear-mixed effects regression with *condition*, *time window,* and their *interaction* as fixed effects and *participants* and *items* as random effects. For Exp. 1 (Fig. 2a), an effect of condition is detected only in the second time window with increased looks in the aligned condition (β = -.08; SE = .02; t = -3.78; p < .001). For Exp. 2 (Fig. 2b), we observed a main effect of time window (β = -.44; SE = .03; t = -14.57; p < .001), a main effect of condition (β = -.21; SE = .03; t = -7.21; p < .001) and an interaction of time window and condition (β = .43; SE = .04; t = 10.05; p = .004). Most importantly, there were more fixations (β = .27; SE = .02; t = 13.63; p < .001) in the aligned condition (*M* = .27, *SD* = .01) than in the rotated condition (*M* = .006, *SD* = .02).

Discussion: In general, signers follow and understand the signed video input and search as expected, i.e., looking at referent-1 or referent-2 when it is presented in the video stimulus. In Exp. 1, signers initially allocate their attention to the first referent in both conditions. As the video stimulus unfolds, they have to re-check their perception of the display when the presentation of the images is rotated in relation to the content of the video. Therefore, the rotated condition seems to pose a certain challenge for processing. This effect becomes even more pronounced in Exp. 2 where the rotated condition seems to be particularly challenging because the pointing in the video contradicts the arrangement of the images and, thus, causes additional processing costs. For the aligned condition, the pointing and the image are placed on the same side of the screen, which does not require additional processing effort, showing that this setup allows for a deictic interpretation. The step-by-step process of mental rotation is not effortless and interpretations such as aligned 2D visualization may enhance processing. Thus, mental rotation does not seem to be a default process on a 2D screen and even harder in a topographic and deictic screen environment. Therefore, mental rotation and the screen arrangement, both impact the signers' processing, which needs to be considered methodologically when using eye tracking.

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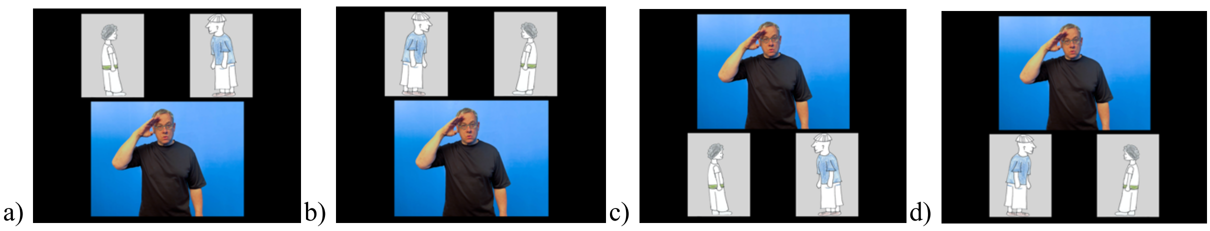

Fig. 1. Example of the visual display where the referent-1 BOY is presented on the left side in the aligned condition (a & c) and on the right side in the rotated condition (b & d). The screen arrangement of Exp. 1 is presented in a and b and Exp. 2 is shown in c and d.

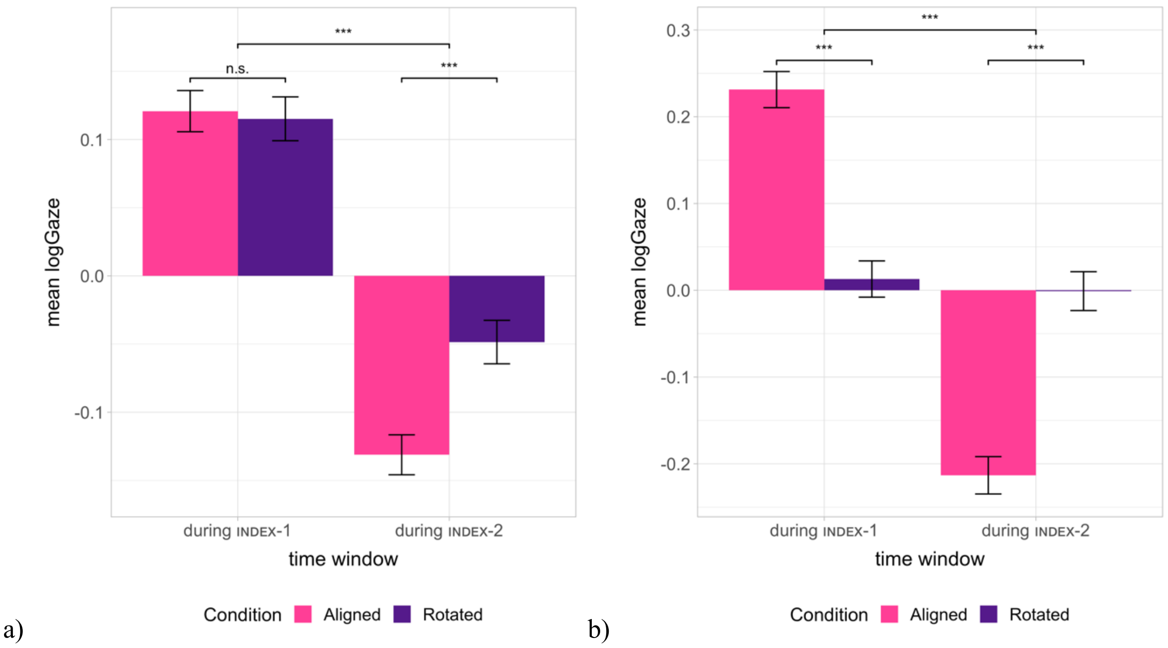

Fig. 2. Mean logGaze transformations of fixations to referent-1 relative to referent-2 by condition (pink – aligned; purple – rotated) and for both time windows for a) Exp. 1 and b) Exp. 2.

Lexical properties in sign language: familiarity and iconicity do not go hand in hand

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Research into the processing of sign languages is limited by the unavailability of lexical characteristics (or large corpora) for most sign languages. Lexical databases for British Sign Language (BSL) and American Sign Language (ASL) include measures such as familiarity and iconicity ratings or phonological neighbourhood density (Vinson et al., 2008; Sehyr et al., 2021). We collected familiarity and iconicity ratings from 90 deaf signers (half of whom were native signers) for a set of 300 lexical signs taken from a database of Spanish Sign Language (LSE). The signs were chose to be representative of the full database (in terms of phonological form) and to include a broad range across the frequency and iconicity dimensions; additionally, 200 of the signs had meanings represented by an image (in the Multipic database, Duñabeitia et al., 2018). The familiarity ratings show a broadly normal distribution whereas the iconicity ratings tend toward a binomial distribution, with signs being rated as either highly iconic or not iconic. The data reveal a negative correlation between familiarity and iconicity, confirming a pattern found for other sign languages (Sehyr et al., 2021), but in contrast to findings for iconicity ratings in spoken language, which have a (weak) positive correlation with frequency (Hinojosa et al., 2020).

To examine the impact of these lexical properties on sign processing, we carried out a lexical decision task with 200 of the rated signs plus 200 pseudosigns (created by changing the handshape, location or movement of a real sign so that it no longer had a meaning). Previous work on ASL found a facilitatory effect of familiarity but iconicity lowered accuracy for native signers (Caselli, Emmorey & Cohen-Goldberg, 2021). Results from forty-two deaf signers (half of whom were native signers) showed a clear lexicality effect: responses to real signs were faster and more accurate compared to pseudosigns (see fig. 1). Analysis of the responses to real signs (see fig. 2) revealed that native signers were more accurate in their responses than non-native signers. Additionally, there was a facilitatory effect of familiarity: signs with higher familiarity ratings had more accurate and faster responses (with no difference between native and non-native signers for this effect). Similar to Caselli et al. (2021), iconicity did not affect reaction times, but in contrast to this earlier study, iconicity was associated with greater accuracy (in both native and non-native signers).

We also collected data on a picture naming task for these 200 signs from the same participants, again registering accuracy and response time as our measures of interest. Previous work showed a facilitatory effect of iconicity on response times in BSL (Vinson et al., 2015), ASL (Sehyr & Emmorey, 2022) and Catalan Sign Language (Gimeno-Martínez & Baus, 2022). As can be seen in Figure 3, familiarity had little impact on the responses (either in terms of accuracy or response times). In contrast, iconicity did play a clear role in this production task: more iconic signs were associated with more accurate and faster responses. There was also an interaction between familiarity and iconicity for accuracy: for more iconic signs, familiarity had no effect on accuracy but for less iconic signs familiarity had a facilitatory effect (see fig. 4), suggesting that iconicity boosts sign retrieval. For this task there were no significant differences between native and non-native signers.

These results reveal that lexical access in a signed language bears similarities to spoken language access – we see typical lexicality and familiarity effects – but there are also modality-specific effects: iconicity is distributed across the lexicon differently in signed and spoken languages. This may be due to how iconicity is exploited by each type of language and also how the language users perceive (and therefore rate) iconicity. Additionally, the impact of iconicity on lexical access is task dependent. While iconicity (weakly) facilitates sign recognition, as has been reported for spoken language (Hinojosa et al., 2020), a strong link between form and meaning has a notable impact on producing a sign from a picture prompt. Measuring these lexical indices provides insight into the structure of the sign lexicon and its cognitive representation.

Keywords: lexical indices, familiarity, iconicity, subjective ratings, lexical decision, picture naming

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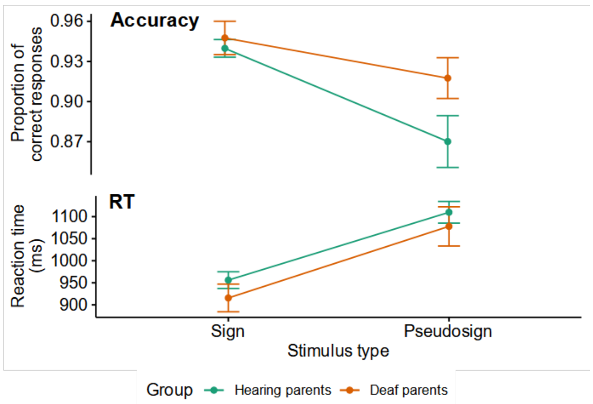

Figure 1. Accuracy and reaction times for the lexical decision task showing the different responses for real signs and pseudosigns. Error bars show standard error.

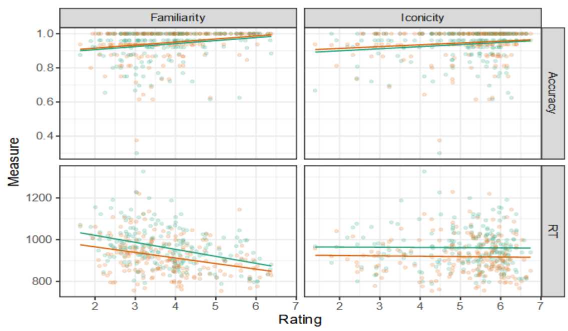

Figure 2. Relation between measures of interest – Accuracy (top row) and reaction time (RT, bottom row) – and lexical indices – Familiarity (left) and Iconcity (right) – for the lexical decision task. See fig.1 for colour key.

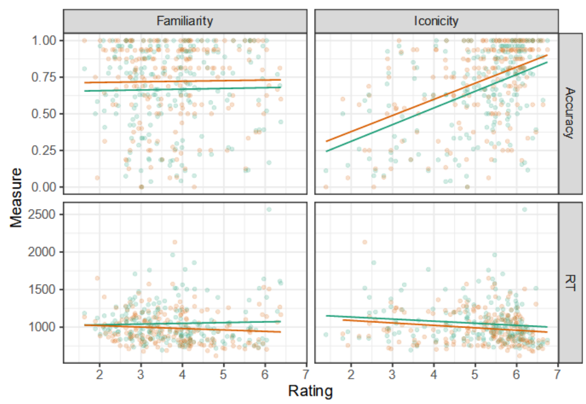

Figure 3. Relation between measures of interest – Accuracy and reaction time (RT) – and lexical indices – Familiarity (left) and Iconcity (right) – for the picture naming task. See fig.1 for colour key.

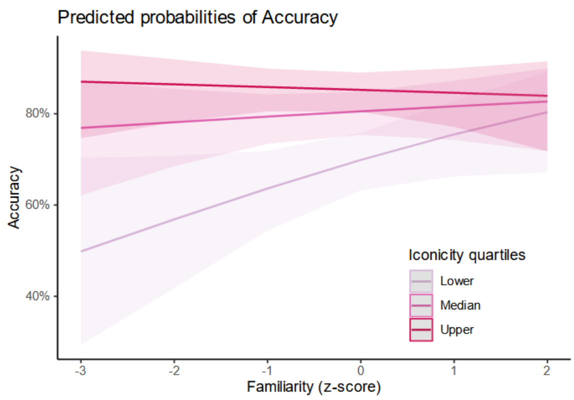

Figure 4. Accuracy scores in the picture naming task as a function of familiarity and iconicity.

Day 2

Wednesday, June 28

Keynote 2: Jeremy Kuhn

Iconicity, scope, and the grammar

Sign language communicates meaning not only through a combinatorial grammar but also through iconicity -- structure-preserving mappings between form and meaning. How do iconicity and the grammar interact? The simplest possible answer is that they interact very little: both communicate meanings, but these meanings are combined intersectively at the level of discourse, like distinct propositions. I will argue that this simple hypothesis is incorrect: at least some iconic meanings are not combined via intersection, and iconic meaning must in general be integrated throughout grammatical composition. I will argue that an illuminating way to think about iconicity is in terms of semantic scope: like logical operators, iconic meanings can take scope at different levels in a logical form. Depending on where the iconic meaning takes scope, it may have different effects on the overall meaning of a sentence, sometimes seeming to disappear completely. I motivate this perspective with data from two different domains: first, iconic modifications of verbs, including pluractional verbs; second, the use of loci to organize discourse referents.

On Elicited Data in Sign Language Syntax

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Goals. The reliability of elicited data in sign language syntax is assessed via experimental methods.

Background. Scientific hypotheses are tested against the empirical reality which is made of raw data, which are then interpreted following specific theories. One of the most essential aspects of this process is data reliability. If the data are not reliable, the risk of postulating incorrect theories is considerable. A commonly used, but often criticized, method to collect data in theoretical linguistics is via informal elicitation, which is based on acceptability judgments provided by a small number of native users. A growing body of literature has started to look into the methodological weaknesses of elicited data for spoken language in the past decade (i.a., Linzen and Oseki 2019; Schütze and Sprouse 2013; Sprouse and Almeida 2012, 2017). These works analyzed three of the major criticisms, namely small number of informants, reduced number of tested items and lack of quantitative measures. Formal experiments are used to replicate syntactic contrasts that have been previously documented either in reference grammars or in papers coming from a selected number of journals. The working hypothesis is that if formal experiments are able to substantially replicate the same contrasts documented by elicited data, then the methodology of data elicitation is as solid as that of formal experiments. In other words, data replication conducted with an experimental method is used to validate elicited data. Follow-up studies further refined the experimental technique to replicate syntactic contrasts, like evaluating minimal pairs as items, rather than single sentence judgments and separating the contribution of forced choice tasks (e.g., maximizing contrasts) from that of Likert scales (e.g., understanding nuances) or magnitude estimation (i.a., Mahowald et al. 2016; Marty et al. 2020; Smith and Little 2018).

More recently, a similar discussion has also started in the sign language literature, although only from an abstract perspective, among other things suggesting to replicate the method validation for sign language (Kimmelman 2021) and to use elicitation techniques that are more similar to that of formal experiments (Davidson 2020). In this paper, we investigate the reliability of elicited data used to describe the syntax of Italian sign language (LIS) with a formal experiment.

Methodology. *Participants.* 24 participants took part in the experiment (7 females, age range 74-23), recruited at the Deaf association of Catanzaro (South of Italy). 13 participants were native signers of LIS, 6 have been exposed to LIS before the age of 6 (early learners) and 5 are late learners.
Stimuli. Data source is the recently published Grammar of LIS (Branchini and Mantovan 2020). We focused on the Syntax part, where we identified *16* different constructions targeting a variety of structures from basic sign order to A′-movement, subordination, relative clauses, and verb-directionality. For each construction, we recovered the key examples and we extrapolated the underlying rule, when not explicitly reported in the text. We then generated a string of signs that minimally violates the rule. Example (1) illustrates the paradigm of sentential negation, one of the tested constructions.

(1) **Rule:** Negation is normally post-verbal in LIS

a. MARIA CAT SEE NEG. (Branchini and Mantovan 2020: 469)
'Maria does not see the cat.'

b. MARIA CAT NEG SEE. (*Minimal violation*)

A native signer of LIS produced both the string that follows the rule and the string that violates the rule. The two sentences were merged in a single video separated by a 1-sec. black screen indicating the first and the second sentence (Fig. 1a). To ensure lexical variation, four lists of 16 pairs were created so that each list contained one construction type counterbalanced for order (rule vs. violation). The four lists plus three training items were used to create an on-line experiment on Labvanced (Finger et al. 2017).
Procedure. Participants were asked to watch the counterbalanced items containing two sentences, one following the rule and one violating it. After stimuli presentation, they were asked to choose which one they prefer in a forced-choice task (Fig. 1b). The experiment was followed by a questionnaire to collect

the relevant metadata. Instructions, consent, training and experiment were administered using LIS.

Experimental Hypothesis: If elicited data are reliable, participants are expected to choose the sentence that follows the rule significantly more often than the sentence that violates it.

Results. The dataset consisted of 379 observations. Participants chose the sentence that followed the rule 70% of the cases (Fig. 1c). A generalized mixed model of the binomial family with *expected result* as fixed effect and *item by participant* as random factor revealed that this difference is significant (estimate for the fixed effect is 2.1906, $p < .001$).

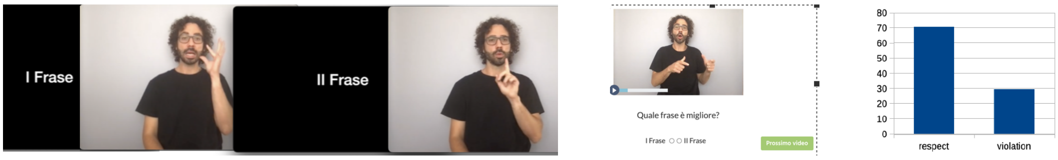

Figure 1: a. Stimulus b. Task c. General Distribution

Qualitative investigation of each construction revealed that the largest contrast was found with *Alternate questions* (96% of expected answers). Two constructions failed to replicate the expected contrast, both involve relative clauses: one construction targeted the ban on externally headed relatives (cf. (2), 42% of expected answers, i.e., reverse pattern), the other targeted the ban on number inflection of the relative pronoun PE (cf. (3), 55% of expected answers).

(2) a. YESTERDAY PAOLO **DOG** FIND PE NOW SLEEP (adapted Branchini and Mantovan 2020)
b. YESTERDAY **DOG** PE PAOLO FIND NOW SLEEP (external head)
'The dog that Paolo found yesterday is asleep now.'

(3) a. CHILD$_{a, b, c}$ WIN PE TEACHER PRIZE GIVE (adaped Branchini and Mantovan 2020: 600)
b. CHILD$_{a, b, c}$ WIN PE$_{a, b, c}$ TEACHER PRIZE GIVE (PE inflects for number)
'The teacher gives the prize to the children who win.'

Discussion. We provided a proof of concept that elicited data are reliable for sign language by replicating consistent findings reported in the literature for spoken languages (a.o., Sprouse and Almeida 2012). Indirectly, we provided evidence of how robust these data are, since the participants were all from a specific region of Italy whose LIS was never investigated with elicited data before (i.e., Catanzaro in the South of Italy). Furthermore, the method seems to be adequate to address some iconic effects of LIS syntax, like directionality. Differently from other sign languages where agreement seems to be optional, it is more resilient in LIS (for a corpus study see Santoro et al. 2016). Our results confirm this fact because participants consistently preferred the form with overt agreement (71% for forward and 75% for backward predicates), as also described in the Grammar of LIS. In turn, this fact suggests that agreement omission may not be free but could be due to currently unknown factors.

Interestingly, one of the most studied construction of LIS, namely relative clauses, failed to deliver the expected result. This proves the unbiased character of the experiment (with biased stimuli all constructions would have behaved uniformly). A number of possible explanations will be proposed during the talk: a) Influence from spoken Italian (for (2) only), b) genuine isogloss for this particular construction, c) possible Type I error in the elicited data (especially for (3)), d) general difficulties related to relative clauses (Hauser et al. 2021; Zorzi et al. 2022).

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Polar questions via contraries in Chinese Sign Language

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Background Polar questions (e.g. *Are you hungry?)* differ from constituent questions (*Who is eating?)* and alternative questions (e.g. *Do you prefer RICE or PASTA?*) in their possible answers, which must be either a positive ((*yes,) I am hungry*!) or negative ((*no,) I am not hungry*!) polarity focused proposition. Polar questions in sign languages often involve dedicated nonmanual marking and/or dedicated question particles. Here we focus on a form of polar questions in Chinese Sign Language (CSL) that involves the use of contraries. Tang 2006 discusses the use of A-not-A polar questions in Hong Kong Sign Language (HKSL), which shares a high proportion of its vocabulary with Chinese Sign Language as used in Shanghai (Woodward 1993), the same CSL dialect that we focus on here. Tang notes that sentence-final question particles in HKSL can be formed by juxtaposing positives and negatives in two ways: GOOD+BAD and HAVE+NOT-HAVE. Since they appear sentence-finally and are phonologically reduced, she analyzes them as semantically and syntactically simplex polar question markers, with one exception of a potentially non-simplex case involving HAVE+NOT-HAVE in a non-sentence final position, which was analyzed as a calque from spoken Cantonese.

Data Pattern This work begins by first noting that, in contrast with HKSL, a similar construction is quite productive in CSL in Shanghai. (1a) shows an example with a positive and negative modal, but other varieties include GOOD^BAD (1b), YES^NO (1c), LIKE^DISLIKE (1d), and NEED^NONEED (1e). In fact, this form of polar questions seems to be productive for *any pair in which there are* <u>*morphologically simplex*</u> *contrary/antonym* signs in the language.

SCHOOL GO CAN CANNOT

(1) 'Can (you) go to school?' (CSL)

(1a) SCHOOL GO CAN^CANNOT
(1b) YOU GO SCHOOL GOOD^BAD
(1c) YOU GO SCHOOL YES^NO
(1d) YOU GO SCHOOL LIKE^DISLIKE
(1e) YOU GO SCHOOL NEED^NONEED

What is most notable about this generalization is that it is highly productive, similar to the well known A-not-A construction in spoken Mandarin, yet built in an opposite way to the Mandarin case. Mandarin A-not-A polar questions are necessarily built from two *contradictories*, a positive and its negation (2), e.g. *good* and *not good* (contrast with *good* and *bad* in the CSL case in (1)).

2a. 你去不去学校？
Ni qu bu qu xuexiao
You go-not-go school

2b. 你能不能去学校？
Ni neng-bu-neng qu xuexiao
You can-not-can go school

2c. 你去学校，好不好？
Ni qu xuexiao hao-bu-hao
You go school good-not-good

2d. 你喜欢不喜欢去学校？
Ni xihuan-bu-xihuan go school?
You like-not-like go school

Analysis From a focus semantics perspective, the disjunction of two contradictories is denotationally equivalent to a polar question, namely, both involve simply the set of alternatives containing a proposition and its negation (e.g. {p, ~p}), and so one might analyze Mandarin style A-not-A polar questions as underlyingly structurally involving disjunction, yet resulting in the logical equivalent of a polar question. However, this cannot be the case for contraries: a disjunction (e.g. *Was it good or bad?)* combines two alternatives {p,q}, which in the case of contraries do not overlap, but unlike contradictories do not partition the entire possibility space. Intriguingly, CSL does not only permit contraries, it strongly <u>disprefers contradictories</u> in polar questions (3). Similarly intriguingly and entirely opposite from CSL, Mandarin actually <u>rules out polar question formation via contraries</u>, which are totally ungrammatical in spoken Mandarin (4).

(3a) YOU SCHOOL GO-NOT-GO	(3b) YOU GO-NOT-GO SCHOOL
(considered Mandarin-like, not CSL)	(highly unacceptable)
(4a) *ni qu xuexiao hao huai?*	(4b) *ni qu xue xiao xihuan taoyan?*
you go school good bad	you go school like loathe
(highly unacceptable)	(highly unacceptable)

So, are the questions we see in CSL in (1) even polar questions (vs. disjunction of contraries)? One clear piece of evidence that they are is that they can be answered in the affirmative (e.g. with just YES, or head nodding) or in the negative (e.g. with just NO or head shaking). These are thus <u>true polar questions formed out of contraries</u>. Following Tang 2006, we agree that these should be analyzed as polar question markers, yet unlike HKSL they are quite productive and derived from pieces that contribute further propositional content, e.g. the questions in (1) are not all equivalent to each other. We propose that the C^0 head that introduces a propositional variable for both polar and wh-questions (see Dayal 2016) is sentence-final in CSL and many other sign languages, and that in CSL, C^0 can be filled by an abstract polar question marker that seeks polarity features originating lower in the clause on a predicate (e.g. LIKE, GOOD), modal (e.g. CAN), or propositional anaphora (e.g. YES). The C^0 head is then spelled out as this bisyllabic particle involving the head carrying the polarity feature along with its contrary, sentence-finally. This is not unlike a dedicated INFL/Q as proposed for Mandarin A-not-A (Huang 1991), but in CSL it is especially clear that the pos/neg structure does not arise from disjunction given the semantic differences (contradictories in Mandarin vs. contraries in CSL). We emphasize that these polar questions via contraries in CSL share features familiar from sign linguistics, notably the use of dedicated non-manuals (which are obligatory, though not our focus here) and morphological incorporation of negation into contentful signs. It also shares the juxtaposed neg/pos with a contact language, spoken Mandarin. However, it is unique among these in the use of contraries to express polar questions, contributing to our cross-linguistic understanding of sign languages and to the theoretical analysis of negation and questions in language more broadly.

Data Collection One of the authors, a native Mandarin speaker, has worked for ten years on CSL, and for this project worked closely with a deaf native signer of CSL active in the Shanghai Deaf community who is also fluent in written Mandarin. Contexts were presented in written Mandarin and discussed in CSL; chat was recorded and analyzed further via playback.

The imperative speech act of command in German Sign Language (DGS)

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Introduction: In this paper we investigate the imperative speech act of command in German Sign Language (DGS) by analyzing the spectrum of possible morphosyntactic and pragmatic markers based on an empirical study. Commands are a typical directive construction in which a *Speaker* or *Signer* requires an *Addressee* to carry out the content expressed in the proposition and in most spoken languages, they are typically realized with an imperative sentence type (cf. Aikhenvald 2010). Imperatives as a sentence type can be distinguished from declaratives and interrogatives on the basis of their morphosyntax (such as deprived verbal morphology and no overt subjects in most languages). Functionally, in addition to commands, the imperative sentence type can express other speech acts such as requests, advices, and permissions among others (cf. König & Siemund 2007; Condoravdi & Lauer 2012). Regarding imperatives in sign languages, manual and non-manual markers (NMMs) seem to be important. For some sign languages (e.g., LIS, LSF) it has been shown that imperatives are marked manually with particular signs, such as the MOVIMP sign (cf. Donati et al. 2017). In addition, imperatives are marked with prosodic cues (cf. Donati et al. 2017 for LIS, LSF, LSC; Brentari et al. 2018 for ASL; Bross 2020 for DGS), like for instance sign and hold duration (e.g., in ASL commands the sign duration is shorter compared to neutral sentences and other imperative speech acts, such explanation, permission and advice (cf. Brentari et al. 2018)) as well as with particular NMMs (e.g., furrowed brows mark commands in LSC (cf. Donati et al. 2017)). Syntactically, imperatives in sign languages exhibit some common properties with imperatives in spoken languages, like for instance subject omission (cf. Donati et al. 2017; Brentari et al. 2018).

Method: For the data collection, a *Picture and Sign Task* was designed. Twenty DGS verbs of different categories (valency (intransitive, transitive, ditransitive), uninflected (neutral and body-anchored), agreement (regular, backward, spatial)) were recorded with a native DGS signer (one of the authors of this paper). Five other native signers of DGS (2 women, 3 men) participated in the study. They were presented with a video via Power Point, which provided information regarding situations where commands are typically used (e.g., workplace) and the interlocutors typically involved (e.g., boss and employee). Subsequently, all verbs were presented (some of the verbs together with pictures that corresponded to the verb's arguments). Participants were then asked to produce twenty short commands directed to the deaf person who was sitting opposed to them by using the respective verb appearing on the screen or by combining the verb on the screen with the picture(s). Their productions were recorded and annotated with ELAN. All constructions were checked with a native signer, who decided which sentences are clearly commands that could be used for the analysis (56 out of 100 signed sentences in the command condition). The non-manuals were evaluated in accordance with the Facial Action Coding System (Ekman et al. 2002; see Pendzich 2020 for the analysis of non-manuals in sign languages with FACS). Neutral sentences (simple assertions) and additional imperative speech acts, such as advice, permission, warning and request were also collected using the same method in order to be later compared with the commands.

Results: Concerning word order, no differences are observed between neutral sentences and commands within our data, since in both cases the object(s) precede(s) the verb following the basic OV order of DGS (see Proske 2022 for the word order of declarative sentences in DGS). Another interesting finding concerns the sign YOU in commands, which can appear in the sentence initial position with a prosodic break between YOU and the rest of the sentence. Furthermore, we found the following two markers for commands in DGS. The first one is glossed as MOVIMP (in 20/56 cases, following the glossing of Donati et al. 2017) and the second one is the PALM-UP gesture (PU) (in 22/56 cases). These two markers have been found in other sign languages for the expression of commands and related imperative speech acts as well. MOVIMP is signed with an index-handshape and a movement resulting from a rotation of the wrist. The sign seems to be combined only with second person pronoun. It seems to appear mainly preverbally and can occur with the sentence final main verb GO (see 1). Of note is that there was one case in our data on commands in which MOVIMP is used as the main verb of the command instead of the verb GO (see 2). As for the PU gesture, it appears always in the end of the commands (see 3). Another possible manual marker for commands seems to be the sign NOW, which appears in 17/56 commands (see 2).

	br		
	hm		hm
(1)	MOVIMP	BANK	GO

		hbf
(2)	YOU	NOW BANK MOVIMP

	bl, hbf
(3)	WORK PU

Commands in DGS can also be marked solely non-manually by using particular combinations of NMMs. Brow raise (br) and brow lowerer (bl) seem to be the most prominent markers in the upper face within commands. Another NMM that we found in almost all commands is an intensified forth to backward head movement (hm), which appears also in neutral sentences in much less intensity. Moreover, in almost all elicited commands the signers tend to lean their head and/or body forward (hbf) as opposed to the neutral sentences. Finally, all verbs are articulated more accentuated in commands than in neutral sentences.

Discussion: Our data suggest that DGS uses a particular non-declarative construction for the expression of commands. This construction resembles imperative sentence types described for spoken languages. In addition, it can be marked with specific manual elements like the MOVIMP sign, which is highly context dependent. The sign NOW could be analyzed as an additional manual marker of commands that indicates the urgency for the addressee to carry out the action expressed by the imperative sentence. The prosodic break between the sign YOU and the rest of the sentence indicates that the second person pronoun is a vocative rather than a true subject of the sentence. Similar observations have been made for spoken languages (cf. Han 1998) and other sign languages (cf. Donati et al. 2017). Note that a crucial point of our study in contrast to previous ones is that the elicitation of different imperative speech acts and neutral sentences follows the same method including the same stimuli in different contexts. This is decisive, since it helps us to specify the essential role of NMMs and manual markers in the expression of sentence types and speech acts in DGS. Based on the data so far, we argue that DGS has a designated imperative sentence type used to express commands. However, it is not clear yet whether in DGS this imperative sentence type can be used to express other imperative speech acts or whether smaller sentence type distinctions are involved, which correspond to specific imperative speech acts. The analysis of other imperative speech acts elicited in our study will help us answer these questions.

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Experiencer object (EO) constructions in ASL: Another myth bites the dust!
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There is a long history of recognizing that 'psych' verbs with experiencer arguments are in many ways different from other verbs with clear agent subjects and causation semantics. Careful analysis suggests two main relevant factors: (1) degree to which the stimulus of the experiencer's state is causative, and (2) degree to which the experiencer object is sufficiently like a syntactic object. It has been claimed that experiencer arguments do not occur in object position (henceforth EO) in SLs. Frederiksen & Mayberry [F&M] 2021 cite such claims: for ASL, Edge & Herrmann 1977; Kegl 1990; Winston 2013; Healy 2015; Sign Language of Netherlands, Oomen 2017; Israeli Sign Language, Meir et al. 2007; Greek Sign Language, Sapountzaki 2005. Winston reported that English EO stimuli elicited biclausal structures: a causing event and a caused event, often linked by light verb LOOK-AT, ex. [1]. Most of Healy's results are biclausal; she concludes ASL psych verbs "almost exclusively encode the experiencer as the subject". Winston used elicited production and online rating, whereas Healy used retelling of video clip stories; they both reached the same conclusion- ASL does not favor the occurrence of experiencer objects.

However, as noted in F&M, experiencer objects *do occur* in ASL. Winston's ratings of EO were comparable to ES (scale 1-7: EO 4.7, ES 5.2). F&M indicated 58% of 69 EO verbs were fully/mostly acceptable in a frame 'person-A VERB person-B' as in MAYA EMBARRASS LISA, and 'body anchoring' did not rule out EO (contra Oomen 2017). These data present a linguistic puzzle.

Historically, Kegl 1990 argued ASL verbs like FRIGHTEN/SCARE, which could be an EO verb, were transitive verbs with agent subject and *theme* object; this reanalysis contributed to belief that ASL did not have EO structures. Recent research on spoken languages (Temme 2018) notes 'frighten' and others are *lexically ambiguous* between eventive and stative-causative readings [exs 2-3]. Therefore it is critical to test EO verbs with *inanimate* subjects, which has not been systematically done for SLs. For example, in F&R's frame MAYA ANNOY LISA, it could be EO 'Maya annoys Lisa' or ES 'Maya is annoyed at Lisa', due to the animate subject.

We provide examples extracted from existing literature (exs. [4-7]) as well as new EO data ([8-11]) showing relevant distinctions from Temme: internal vs external causation; eventive (sequential) vs stative (simultaneous); causer vs subject matter stimulus [9]; and propositional attitudes (10), evaluatives (ES only), and dispositional uses (11). Our methodology involves translation tasks (in both directions), elicited production based on explicitly described contexts, and acceptability judgments of felicity in particular contexts, with reliability checks over time.

We argue that many ASL EO structures have been rejected or re-structured to ES for pragmatic/prosodic reasons, especially dispreference for syntactic objects as *narrative focus* items, a factor which may explain why *embedded* EOs are widely acceptable (e.g. exs 4, 6). Previous conclusions on the absence of EO structures are the result of an unfortunate coincidence of choosing contexts and environments that are heavily biased against EO structures. Note 'bias', not 'ban', see main verb uses in [2, 3, 5, 7, 9]. These data serve as a necessary corrective against the prevailing myth.

(1) The clown amused the children. English EO

a. CLOWN$_b$ IX$_b$ CHILDREN$_a$ $_a$[$_a$LOOK-AT$_b$ BELLY-LAUGH-AT$_b$]$_b$ ASL ES: children are amused

b. [CLOWN$_b$ ACT-SILLY, DO+, ACT]$_b$ CHILDREN$_a$ $_a$[$_a$LOOK-AT$_b$ BELLY-LAUGH-AT$_b$]$_b$

(2) TRUE-BUSINESS STOP THINK+ FAIL **CALM** MARY [not ambiguous] (ASL; Authors)
That she stopped thinking she will fail has calmed Mary

(3) STOP THINK+ FAIL **CALM** MARY [ambiguous]
ES: Having stopped thinking she will fail, Mary is calm
EO: Stopping thinking she will fail calmed Mary

(4) PRO-Xclown CLOWN WANT **FEAR/SCARE** SOMEONE (ASL; Healy 2015)
The clown wanted to scare someone.

(5) EACH VOTE.Nmz-Red_pl-dist **BOTHER** IX1 (ASL; Abner 2012:145)
Each election bothers me.

(6) FINISH ADOPT BABY DOG FOR-FOR **SURPRISE** IX$_{j,pl\text{-}arc}$ KID (ASL; Abner 2012:148)
He adopted a puppy to surprise the kids.

(7) IXa DRINK TEA **SURPRISE** IX1 (ASL; Kastner and Davidson 2013)
That she drinks tea surprises me.

(8) HIS BEHAVIOR **BOTHER** IX1 WHY, (SEEM) IX3 THINK NO-ONE NOTICE. (ASL; Authors)
His behavior bothers me because he seems to think that no-one notices.

(9) TRUE-BUSINESS THINK FAIL **FRIGHTEN** MARY
The thought that she might fail frightened Mary

(10) a. He knows that Laura made a mistake. non-Exp
a’. HE KNOW-THAT LAURA TRUE-BUSINESS MISTAKE++
b. It surprised him that Laura made a mistake. Exp
b’’. TRUE-BUSINESS LAURA MISTAKE++ **SURPRISE** HIM EO exp
b’’’. LAURA MISTAKE++, HE **SURPRISED** ES exp

(11) a. That Laura made a mistake ruined him. non-Exp
a’. LAURA MISTAKE++ RUIN/THROW-OFF HIS BUSINESS
b. That Laura made a mistake annoyed him. Exp
____________br
b’. LAURA MISTAKE++ HE IRRITATED/**ANNOYED** ES exp
b’’. TRUE-BUSINESS LAURA MISTAKE++ **ANNOY** HIM EO exp

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“Quantifying” in a Young Sign Language

Basel Rayan, Svetlana Dachkovsky & Rose Stamp

All human languages have ways of expressing quantification. In sign languages, as visual languages, signers can also exploit the use of space, the use of classifiers, and the use of the body (Nendauni, 2021). For instance, some lexical quantifier signs are produced in the neutral signing space with the size of the sign determining whether the quantifier has the meaning of ‘some’ or ‘many’. In addition, signers can employ the use of classifiers to depict the relative quantity of an entity, e.g., by using a cupped handshape in phrases such as ‘most of the rice’. Do young sign languages exhibit all types of quantification from the outset of language emergence? Which strategies do signers exploit in the early stages of language emergence and which at the later stages? In a recent study, by Kocab and colleagues (2022), looking at Nicaraguan Sign Language, they found the use of quantification even in signers from the first generation, suggesting that quantifiers may represent a universal phenomenon present from the outset of language emergence. Studies show that some features in sign language appear at the earliest stages of language emergence such as lexical items (Sandler, 2018) and others such as classifiers and use of space appear later (Aronoff et al., 2003, Kocab et al., 2015). In this study, we examine quantification in a young sign language, Israeli Sign language (ISL), which emerged with the formation of the deaf community in Israel, around 90 years ago. We follow a similar approach to Kocab et al.’s study but we test the possible effects of animacy and dynamicity. Thirteen signers of ISL (9 females, 4 males, 6 older, 7 younger) were recruited and completed a Quantifier Elicitation Task (see Figure 1). Four quantifiers were targeted: ‘none’, ‘some’, ‘many’, and ‘all’ in controlled conditions for static and active, countable and uncountable, animate and in animate.

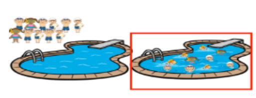
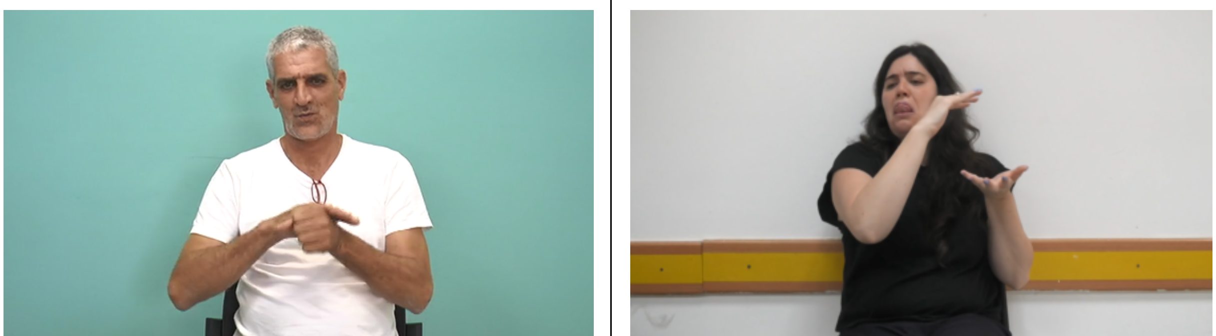
			
(1a) Left: **None** of the children are in the pool (1b) Right: **All** the children are in the pool	(1c) Left: **Some** of the birds are flying (1d) Right: **Many** of the birds are in the pool	(2a) Left: Most of the sugar is in the bowl (2b) Right: **Some** of the sugar is in the bowl	(2c) Left: There is **no** water in the glass (2d) Right: **Most** of the glass is full

Figure 1: Examples From The Quantifier Elicitation Task.

Preliminary results reveal that signers use a range of different strategies including 11 lexical forms and 20 classifier forms. Similar to Kocab and colleagues (2022), signers of all ages produced quantification using a range of expressions. The type of the linguistic expression has a direct relationship with the of quantifier – ‘none’ favoured lexical strategies while ‘many’ favoured classifier strategies, which might reflect inherent semantic properties of quantifiers, such as polarity (e.g., Shikhare et al. 2015) and vagueness (Clothier 2019). Non-manual features, such as tongue wiggle (for showing ‘many’), cheek puff and cheek tighten, contributed to the specification of the quantifier meaning and correlated with specific quantifiers. For example, tongue wiggle consistently co-occurs with the quantifier ‘many’.

Younger and older signers produced similar numbers of lexical quantifiers, yet younger signers use more classifiers for conveying quantification compared to older signers, suggesting that classifiers may take time to emerge as claimed by Aronoff et al. (2003). In addition, younger signers are more likely to use facial expressions with quantifiers than older signers, which points to a more grammaticalized status of the non-manual as the language matures.

Our further analysis will shed light on the interaction of specific semantic components – animacy, countability and dynamicity in the expression of quantifiers both withing and across ISL age groups. Furthermore, the presentation will delve into on the mapping of semantic parameters on specific aspects of the quantifier form.



Old Signer – Lexical (e.g., a full jar of honey)	Young Signer – Classifier (e.g., a full jar of honey)

Figure 2: Comparing Lexical 'all' with Classifier 'all'.

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INHERENTLY RECIPROCAL VERBS IN BRAZILIAN SIGN LANGUAGE

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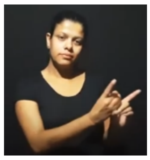
A reciprocal construction, by definition, "denotes an eventuality that involves reciprocity between its participants" and reciprocal verbs usually bear a specific morphological marking (Siloni, 2008). In this presentation, we aim at describing the phonological specification of verbs that are inherently reciprocals in Brazilian Sign Language and we will argue that not only hand specification (all inherently reciprocal verbs are bimanual) is relevant for the reciprocity reading in these verbs, but also movement type (single or repeated movement vs. alternate movement).

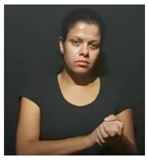
Although reciprocal constructions have been described in different signed languages (Fischer and Gough, 1978; Pfau and Steinbach, 2003; Zeshan and Panda, 2011), most of these descriptions are focused on reciprocalization strategies that take non-reciprocal verbs and by means of different grammatical mechanisms turn the construction into a reciprocal one. In this study we focus on verbs which meanings are inherently reciprocal. In English, for instance, verbs like *meet* necessarily imply reciprocity, in such a way that if A meets B, B also meets A.

From a list of 582 verbs from Lourenço (2018), we extracted all the verbs that were lexical reciprocals. To be considered inherently reciprocal, we followed Rákosi's (2008) criteria, to wit: i) the verb should be unambiguously reciprocal; and ii) the verb does not require any special marking on its form or any modification of its arguments for the reciprocal relation to hold. We found 18 verbs that meet these criteria and, therefore, can be considered inherently reciprocals. Examples are provided bellow:

1) a. IX_a MEET IX_b.
   A meets B (B meets A, also true).
   b. IX_{dual} MEET.
   We(dual) meet [each other].



2) a. IX_a MARRY IX_b.
   Meaning: A marries B (B marries A, also true).
   b. IX_{dual} MARRY.
   Meaning: We(dual) marry [each other].

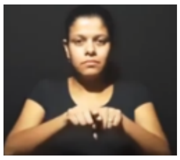


Although lexical reciprocals tend to be analyzed as idiosyncratic, some phonological specifications are interesting among the inherently reciprocal verbs. The first one is that all of them are bimanual. This is interesting, because Pfau and Steinbach (2003) describes that one of the reciprocalization strategy used in DGS (German Sign Language) is to take a one-handed verb and copy its hand specifications into the second hand, resulting in a two-handed derived reciprocal. This strategy is also attested in Libras as a reciprocalization mechanism. So, it is interesting to notice that all inherently reciprocal verbs are bimanual in Libras. The fact that reciprocals usually are two-handed might be due to a semantic mapping (one could call it iconic) between each hand and (at least) a participant of the event. If we consider that each hand would be mapping (at least) one participant, and the hands are coding the very same event (or collection of sub-events, as discussed below), we end up with the observation that these participants share the same properties (e.g. thematic relation) with respect to the event. This is a hypothesis that should be further elaborated, but it does resemble somehow the fact that hand specifications can display a referential mapping in signed languages, as suggested, for instance, for classifier constructions.

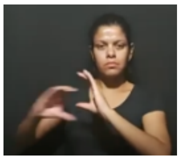
Another interesting observation concerns the movement specifications of these verbs. We identified two different types of movement: single (and repeated) movement and alternate movement. The verbs that have a single (or repeated, but not alternate) movement are BREAK-UP, COUPLE, SEPARATE, OPPOSE-IN-CHALLENGE, MARRY, MATCH, HAVE-CONTACT, MEET, SHACK-UP, DATE, and RESEMBLE. The verbs that have alternate movement are COMMUNICATE, DIALOGUE, DISCUSS, WAR, FIGHT, NEGOTIATE and ARGUE.

These two groups of verbs seem to code different types of reciprocal events, in respect to symmetry (Siloni, 2012). See the following examples:

3) IX$_a$ SHACK-UP IX$_b$.
A shacks up with B
(B shacks up with A, also true)



4) IX$_a$ COMMUNICATE IX$_b$.
A communicates with B
(B communicates up with A, also true)



In (3), the verb SHACK-UP denotes a singular event that involves A shacking up with B and also B shacking up with A. Therefore, the participants in this event are in a symmetrical relation. On the other hand, in (4), there seems to be a plurality of sub-events, some of which are events of A communicating with B and some of B communicating with A. The reciprocity in (4) is a result of an accumulation of sub-events. The verbs like (3) can be called symmetrical reciprocal verbs (Siloni, 2012) or reciprocal verbs with irreducible symmetry (Dimitriadis, 2008).[1]

The fact that reciprocal verbs that are not symmetrical have an alternate movement might not be accidental. Kuhn (2015) notes that, in French Sign Language (LSF), some verbs can have their form changed in order to indicate pluractionality. He calls "/alt/" the morpheme that is pronounced as the "alternating motion of the two hands" (p. 124) and that "entails that a plurality of events vary with respect to their thematic arguments" (p. 126). In the case of the non-symmetrical reciprocal constructions, the alternate movement might be coding the presence of a plurality of sub-events, in which the participants alternate their thematic roles in a reciprocal way. In contrast, the symmetrical verbs have a single movement, which correlates with the fact that they denote a single event in which both arguments have identical (symmetrical) participation. The one exception to this generalization is the symmetrical verb COUPLE that has repeated movement, but this repeated movement is not alternate movement. Probably this repeated movement is related to the atelic reading of this verb, as claimed by Wilbur's observations on telicity marking in sign languages (Wilbur, 2008).

This relation between type of movement and reciprocal readings (symmetrical vs. non-symmetrical) adds up to the growing body of works that claims that signed languages can make visible some semantic properties that are not usually morphologically realized

[1] "A predicate is irreducibly symmetric if (a) it expresses a binary relationship, but (b) its two arguments have necessarily identical participation in any event described by the predicate" (Dimitriadis, 2008, p. 378).

in spoken languages (Wilbur, 2010; Schlenker, 2018). Moreover, our data seems to align with some theoretical proposals that claim that verb movement is related to event properties of predicate signs. Specially, the Event Visibility Hypothesis (Wilbur, 2008, p. 229) who claims that "in the predicate system, the semantics of the event structure is visible in the phonological form of the predicate sign" and the Bodily-Mapping Hypothesis (Bross, 2020, p. 275) that predicts that the inner aspects (which are located below VoiceP, assuming a Cinquean structure) are expressed "by manipulating the movement path of the verb sign".

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Form and function in serial verb constructions — insights from German Sign Language

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Background. Serial verb constructions (SVCs) in sign languages are relatively understudied, and discussions of how word order and meaning are entangled therein are crucially lacking. The present study analyzes previously unexamined German Sign Language (DGS) data which suggest that serializing behaviour remains consistent along some dimensions across languages and modalities (c.f. Aikhenvald 2006), but varies along others. The DGS examples below were collected from the publicly available DGS Corpus project.

Serial verbs of motion. Motion events in DGS can be expressed by strings of verbs decomposing path and manner of motion as has been observed in other sign languages (e.g. Supalla 1990, Benedicto et al. 2008), and spoken languages. In (1), the motion event of going for a walk is decomposed into WALK and GO. Similarly, in (2), 'go swimming' is broken up into SWIM and GO.

(1) SUNDAY MUST **WALK GO**
'On Sundays we would go out for a walk'

(2) AGREED **SWIM GO** HEARING_AID TAKE_OUT ANYWAY
'Right, you have to take off your cochlear implant during a swim.'

In (3), we see the event sequence 'flee the scene' decomposed into three verbs, LEAVE, RUN_AWAY and GO.

(3) ALARM LET_KNOW IX$_2$ ALARM IMMEDIATELY **LEAVE RUN_AWAY GO**
'If the alarm goes off, everybody knows that they have to flee the scene.'

Serial verbs of transfer. Verbs of transfer like TAKE and GIVE can serve unique grammatical functions within SVCs. In (4), TAKE introduces an instrument. TAKE can also share an object with another verb to emphasize the causedness or intentionality of an event, as in (5).

(4) IX$_1$ **TAKE** IX$_1$ **WASH_HANDS** HAND
'You could try washing your hands with it.'

(5) IX$_1$ **TAKE** TIME **SACRIFICE** LIKE
'I have to sacrifice my time.'

Conversely, GIVE can introduce the benefactive in an event, as shown in (6). The benefactive reading is reinforced by the mouthing *für* 'for' over the first-person pronoun.

(6) IX$_3$ MOM **BUY** $\overline{\text{IX}_1}^{\text{/für/}}$ CAR $_1$**GIVE**$_3$
'At some point mom bought me a toy car.'

Iconicity and conventionalization. In DGS, the use of serial verbs of transfer exhibits a typologically common asymmetry dependent upon linearity, summarized in the table below.

Verb	V$_1$	V$_2$
GIVE	*	Benefactive/recipient introduction.
TAKE	Instrument introduction, event initiation.	—

The data demonstrate the sensitivity of the verbs to iconic order within single-event predication; an outcome should not be "given" to the beneficiary before being performed, and an instrument should not be accessed only after it is used. Thus, both GIVE and TAKE are preferred in argument-introducing contexts as V$_2$ and V$_1$ respectively. GIVE is never co-eventive with the following verb due to its telic features, and TAKE only avoids triggering an event boundary as V$_2$ by shedding its event-initiating interpretation (see Ramchand 2008 for diagnostics). My preliminary analysis thus suggests that temporal iconicity conditions the conventionalization of some high-frequency verbs in verb series, such as verbs of transfer.

Simultaneity and word order. For serial verbs of motion, the picture is more complicated. The order V$_{manner}$ + V$_{path}$ seems to be allowed fairly consistently across sign languages, and is the only observed order in DGS (note that motion SVCs are distinguished from cases in which GO embeds another verb, where the inverse order *is* attested in DGS, e.g. 'go (in order) to shop' is signed as GO SHOP). Alternative orders for verbs of manner and of path in motion SVCs across sign languages are shown below for comparison (adapted from Benedicto et al. 2008, Lau 2012, Couvee & Pfau 2018); the sampled languages are American Sign Language (ASL), Catalan Sign Language (LSC), Argentinean Sign Language (LSA), Sign Language of the Netherlands (NGT), and Hong Kong Sign Language (HKSL).

Pattern	ASL	LSC	LSA	NGT	HKSL	DGS
$V_{manner} + V_{path}$	✓	✓	✓	✓	✓	✓
$V_{path} + V_{manner}$	✓	✓	*	✓	*	*
$V_{manner} + V_{path} + V_{manner}$	*	✓	✓	?	?	*
$V_{path} + V_{manner} + V_{path}$	✓	✓	*	?	?	*

Because manner and path are simultaneous properties of a motion event, temporal iconicity has no explanatory power here. Benedicto et al. (2008) attempt to explain the results from ASL, LSC, and LSA in terms of VP-shell structures (complementation, rather than adjunction). They assume that V_{manner} merges in the c-command domain of V_{path}, and reason that while LSC and LSA are head-final and require V-movement operations to derive all the data, ASL, which is head-initial, should derive its unmarked $V_{manner} + V_{path}$ order without head movement, and only requires further movement to derive the more sparsely attested orders.

Complementation vs. Adjunction. The data that I have collected indicate that the same degree of flexibility is not observed in DGS as is in LSC or LSA, despite all of them being broadly head-final languages. The merge of V_{path} over V_{manner} would be sufficient to derive the DGS word order, but assuming that alternative orders are derived via V-movement, syntactic islandhood would better explain why these other orders are not attested. I thus suggest that adjunction-style analyses (à la Veenstra 1996) are more consistent with the DGS data. V_{manner} can naturally be treated as an adverbial adjunct to the main verb, V_{path}. Stereotypical adjunct behaviour matches both the resistance to alternative orders via V-movement, and the idiosyncratization in the order of transfer SVCs. Single events will be correctly interpreted, provided that the necessary event semantic information is recoverable (e.g. uniqueness of thematic relations). Where crosslinguistic similarities in interpretation appear, they stem from typological consistencies in the verbs' lexical semantics and the influence of iconicity, and not from a single universal syntactic structure.

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Agents. What Motion Predicates in ASL reveal about the structural properties of Agent-adding devices.

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Much work on the issue of transitive/intransitive alternations discusses whether syntax or the lexicon are responsible for each of the members of the tr/intr pair and whether or how the two are derivationally related. In this paper, we analyze data from ASL motion predicates that support a syntactic approach, with one particular distinct head introducing, specifically, an Agent argument (not a causer). We also show that not all Agents are the same and that a particular difference (whether the Agent stands in [±continuous] contact with the theme/undergoer; Hale-Keyser2001) has structural consequences. Further, we claim that the multiple structural patterns we observe for the [±cont] contact options are the combined result of the particular Numeration selected and the subsequent syntactic operations in the derivation. The data obtained for this study has yielded structures using classifier (CLS) predicates. We take the position that CLS-predicates are morphologically complex (verbal) units composed of a handshape (the classifier itself, coreferential with an argument of the predicate) and a movement denoting the event's motion. In (1), we show the notation used here: 3+ represents the CLS, of type *whole entity* ($_{w/e}$) coreferential with CAR (sharing the subindex-$_a$), while +GO_UP encodes the simultaneously co-articulated movement:

(1) CAR_a 3_a+GO_UP
car $\text{CLS}_{w/e}$+move_upwards ‘A car is moving up (the road)’

Data. A 175 videoclip app was used as a qualitative, not experimental, elicitation tool. The app, designed for crosslinguistic crosscultural elicitation, includes 87 items related to transitivization: 50 for initial [-cont] contact (*kick the ball into the hole*-type), 37 items for [+cont] contact (*take the ball to the basket*-type), each with a corresponding minimally contrastive intransitive pair (*the ball moves into the hole*). Telic and atelic versions of the motion event are included. Data from 3 native ASL signers were collected using 2 cameras (at a frontal and 45° angle).

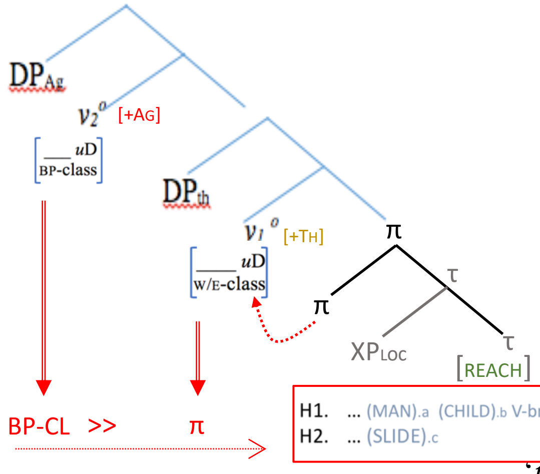
Assumptions. We assume Agents (but not causers) are introduced by a dedicated functional head, *little v* (Kratzer 1996, Chomsky 1995) in ASL. We further assume a *v*-split (Borer1994, 2005; Benedicto-Brentari2004; Ramchand2008; Harvey2013), with an agentive v_2 structurally separate and above a thematic *v* (v_1) that introduces the theme/undergoer; we follow Benedicto-Brentari 2004 analysis that positions *handling* (HDL) and *body-part* (BP) classifiers bundled in the upper v_2 head and *whole entity* (W/E) classifiers in the lower v_1 head. Finally, we assume the syntactic decomposition of subeventive structure, as in Benedicto-Branchini-Mantovan2015, represented in (2-4): a larsonian recursive embedding of a PATH π-substructure and a telic REACH τ-substructure in Motion Predicates, yielding Serial Verb Constructions. The subeventive PATH-π, as well as REACH-τ, are, in these languages, a verbal element (+V), akin to ‘move’ but more complex in structure.

Results. The most notable result is that [+cont] contact Agents are, we claim, the result of syntactic movement of the PATH π-head to (v_1 and subsequently to) v_2 head, with the intended interpretational effect that the Agent is involved (together with the theme) in the motion. We take it that the [±continuous] contact distinction can be derived from the path-related structure ending up in syntactic contact with the Agent-related head, via syntactic movement. Along these same lines, thus, [-cont] contact Agents will result from lack of head-movement of π to the agentive v_2.

Let's consider the possible derivations here. Let's first consider a Numeration that contains 2 classifiers, say, one BP-CLS and one W/E-CLS, and the necessary clausal subeventive functional heads; the BP-CLS will bundle with the v_2 head and the W/E-CLS with v_1 (per Benedicto-Brentari2004). We see the derivation in (2) next: the π-head, a bound morpheme, will raise to v_1+ W/E-CLS and no further head movement will occur (the complex head can be spelled out

Agents. What Motion Predicates in ASL reveal about the structural properties of Agent-adding devices.

(2)



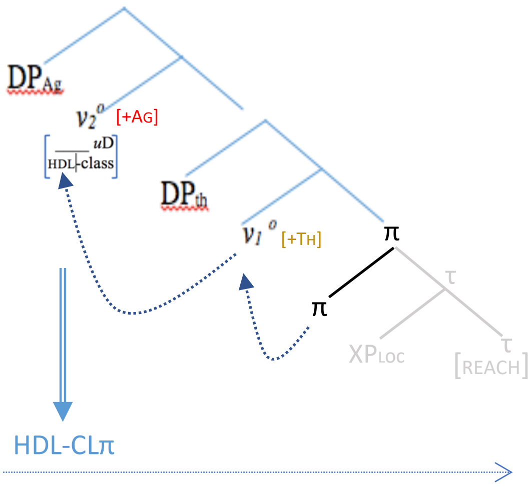
as is).
This will result in the two heads, v_2+BP-CLS and v_1+ W/E-CLS+π, being spelled out separately, resulting in an SVC sequence with the concurrent interpretation that the Agent does not participate in π's motion path (since π didn't raise to v_2).
In the example in (2), B_{BP}.a+PUSH spells out v_2, while V-bnt_{WE}.b+SLIDE-DOWN spells out v_1, in a prototypical SVC.

H1. … (MAN).a (CHILD).b V-bnt_{WE}.b+BE_AT MAN B_{BP}.a+PUSH.b BOY.b V-bnt_{WE}.b SLIDE-DOWN.π
H2. … (SLIDE).c B.c+BE_AT ________ B_{BP}.a+PUSH.b B.c+BE_AT.π ______________

'the man pushed the boy (to go) down the slide'

This derivation yields the [-cont] contact Agent type, with no sharing of the path of motion. Let's now consider an alternative Numeration: one that provides only one classifer morpheme, of the HDL-class type, to be bundled with the higher v_2, and no REACH head.

(3)



In (3) π, as a bound morpheme, again moves to v_1 but it cannot find a suitable host there (there being no CLS), and so continues to v_2,+HDL-CLS where it can be spelled out. In this case, as a result of the particular Numeration and the operations that take place in the course of the derivation, a single predicate form appears ($Cdwn_{HDL}$+GRAB) with only one HDL-CL, Cdwn+, that is co-articulated on the motion's PATH (carried by π).

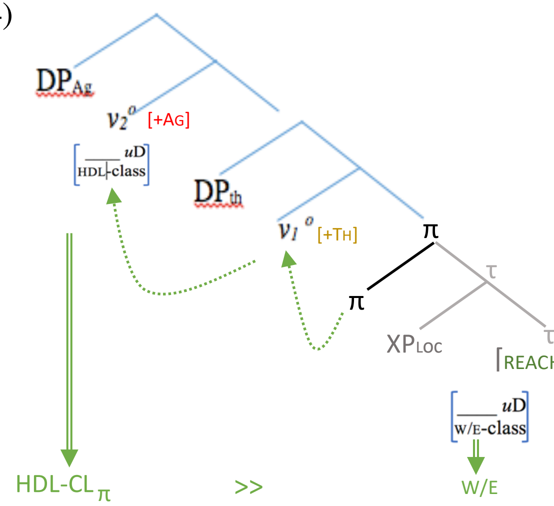
[0905-ASLem]

H1. … GIRL … TRAIN $Cdwn_{HDL}$+GRAB.π_b
H2. $5dwn_{WE}$+BE_AT.b T-U-N-N-E-L … TRAIN $5)dwn_{WE}$+BE_AT.b

'the girl pushes a train toy towards the tunnel

Alternatively, if a a head REACH is provided by the Numeration, together with a HDL-CLS and a W/E-CSL, then again, an SVC may arise. In this case, the W/E-CLS bundles with the telic head

(4)



REACH, which can thus be spelled out; the bound head π raises to v_1 where it cannot find a suitable host (there being no CLS), and so continues on to v_2,+HDL-CLS where it can finally be spelled out. Two predicate forms, thus, are produced, again, as an SVC: C-C_{HDL}+HOLD, the output of <v_2,+HDL-CLS+v_1+π>, and $Vbnt_{WE}$+REACH, the output of <REACH+ W/E-CLS>.
Thus, again, the HDL-CLS is co-articulated with π, yielding the interpretation of [+cont] Agent, sharing the path of motion.

H1. … (FATHER) (CHILD) C-C_{HDL}+HOLD.π V-bnt_{WE}+SLIDE-DOWN.π
H2. … C-C_{HDL}+HOLD.π B-fl_{WE}+BE_AT

'the father takes the child (all the way) down the slide'

As predicted, thus, derivations with π-to-v_2 movement (3-4), yield the [+cont] agentive type.

The head for thinking, the eyes for seeing? Investigating the relationship between place of articulation (PoA) and two semantic domains in German Sign Language (DGS).

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All sign languages share that they employ many signs where the relationship between the form of a sign and its meaning is being represented iconically. We can find iconicity in sign languages on all linguistic levels (Perniss et al., 2010). On the phonological level, iconicity can be present in all parameters, such as the place of articulation (PoA; Börstell & Östling, 2017; Zeshan & Palfreyman, 2019). The PoA can be associated with a certain meaning, e.g., the PoA (fore-)head is often associated with signs addressing cognitive aspects (Börstell & Östling, 2017; Kimmelman et al., 2017; Östling et al., 2018; Rosenstock, 2006; Wilcox, 2005; Zeshan & Palfreyman, 2019). Some of these studies consider DGS in their data set (Östling et al., 2018; Rosenstock, 2006), but none of them shows the quantitative relationship between a semantic domain and the associated PoA for DGS. Therefore, this work is a contribution to the theoretical understanding of the iconic form-meaning relationship between the two semantic domains *cognition* and *visual perception* and the PoAs of the respective signs in DGS.

To investigate this relationship, we gathered German action/process words and composed two lexeme lists for the two semantic domains. These lexemes were taken from different resources, such as data of previous research on this topic as well as Concepticon (List et al., 2022; List et al., 2016). As this yielded only few lexemes in the semantic domain *visual perception*, a third resource was added (Dornseiff, 2020) to obtain a similarly long list as the one for the semantic domain *cognition*. In a last step, all lexemes were double-checked through GermaNet (Hamp & Feldweg, 1997; Henrich & Hinrichs, 2010) to assure a uniform classification. The list for the semantic domain *cognition* consists of 45 lexemes, the one for *visual perception* of 55 lexemes. These lexemes were then searched for in iLex, the database of the DGS-Korpus project (Hanke & Storz, 2008; Hanke, 2002). A sign was labelled a match if one of its proposed meanings in the database was the same as the German lexeme from our list. With this defined procedure, it was not always possible to find a respective sign for each German lexeme, for example when searching for multi-word-expressions. Yet, as a meaning can be expressed by various signs and a sign can have different variants, this may result in more signs than the original German lexemes. For the semantic domain *cognition*, we found 90 matches and for the semantic domain *visual perception*, we found 40 matches. Signs were categorized regarding their PoAs following a combination of the annotation conventions from the DGS-Korpus project (Konrad et al., 2022) and Kimmelman et al. (2018).

Results show that 42% of the signs in the semantic domain *cognition* are articulated near the forehead. The next frequent PoA is the neutral signing space with 23% of the signs (see Figure 1). Taking all PoAs with forehead and head together, 57% of the signs are articulated near the (fore-)head. Thus, consistent with previous research for other sign languages, in DGS as well, the (fore-)head as a PoA is strongly related to the semantic domain *cognition*. However, the expected relationship between the semantic domain *visual perception* and the PoA eyes seems not to be as strong as the one between *cognition* and (fore-)head: Only 20% of the signs are articulated near the eyes. The same number of signs are articulated in the neutral signing space (see Figure 2). Potential explanations for these numbers are the relatively small set of signs investigated, the need to not block the eyes with the hands as the primary channel of input, and restrictions in the predefined annotation schemes for PoA. However, grouping the physically close PoAs eyes, nose and cheeks into the category *upperface* clearly shows the expected tendency for signs in the semantic domain *visual perception* to be articulated around the eyes (see Figure 3).

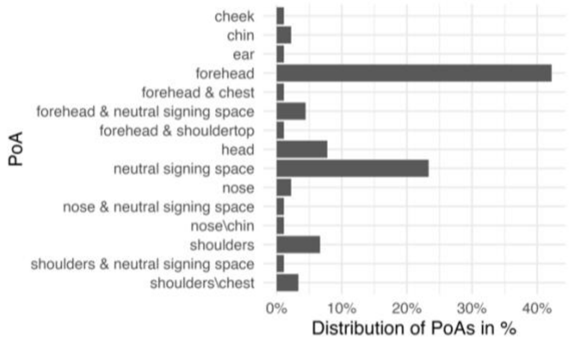

Figure 1: Relative frequency of PoA of signs
in the semantic domain *cognition* (n=90).

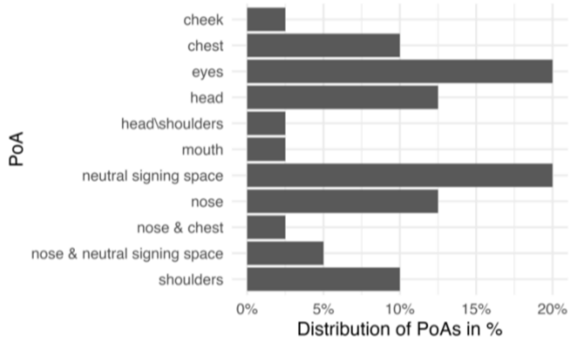

Figure 2: Relative frequency of PoA of signs
in the semantic domain *visual perception* (n=40).

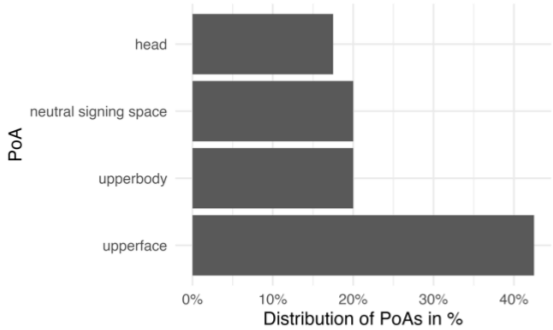

Figure 3: Relative frequency of PoA of signs
in the semantic domain *visual perception*, grouped (n=40).

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Interpretation and the Explicitation Process

Campbell McDermid, Anita Harding & Carrie Humphrey

To date, there has been several studies on how sign language interpreters make changes or alterations to their target texts (TT) in ASL (Cokely, 1992; Livingston et al., 1995; Napier, 2005; Russell, 2002, Stone, 2009). These have shown that sign language interpreters add or clarify information (Livingston et al., 1995; Stone, 2009), substitute or omit some propositions (Cokely, 1992), or add an implied non-lexical function or implied meaning (Russell, 2002). There has been little work, however, on how they interpret into spoken English when faced with an ASL source text (ST). To address this, Klaudy's (1998) taxonomy of obligatory, pragmatic, translation inherent, and optional explicitation was used as a model to study the work of interpreters. The concept of compression was also reviewed as a process noted by many translation and interpretation researchers (Klaudy & Károl, 2005; Molina & Albir, 2002; Nida, 1964). Some strategies were identified as strengthening the propositions for an audience based on the operational definitions of this process in the literature (Carston, 1996; Sequeiros, 2002). Others were seen as weakening the utterance, thus requiring the audience to do more cognitive work to determine what was said or implied (Carston, 1996; Kamenicka, 2007; Molina & Albir, 2002). This model was then used as part of this study to investigate the two research questions:

1. What alteration do ASL-English interpreter make to a target text when working from ASL into spoken English?
2. How can these alterations be characterized?

Twenty-two certified interpreters volunteered to interpret 4 short ASL texts into spoken English. A research team then used a combination of grounded coding in an analytic-inductive approach and Klaudy's (1998) taxonomy to code the changes they made in their texts. Inter-rater agreement was high and fell with the range of 86.96 to 93.66 (mean of 90.43%). Discrepancies were then discussed and re-coded as needed. Given that interpreters often work in virtual realities and with a myriad of consumers, they interpreters were not given a specific audience but instead told to interpret for a general consumer into spoken English.

The findings of this study can be broken down into three shifts in the English target texts of the interpreters away from the structure of the ASL source. These included explicitation, compression, and shifts in reference. Table 1 provides examples in a simplified gloss and English translation of the types of explicitation strategies identified in the data.

Table 1. Examples of explicitation in the data

Aspect	**Story**	**Source Text**	**Target Text**
Coordinating Conjunctions	Secretary, line 3 Appendix A	I ARRIVED (center)	L: **and** once I arrived,
Determiners	Engineer, line 11, Appendix B	YOU WORK DO DO (on right)	S: And what does **the** work look like?
Discourse Marker	Secretary, line 17 Appendix A	I BCK,	C: **finally, when** I came back from the restroom
Phrasal Verb	Engineer, line 5, Appendix B	**MEET** (on right) THERE (on right)	V: I **came across** an engineer.

		ENGINEER POINT (to engineer)	

Table 2 outlines some examples of the compression strategies used by the interpreters and Table 3 provides examples of shifts in reference.

Table 2. Examples of compressions in the data

Aspect	**Story**	**Source Text**	**Target Text**
Agentless Passive Voice	Secretary, line 5 Appendix A	**POINT (to secretary)** TOLD-ME (left to center) WAIT LONG WILL	N: and I was told **[by someone]** that I would have to wait a really long time
Object Deletion	Secretary, line 15 Appendix A	ASK **(to secretary)** WHERE BATHROOM WHERE?	C: and asked **[them]** where the restroom was.
Speaker Stance	Engineer, line 9, Appendix B	**OH-I-SEE (to right)**	**[omitted]**
Verb Compression	Secretary, line 19 Appendix A	**POINT** (to secretary) **CL:1 (come up to me)** (from left to right) TOLD-ME (from left to center) MEETING START SOON	C: they **[came to me]** told me that the meeting would begin promptly

Table 3. Examples of shifts in reference

Aspect	**Story**	**Source Text**	**Target Text**
Role for Pronoun	Secretary, line 18 Appendix A	**POINT** (to secretary) CL:1 (come up to me)(from left to right)	A: …the **receptionist** approached me
Indefinite Pronoun	Secretary, line 18 Appendix A	**POINT** (to secretary) CL:1 (come up to me) (from left to right)	Q: uh **someone** came up to me
Superordinate for Pronoun	Secretary, line 11 Appendix A	**CL:1** (approach center, turn, move back left),	C: So, the **person** left.

A discussion by the researchers of the potential impact and role of these changes found that most of the strategies were optional and many strengthened the utterance. Obligatory strategies included the addition or clarification of conjunctive devices, such as "or" between compounded verb phrases or the addition of determiners such as "the." In the ASL source texts, "or" was represented by a pause and could have been translated as "or" or "and" and so this would have to be "figured out" by the interpreter. The definite article "the" was not represented by a lexical item such as a POINT, and so nouns could have been prefaced with the indefinite article "a/an" or "the" as both made sense in context and so the interpreter would have to again decide which to include. The reduction of verbs such as "meet," "chat" and "ask" into the one verb, "ask" could have been for stylistic (optional) or for pragmatic reasons, as the verb "to ask" entails the "meeting" and perhaps "chatting." Including phrasal verbs such as "came across" made the text sound more like colloquial English to the researchers instead of using the translation equivalent "met" for the ASL sign MEET.

In conclusion, it was found that ASL-English interpreters in this study typically made changes to their target texts in spoken English. These usually involved explicitation and strengthened the utterance and most could be considered optional. The types of changes are in line with the Klaudy's (1998) taxonomy and so have been noted in translation or interpretation work between other language pairs as well. Students of interpretation, where they are not directly being taught these strategies, may benefit from targeted instruction.

Analyzing the relationship between phonological and semantic features in a corpus of astronomical neologisms in LSQ

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Although the study of the sublexical organization of signs is younger than that of spoken words, most sign language phonologists now agree that signs exhibit internal phonological organization (e.g. Sandler, 2012). While the presence of a phonological level is not modality-dependent, modality does have an impact on the phonological structure of languages, as illustrated by the significant incorporation of simultaneity into the organization of sign languages compared to what is found for spoken languages (e.g. Fenlon et al., 2017). Modality also allows a greater representation of iconicity in sign form (e.g. Östling et al., 2018; Taub, 2012). Due to the centrality of iconicity, the link between phonology and semantics seems prominent in some signs, as is the case of classifier signs, which are categorized by Fenlon et al. (2017) as part of the non-core lexicon, in that they are composed of meaning-bearing units, as against the core lexicon. Also known as depicting signs (Liddell, 2003), non-core lexicon signs would allow for a more direct link between the referent and the linguistic form.

Some linguistic contexts are particularly characterized by that direct link between referent and linguistic form. This is the case, for instance, for the lexicon of emerging languages (Coppola, 2020; Horton, 2020), even if they are known to evolve more rapidly than more established sign languages (Meir et al., 2012), and for neologisms where the form of signs can be considered still unfixed or evolving, in the process of entrenchment, conventionalization, and acceptance (e.g. Langacker, 2005; Schmid, 2015). In this study, we focused on the sublexical structure of neologisms in LSQ (Quebec Sign Language). More precisely, we observed the link between phonology and semantics in a set of 99 neologisms in the scientific domain of astronomy. Considering the iconic potential offered by the visual and spatial modality of sign languages, we ask: does semantic motivation, and more precisely iconic motivation, influence the formation of structural components of signs (place of articulation (POA), movement and handshape) for lexical creation of astronomical signs in LSQ? Given the semantic domain for which the neologisms were created, one that denotes physical, concrete objects, we hypothesize that the three major structural components will be driven by iconicity. As astronomy is the science that studies celestial body, spherical objects located in space and primarily in motion, we posit three specific hypotheses: the POA will be distal (H1), the movement will involve a path (H2), and the fingers of the handshape will be curved (H3).

This study is based on a corpus developed by a team of native signers for whom LSQ is the reference language. In collaboration with an astronomer, the team proposed 99 neologisms to name 49 astronomical concepts from the International Astronomical Union list (see this link). Each major structural component was described according to its shape features and, like Pietrandrea (2002), we indicated the semantic contribution of each feature, i.e., whether a feature is meaningful, motivated by the shape of the represented object, or not. We described five handshape features (number of selected fingers, nature of selected finger(s), fingers position, spacing between the fingers, and thumb position), two POA features, area (face, body or signing space) and position (on the *x*, *y*, and *z* plane), and five movement features (nature, geometric form, temporality, oscillation, and direction of the movement). Within a corpus driven approach, we used two types of statistical measures, a statistical method of exploratory factor analysis, the multiple correspondence analysis (MCA) (Sourial et al., 2010), and a chi-square analysis in order to verify whether the difference between the counts of different variables is significant or not.

The descriptive analysis of the phonological features of these neologisms shows that although all signs are semantically motivated, iconicity is not evenly distributed across phonological components and features. We observed a use of classifiers for the creation of new lexical items. All handshapes of these signs include in their sublexical structure at least one iconic feature, mainly the [curved] feature of the selected finger position. While formed of phonological elements, handshape seems to behave as a morpheme in the creation of new signs, i.e., as a morpheme allowing the classification of a spherical entity. The semantic domain thus influenced the shape features of handshape, confirming hypothesis 3. As for movement and place of articulation, their use in the creation of these neologisms is less prominent. The movement allows, in half of the cases, to iconically represent the shape of the referent or its spatial motion, whereas the POA is mainly realized in the neutral space and does not participate in the representation of the referent, thus refuting hypothesis 1. We find that, in the case of the astronomy neologisms in LSQ, the handshape is an iconic structural component, while the POA is mainly neutral. For movement, the distribution of iconic interpretation is not as clear as for the two other components. This suggests that sublexical components cannot per se be interpreted as bearing iconicity or as being exempt of iconicity. Findings from our analysis echo what has been proposed by van der Hulst & van der Kooij (2021), namely that a feature can be semantically motivated and that "semantic/iconic factors play an overriding role in the emergence of the phonological form of signs" (p. 22). Certain sublexical components are more likely to be iconically motivated, and in the case of astronomical signs, these are handshape and, maybe, movement. It should be noted that the notion of distance included in the majority of the referents in the corpus is represented by, among other things, the arrangement of the hands.

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An experimental approach to sign language reduplication: From function to form

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This study combines a methodological and a theoretical goal, as it (i) introduces three novel experiments to investigate reduplication in Sign Language of the Netherlands (NGT), and (ii) presents the results, providing the first comprehensive overview of reduplication in NGT.

1. Background

Sign language (SL) reduplication comes in many shapes and may fulfil various morphemic functions (Wilbur 2009). This study focuses on three of these functions in NGT: nominal pluralization, aspect marking, and reciprocal marking. First, nouns are pluralized by means of reduplication in many studied SLs (e.g., Sutton-Spence & Woll 1999 for British SL; Pfau & Steinbach 2005 for German SL). Often, plural reduplication is constrained by location and movement features of the noun. Indeed, based on analysis of NGT teaching materials, Harder et al. (2003) observe that NGT nouns can be pluralized by reduplication, and that there are phonological constraints, e.g., reduplication was found to be ungrammatical for nouns with a repeated movement in their base form.

Second, aspect marking in SLs often involves reduplicating the verb and modulating the rate and rhythm of the verb's movement (e.g., Zeshan 2000 for Indo-Pakistani SL; Rathmann 2005 for American SL). According to Hoiting & Slobin (2001), the continuative and habitual are marked in NGT by reduplication and an "elliptical modulation". They also identify phonological constraints: NGT verbs that are body-anchored and/or have internal movement cannot be reduplicated. However, since the method is not discussed, it is unclear how the authors came to this analysis. Moreover, Oomen (2016), investigating the same aspect types for NGT based on one informant, does not find any phonological restrictions.

Third, several SLs were found to form the reciprocal by means of "backward reduplication" of the verb, where the verb is reduplicated, and its movement is reversed in the reduplicant (e.g., Pfau & Steinbach 2003 for German SL; Zeshan & Panda 2011 for Indo-Pakistani SL). Klomp (2021) conducted a small-scale study on NGT reciprocals, involving one participant. The results suggest that two-handed agreement verbs are marked for reciprocity by sequential backward reduplication, while one-handed agreement verbs may be marked by sequential or simultaneous backward reduplication.

2. Aims

The present study investigates reduplication in NGT to mark plurality on nouns, and aspect and reciprocity on verbs, considering the factors that potentially influence NGT reduplication as suggested in previous studies. It is the first study to systematically address all three of these functions of reduplication in NGT, adopting a novel experimental approach.

3. Method

All three functions of reduplication were first explored in the Corpus NGT (Crasborn et al. 2008), containing 70+ hours of videos of 92 deaf signers. In total, 297 plural nouns, 240 sentences marked for aspect, and 54 reciprocals were extracted from the corpus. I cannot go into the corpus findings here, but suffice it to say that they were taken into account when developing the three elicitation tasks, one for each specific function of reduplication. In designing the tasks, the relevant variables suggested by previous studies were also kept in mind.

(i) Pluralization. A gap-filling task was designed to elicit the plural form of 21 nouns with different specifications for location (body, lateral, midsagittal) and movement (simple or repeated). Five deaf signers were presented with 42 signed sentences (excl. fillers) in which the plural noun was omitted and replaced by a question mark sign; they were asked to fill in the gap, based on a picture. An example is shown in (1).

(ii) Aspect marking. An elicitation task was developed to elicit aspect marking on six different verbs: two body-anchored, two with internal movement, and two without these properties. For each verb, there were items targeting habitual, continuative (both imperfective), and iterative (perfective) aspect. Each of the 36 items (excl. fillers) consisted of two parts: (i) a picture showing the verb, and (ii) a question in NGT about that picture, with a context which specifies the duration or frequency of the event shown, e.g. (2), which targets the continuative. Six deaf signers were asked to answer the question in a full sentence, based on the picture presented.

(iii) Reciprocal marking. The third elicitation task aimed to elicit the reciprocal form of one- and two-handed plain and agreeing verbs. Seven verbs (agreement and plain; one- and two-handed) and different types of reciprocal meaning were targeted. This resulted in 11 items (excl. fillers), each consisting of a video showing two actors playing out a reciprocal situation. The situation-video was shown together with a video of a verb in its base form, see (3). Six deaf signers were asked to tell a story to describe the situation they saw in the video, using the verb they were given.

(1)

Item: 'Last October, the *?* were on strike'
Target: 'The farmers were on strike'

(3)

Item: 'to give'
Target: 'They give each other a cup'

(2)

Item: 'This man is at home. What has he been doing for hours?'
Target: 'He has been cleaning for hours'

4. Results

I summarize the main findings, but cannot elaborate on all results here.

(i) **189 nominal plurals were elicited; 61% of these are reduplicated.** I identify two main reduplication types: simple (repetition of the noun's movement) and sideward (repetition with an added sideward movement), the choice of which depends on the phonological properties of the base noun.

(ii-a) **71 continuative and habitual (imperfective) sentences were elicited, of which only 23% involves reduplication**, where the movement of the verb is repeated. The low percentage is due to phonological constraints: predicates with the location feature [trunk] or a handshape change are not reduplicated.

(ii-b) **52 iterative (perfective) sentences were elicited, of which 71% involves reduplication of the verb**; pauses are added in between reduplication cycles, and this reduplication type is unconstrained.

(iii) **62 reciprocals were elicited; 45% involves simultaneous or sequential backward reduplication of the verb.** Two-handed verbs are never reduplicated. For one-handed agreeing verbs, reduplication type depends on the semantics: for simultaneous reciprocal meaning, signers choose simultaneous reduplication, while for sequential reciprocal meaning, signers choose sequential reduplication or zero marking. For one-handed plain verbs, simultaneous backward reduplication marks simultaneous reciprocals, while sequential reciprocals are zero-marked.

***(iv)* For all three morphological functions, reduplication is optional**, even for unconstrained base signs.

5. Conclusion

All three tasks successfully elicited the targeted constructions. The results show that NGT patterns with other investigated SLs, as phonological, morphosyntactic, and semantic factors influence reduplication. They also reveal some unexpected patterns, e.g., the across-the-board optionality. The three investigated functions differ from each other in terms of what types of reduplication occur, and which factors play a role. These insights complement findings from previous studies on NGT, due to the novel methodology. Using similar elicitation tasks in research on other SLs would provide more insight into cross-linguistic patterns and variation.

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The meaning of reduplication with movement in LSC

Raquel Veiga Busto

Prior research has identified a number of morphological operations used to express numerosity in sign languages (Wilbur 1987; Pfau & Steinbach 2006; a.o.). One such strategy is reduplication with movement, whereby the relevant sign is repeated at different locations within the signing space, yielding a plural interpretation. While the meaning associated with each operation in the pronominal domain has not been extensively analyzed for most sign languages, earlier studies generally assume that pronouns reduplicated with movement convey a distributive/exhaustive interpretation (Sandler & Lillo-Martin 2006). Building on felicity/grammaticality judgments and production tasks elicited with two native deaf signers of Catalan Sign Language (LSC), this paper aims at analyzing the meaning contributed by the combination of reduplication and movement in personal pronouns. Ultimately, this study shows that pronouns reduplicated with movement in LSC present a number of properties which are not compatible with a distributive/exhaustive plural analysis.

I. Upper bound cutoffs: in LSC, pronouns reduplicated with movement are used to recover entities whose cardinality is equal or lower than 5 (1). Alternatively, they may pick up more than 5 entities, but in such cases, they also yield the interpretation that only certain members of the set are being referred to. This is shown in the (2a), where a group of 50 people is introduced in the context sentence and the subsequent reduplicated third person pronoun is interpreted as referring to a subset of them. If reference is intended to the whole plurality, the so-called collective plural pronouns must be used instead (2b).

(1) Context: At today's comic play there are only three people in the audience. To make fun of them, one performer says to the other:
IX3-rep3[1] FOOLISH.
'They are foolish.'

(2) Context: At today's comic play there are about 50 people in the audience. To make fun of them, one performer says to the other:
a. IX3-rep3 FOOLISH.
'Some of them are foolish.'
b. IX3-$_{\text{straight}}$ FOOLISH.
'They are foolish.'

II. Exhaustivity: unlike (1), where reduplication with movement enforces an exhaustive reading, the pronoun in (2a) does not require the entities in the context to be exhausted and their interpretation is analogous to that of the partitive reading of the quantifier *some*. In fact, the upper bound implicature ('some, not all') of reduplicated pronouns undergoes suspension (3) and cancelation (4) in the same contexts as those described for *some* (Horn 1972). Further, just like the existential quantifier *some*, pronouns reduplicated with movement are logically consistent with the conjunction of their inner negation (5), unlike plural pronouns and universal quantifiers.

(3) a. IX3-rep3 FOOLISH, POSSIBLY EVEN ALL.
b. SOME FOOLISH, POSSIBLY EVEN ALL.
'Some of them are foolish, and possibly even all of them are.'

(4) a. IX3-rep3 FOOLISH. IN FACT, ALL FOOLISH.
b. SOME FOOLISH. IN FACT, ALL FOOLISH.
'Some of them are foolish. In fact, all of them are foolish.'

[1] The gloss -rep*n* stands for signs modified by reduplication with movement, where *n* represents the total amount of repetitions; the subscript -$_{\text{straight}}$ stands for signs modified by a horizontal trajectory movement, but no reduplication.

(5) a. IX3-rep3 FOOLISH, IX3-rep3 NOT.
b. SOME FOOLISH, SOME NOT.
'Some are foolish, and some are not.'

III. Distributivity: pronouns reduplicated with movement do not enforce the reading that the predicate applies to every individual member in the extension of a plurality. This is shown in (6), in which the reduplicated pronoun, combined with the mixed predicate *push a car*, is not interpreted as 'The two women pushed a car each', but rather as 'The two women (together) pushed a car'. To get the reading that the members of the set are picked out separately (i.e., distributively), it is necessary to reduplicate other elements, such as the predicate, the quantifier or both the predicate and the quantifier (7).

(6) WOMAN TWO IX3-rep2, CAR PUSH.
'Two women (together) pushed a car'.

(7) WOMAN TWO, CAR PUSH-PUSH.[2]
WOMAN THE-TWO, CAR EACH-rep2 PUSH-PUSH.
'Two women pushed a car each.'

Analysis and implications. The results of this study show that pronouns reduplicated with movement present significant functional differences with respect to pronouns reduplicated with movement as previously described for other sign languages. Considering that distributive/exhaustive plural pronouns would be expected to show the opposite properties, it is proposed that the meaning of reduplication with movement in LSC pronouns is not distributivity, but rather paucity. As it is the case of other languages with a paucal value, the paucal in LSC is used to specify that the cardinality of the referents is small (i.e., it comes with upper bound cutoffs). Besides, its range is not clearly predetermined (i.e., it is an approximative number, cf. Corbett 2000) and its meaning depends on the size of the referred group (i.e., it has a contrastive interpretation, cf. Crowley 1982). These results raise the question of whether reduplication with movement might have a different meaning across sign languages and, hence, that the array of number values generally taken to be distinguished in sign language personal pronouns (singular, dual, distributive plural and collective plural) might be more varied than previously assumed. As far as I am aware, no previous study has considered the existence of a paucal value in sign language pronominals. However, Turkish Sign Language classifiers have been shown to use reduplication with movement to express paucity (Kubuş 2008). Therefore, the association of reduplication and movement with a paucal interpretation might not be restricted to LSC nor to personal pronouns.

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[2] The gloss PUSH-PUSH stands for punctuated reduplication, that is, a reduplication type in which each repetition of the sign is clearly separated from each other (cf. Coppola, Spaepen & Goldin-Meadow 2013).

Day 3

Thursday, June 29

Martin Dale-Hench & Uiko Yano

Intuitions of native Japanese Sign Language signers on mouthing words with multiple pronunciations

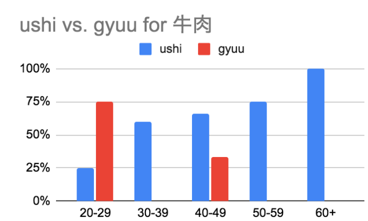
Mouthings in sign languages are defined as mouth movements that are derived from spoken languages, as opposed to “mouth gestures” that do not appear to be related to spoken language (Boyes Bream 2001). Some of the critical roles that mouthings play are disambiguation, or “to specify or complement the meaning of the sign” (Schermer 2001: 277). If the sign’s meaning is potentially ambiguous, the signer may specify which word is being expressed by mouthing a spoken word. For example, in American Sign Language, PIECE and CAKE both may be signed in similar ways, so the signer may mouth “*piece*” or “*cake*” during manual production to disambiguate.

In spoken/written Japanese, many written words have two or more possible readings, because of the Japanese’s history of importing Chinese logographic symbols (known as *‘kanji’*) along with Chinese pronunciations that are wholly unrelated to words native to Japanese. As a result, there may be several possible readings for a specific logograph - Chinese-derived or natively Japanese. Readings of *kanji* based on Chinese-derived pronunciations are called *on-yomi* and those based on native Japanese pronunciations *kun-yomi*. For example, the character for “west” (西) could be read *nishi* (kun-yomi), *sei*, or *sai* (both on-yomi), depending on the morphological environment where it is used.

The guiding question of this study is how native Japanese Sign Language (JSL) users negotiate *kun-yomi* and *on-yomi*. Do they use multiple readings for certain *kanji*? Or do they choose one of them for a signed lexical item and apply it across all morphological environments without switching between the two? For example, would they mouth *nishi* for all instances of the JSL sign for “west,” or would they show a mix of *nishi* and *sei/sai*, depending on the compound word? Given that Oka & Bono (2019) have shown that older native JSL signers mouth less than younger generations, another question addressed by this study is whether the results would be impacted by the age of the signer. We hypothesize that native JSL users will strongly favor only one reading for all instances of a sign, regardless of the morphological environment, and that reading will usually be the more familiar kun-yomi, and that older generations will favor zero mouthing or kun-yomi. If our hypotheses are correct, they could be used as evidence that, despite being derived from spoken language, a mouthing may be divorced from the actual spoken word and become “frozen” with the manual sign, and there is no need to change the mouthing according to the morphological environment of the sign.

This experiment tested 24 native JSL signers, 12 male and 12 female, who varied in age between 20 to 70 years. A native JSL signer interviewed all of the participants using elicitation questions. In particular, the participants were asked to sign out 10 pairs of pictures, the first one representing the morphologically simple word, such as *cow* (牛: *ushi*) and the second one representing a morphologically complex word such as *beef*, which is literally “cow” + “meat” in Japanese (牛肉: *gyuuniku*). The interviews were conducted on Zoom, and the specific mouthings for the target words were analyzed from the recordings.

Our findings confirmed our hypothesis that native JSL signers favored kun-yomi readings even when the spoken Japanese analogue would say it in the on-yomi reading. For example, the word *cow* (牛) is read *ushi* in spoken Japanese, and almost every signer mouthed at least an approximation of *ushi* when producing the manual sign. However, when they were prompted to sign out *cow+meat (*beef*:* 牛肉), which has a Japanese reading of *gyuuniku*, rather than mouthing the on-yomi *gyuu,* 16 out of 24 signers (67%) still mouthed *ushi*, and then *niku*. In total, for items that have the corresponding spoken Japanese in the on-yomi form, the signers favored the kun-yomi reading 60% of the time, and the on-yomi reading only 16% of the time. The remaining 24.4% did not produce any mouthing or used a different strategy such as classifier constructions.



Another interesting finding was that there were 3 instances where the younger generations used more on-yomi readings, while the older generations showed a marked preference for kun-yomi readings. The chart (on right) shows the mouthing results for the “cow” component of “beef” (牛肉: *gyuuniku*). Almost every signer above the age of 50 mouthed *ushi*, while 75% of the 20-29 age bracket mouthed *gyuu*. The discrepancy, also found in two other word pairs, suggests that while native JSL signers generally prefer kun-yomi readings for mouthings, this phenomenon may see a diachronic change in the years ahead.

In sum, our findings suggest that while a mouthing may be derived from a spoken language, it may become divorced from how the spoken word is used in certain morphological environments and provides support for the approach that a mouthing is frozen and linked to a sign’s lexical entry. However, future research is also needed to control for the modality of the interview, as it was done remotely on Zoom, and to test whether knowledge of *on-yomi* Japanese readings influence JSL mouthing production.

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Measuring facial non-manual markers with a depth sensing camera: A case-study on polar questions in NGT

Lyke Esselink, Marloes Oomen, Floris Roelofsen

Aim. This paper aims to make a methodological contribution to experimental research on non-manual markers (NMMs) in sign languages. Namely, we explore the use of a *depth sensing camera* to track features of the face of a signer (e.g., brow raise, eye squint, mouth shape). As a case study, we use this method in a study of polar questions in Sign Language of the Netherlands (NGT). The method allows us to obtain fine-grained, quantitative representations of facial expressions used to express polar questions in NGT, and is straightforwardly applicable to other empirical domains and other sign languages as well.

Traditional methods. Research on NMMs in sign languages is generally based on video data. Such data, however, is two-dimensional and therefore never fully captures the actual physical reality that it represents, which is three-dimensional. Furthermore, important details are sometimes not visible on video footage because of a limited frame rate, limited resolution, motion blur, or occlusion (e.g. a hand in front of the face). Ideally, researchers would be able to base their analysis on data that captures the poses and movements of a signer, in particular NMMs, in a format that stays closer to the original, with less inherent transformation (3D to 2D), compression (frame rate, resolution), and noise (blur, occlusion).

Analysis of video data starts with annotation. This process is notoriously laborious, especially when NMMs are concerned. Even when done with great care, manual annotation has some inescapable limitations. It is inherently *subjective* (two annotators may disagree as to whether an eyebrow is raised or neutral), *not robustly reproducible* (a single annotator may label an eyebrow as raised one day, and the same eyebrow as neutral six months later), and inherently *categorical* (an eyebrow can be labeled as raised or neutral, perhaps 'half raised', but not 'raised to degree 0.35') while in reality eyebrow raise and other facial features are quantitative/continuous variables, not categorical ones—so in the annotation phase the data is further 'compressed', losing part of the original information. Ideally, researchers would have a method to annotate NMMs that is less laborious, not subjective, reproducible, and quantitative rather than categorical (meaningful categories may be identified in a later stage of analysis, but should not be imposed on us from the start).

Recent advances. Recent work by Kimmelman et al. (2020) and Kuznetsova et al. (2021, 2022) addresses the limitations of manual annotation of NMMs, building on initial proposals by Metaxas et al. (2012), Liu et al. (2014), and Puupponen et al. (2015). They use face recognition software (OpenFace) to automatically detect a signer's eyebrows and eyecorners, and compute a degree of eyebrow raise/lowering in terms of the distance between these. This method to extract degrees of eyebrow raise/lowering from video data is automatic, objective, and quantitative. However, there are still some limitations. First, measurements of relevant facial features like brow raise are *indirect* and *not robustly reproducible*. OpenFace detects facial landmarks. Features like brow raise have to be derived from distances between landmarks, but this cannot be straightforwardly done in a reliable way because these distances partly depend on the distance and angle between the camera and the signer's face (as discussed by Kuznetsova et al., 2021), which are impossible to keep constant across and even within recordings. Second, the proposed method still takes 2D *video data* as its starting point. This is what OpenFace takes as its input. So, while this body of work makes an important first step in addressing the limitations of manual annotations, it does not address the issues of inherent transformation, compression and noise associated with video data.

Proposal: using a depth sensing camera. We explore a way to overcome these issues, at least partly, by using a depth sensing camera in addition to ordinary video cameras for data collection. Specifically, we make use of a TrueDepth camera built into an iPhone 13 in combination with the free Live Link Face application by Epic Games. This hardware/software combination can be used to measure 61 facial features, called ARKit *blendshapes*. Not all 61 ARKit blendshapes (click here for a full list) are relevant for the study of NMMs in sign languages. For our purposes, we selected 9 relevant blendshapes (motivation for this choice will be provided in the paper): BrowInnerUp, BrowOuterUp, BrowDown, EyeWide, EyeSquint, CheekSquint, NoseSneer, MouthShrug, and MouthFrown. Blendshape coefficients are values between 0 to 1, indicating the degree of engagement for each feature. Blendshape coefficients are measured at a frame rate of 60 fps.

Unlike OpenFace, which performs landmark detection based on video input, this method thus bypasses the main issues associated with video data, and moreover directly measures facial features that are of interest for sign language research as opposed to landmark coordinates, which first have to be translated into feature coefficients, something which, as mentioned above, cannot always be done in a straightforward way, if at all.

Case study: polar questions in NGT. As a concrete case study, we collected data on the use of facial NMMs in polar questions in NGT. Previous work in this empirical domain (Coerts, 1992; de Vos et al., 2009) mainly focused on eyebrow movement, and found much variation—in particular, both raised and lowered brows often occur. Our experimental design controlled for two contextual factors which may influence the way in which a polar question is expressed: prior speaker belief and immediate contextual evidence concerning the question radical. For instance, when prompted to ask *Is the zoo open?* a participant may be given prior information (through role play with a confederate) that the zoo is probably open, but be faced with immediate contextual evidence (through role play with another confederate) that the zoo is actually probably closed, and similarly for other combinations of prior belief and immediate contextual evidence. We recorded participants with a depth sensing camera as well as an ordinary video camera. This allowed us to gather fine-grained, quantitative data on the facial NMMs that are used in the expression of polar questions in NGT, across contexts and participants. The data is very rich and lends itself to various types of quantitative analyses. Space prevents us from discussing these in detail here. We highlight the fact that a clustering analysis yields three main clusters of facial expressions. Cluster A is characterized by high values of BrowInnerUp (0.75), BrowOuterUp (0.67), and EyeWide (0.82); cluster B by high values of BrowDown (0.60) and moderately high values for EyeSquint (0.39); and cluster C by low values ($\leq$0.20) for all blendshapes, thus containing relatively neutral facial expressions. Our contextual manipulations clearly affect which facial expressions are used in a polar question. For instance, while in general expressions from cluster A (brow raise, eyes wide open) are much less commonly used than ones from cluster B (brows furrowed, eyes squinted), 19% vs 39%, they are slightly *more* common when there is neutral prior belief and positive contextual evidence, 35% vs 33%. On the other hand, they are *never* used when there is positive prior belief and negative contextual evidence. Further analyses and results will be discussed in the full paper. All data and analyses scripts will be made freely accessible and reusable.

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Grammatical and affective layering in ASL: A preliminary study

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Keywords: sign language linguistics, nonmanual markers, ASL, layering, facial expressions, semiotics

The 44 muscles of the face independently, and in tandem, produce facial expressions that may dynamically combine to fulfill a variety of linguistic and non-linguistic functions Prior research has indicated the universality of six affective facial expressions: sadness, happiness, anger, surprise, disgust, and fear (Ekman & Friesen, 1988). The use of facial movements for both linguistic and affective expressions in signed languages raises the question of how signed languages disambiguate between the two. Further such facial expressions may be combined, or layered, while maintaining their grammatical function. There are apparent phonological, language-specific rules for layering affective and grammatical facial expressions, that is, where facial movements are co-articulated and execute a number of functions. Using previous studies of layering as a point of departure, this study focuses on grammatical facial expressions used for polar questions when they are co-articulated with affective facial expressions.

Layering occurs when there are simultaneously occurring facially-produced phones (Wilbur, 2013, p. 191). Affective facial behaviors are not as constant; instead, they develop and change across a context string (Baker-Shenk, 1983). Compound emotions can also form hybrids that convey specific facial elements from each of the emotions involved (Du, Tao, & Martinez, 2014). A similar occurrence happens when grammatical expressions are layered. With both grammatical and affective behaviors, layering variations can occur (Baker-Shenk, 1983; Weast, 2011; Schnepp et al., 2013; Kimmelman et al., 2020). Even though signers intrinsically utilize layering as a metastrategy in communication, the effect of layering has not been fully explored. This study examines, in particular, whether affect-related variations are present in polar questions, and if so, what layering strategies ASL signers typically use.

This study drew on two data sources: an online pool of 251 polar questions from Boston University's ASL Linguistic Research Project (Neidle, Opoku, & Metaxas, 2022) and a six-hour-long live stream session consisting of a free-flowing conversation between four Deaf ASL signers available on YouTube (i3xCx, 2021). From the first data source, one polar question was used as a baseline (i.e., it was not layered with any affective facial expression), and four polar questions were observed that had layering and variation of a surprise facial expression. Seeing that the Boston University corpora was generated in a laboratory and seemingly scripted, more naturally-situated data was supplemented by way of the second source. As found in the latter, one baseline polar question was analyzed, along with two clauses from the first hour of the conversation that had grammatical and affective layering, specifically of a 'surprise' facial expression.

Following the analysis and annotation of the data as described, three layering strategies were uncovered:, namely, separation, addition, and competition. Prototypical polar questions have been previously reported as characteristically displaying three nonmanual signals (NMS): brow raise, head tilt forward, and body lean forward, with the additional possibility of widened eyes (Liddell, 1980). Following suit, the two polar questions serving as baseline sentences displayed these very prototypical NMS. In contrast, in one layering strategy, signers maintained the supposition of surprise by **separating** affective NMS features into a sequence. That is, these facial phones are generated preceding or following grammatical information. It can be inferred that such a strategy improves message clarity while ensuring that subtle nuances are retained, expressed, and comprehensible.

A second layering strategy, **competition**, occurs when one articulator fulfills multiple functions. In Figure 1, competition of the frontalis muscle simultaneously lifts and lowers the eyebrows while the eyes struggle to widen and contract. This competition occurs as the muscles attempt to express both the affective nature of surprise and the grammatical nature of a polar question. This strategy has been seen in studies of "motherese" (Reilly & Bellugi, 1996), and competition of the eyebrows has been compared to pitch in some tonal languages (Weast, 2011, p. 221).

The last layering strategy supplements grammatical features by **adding** affective ones. For example, signers added a jaw drop to further depict a surprised disposition (Figures 2d & 3a). At other times, signers added a darting of the eyes back and forth with a squint amidst constructed dialogue (Figures 1a-d and 3a-d). In the same vein, signers also leaned their heads and bodies further forward (Figures 1 & 2) or backward (Figure 3).

This preliminary study observes how signers' can monitor their expressions while prioritizing communicative practices to ensure message clarity. Signers can separate affective features from grammatical NMS (e.g., jaw drop Figures 1d, 2d, & 3a), use one articulator competing for multiple functions (e.g., Figures 1c-d & 3c-d), or supplement the grammatical NMS with additional markers (e.g., darting eyes in Figures 1 & 3). Noting this study's smaller scale of data, a larger sample of elicited and holistic data is needed to confirm these patterns. Nevertheless, this analysis of layering further introduces sign language linguists to the metastrategies driven by real-time brokering of shared facial articulators, utlizing affective expressions' flexibility of scope and timing and maintaining clarity for higher grammatical functions.

Figure 1

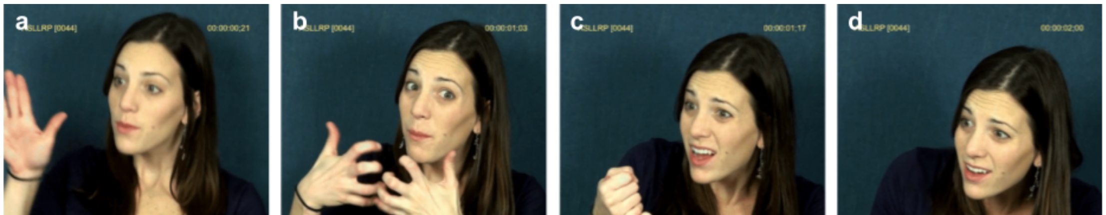


Figure 2

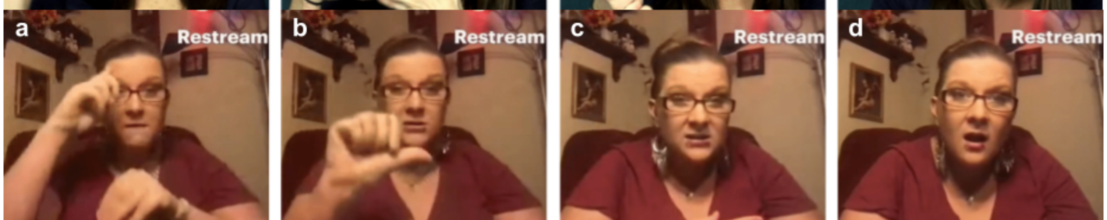
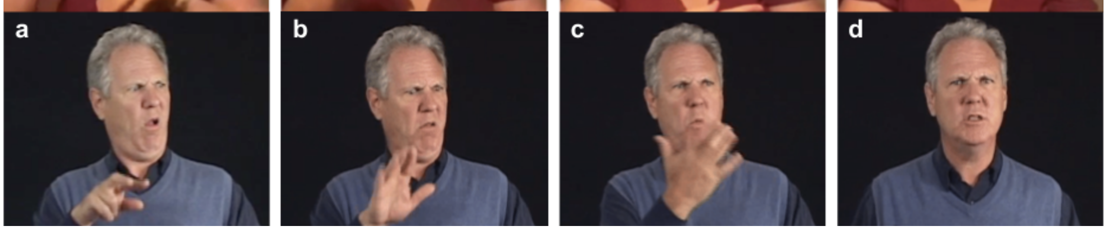


Figure 3



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Biased polar question forms in NGT: The function of headshake

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Background and objective. It is often claimed that polar questions in sign languages are marked by raised eyebrows, in addition to other typical non-manual markers (NMM) including wide-opened eyes, addressee eye contact, and body/head forward position (e.g. Zeshan 2004). However, many experimental and corpus-based studies report decidedly more variation, including in brow position (e.g. Coerts 1992; De Vos et al. 2009 for NGT). We hypothesize that at least part of this variation can be accounted for by taking *bias* into account. As far as we know, only three sign language studies (Cañas Peña 2019 for Catalan SL; Gökgöz & Wilbur 2017 for Turkish SL; Sze & Lee 2023 for Hong Kong SL), based on elicitation and judgment data, have previously addressed the role of bias in question forms.

We designed a production task manipulating a signer's *original speaker belief* (SB) about a certain proposition p established before the current situational and conversational context, and *contextual evidence* (CE) concerning p directly provided within that context to investigate how these factors influence the form of a polar question in NGT about the truth or falsity of p. This allows us to identify different polar question forms that are used in NGT, and how these question forms are conditioned by prior speaker expectations and contextual evidence. We investigate both manual and non-manual markers. In the present paper, we focus specifically on question forms that include *headshake*, the main marker for negation in NGT (e.g. Coerts 1992; Oomen & Pfau 2017), since biased question forms often involve negation across languages (e.g. 'Don't you have a car?'; 'You have a car, don't you?'). We identify several question forms in which headshake occurs, and determine the range of contexts in which these forms are used.

Experimental setup. Data were elicited from 6 deaf NGT signers in a controlled production experiment. We manipulated SB and CE to elicit biased question forms in NGT. The study design was based on work by Domaneschi et al. (2017) on biased polar questions in English and German, which in turn builds on Roelofsen et al. (2013). In a role-play setting, we prompted participants to ask questions to two confederates, both deaf signers of NGT, whose responses introduced different SB and CE (+, 0, –). These exchanges were designed to trigger a target question directed toward the second confederate at the end of each role play. All participant utterances were video-recorded and target items were prepared for analysis in ELAN. From each participant, we elicited 30 target items across 7 conditions (different combinations of +/0/– SB and CE, excluding the ++ and −− conditions since they make polar questions unnatural to ask), for a total of 210 items. Nine items had to be discarded. In ELAN, we added ID-glosses for manual signs, detailed annotations for a wide range of non-manual markers, and annotations to indicate potential manual markers of question forms (e.g. PALM-UP). We then selected all question forms containing headshake for the current analysis. The table on the right indicates how many question forms with headshake were identified for each condition.

	SB		
CE	+	0	-
+		2/29	6/28
0	6/29	11/30	14/29
-	18/29	25/27	

Results. We analyzed all elicited constructions for (i) NMM patterns; (ii) their general sentence structure; and (iii) function and place of occurrence of the headshake.

NMM. There is much more to say about NMM than space allows here, but we will highlight three key observations. First, *almost all* analyzed items involve either brow lowering or inner brow raise, with full brow raise attested rarely. We propose that these non-raised brow configurations, which typically coincide with eye squint, are markers of *uncertainty* about the question radical. These NMM occur across all experimental conditions, although with somewhat lower frequency in [-SB,+CE] and [0SB,-CE]. Second, in conditions [-SB,+CE] and [+SB,-CE], we frequently attested the NMM ‘head up’ (combined with the general question NMM ‘head forward’; see below) and ‘nose wrinkle’; these appear to signal *unexpectedness* of the question radical. Third, the most consistently attested NMM across all items and conditions is a head or body forward position. This contrasts with what Cañas Peña (2019) reports for Catalan SL, where she found backward head/body position in conditions with negative CE.

Sentence structure. In (1) to (5) below, we list the most common elicited question-type forms (we count any utterance inviting a yes/no response as a question-type form), with representative examples. For reasons of space, we do not gloss NMM other than headshake (‘hs’), but see above for discussion. In the tables below, dark gray cells indicate the conditions in which the question type forms (1)-(5) were attested. We discuss the distributions further below.

(1) **Negative sentence radical with inquisitive NMM (not glossed):**

ENTRANCE $\overline{\text{FREE-OF-CHARGE}}^{\text{hs}}$ — ‘Is entrance not free of charge?’

(2) **Negative sentence radical + RIGHT:**

$\overline{\text{KIM HOME}}^{\text{hs}}$, RIGHT PALM-UP — ‘Kim isn’t home, right?’

(3) **Positive sentence radical + mouthed ‘or not’:**

KIM IX_3 VEGETARIAN $\overline{\text{INDEX}_3}^{\text{‘or not’, hs}}$ — ‘Is Kim a vegetarian or not?’

(4) **Positive sentence radical + inquisitive headshake**:

IX_3 SUNDAY ZOO OPEN $\overline{\text{HESITATE}}^{\text{hs}}$ — ‘Is the zoo open on Sunday?’

(5) **Negative sentence radical + inquisitive headshake**:

IX_3 SUNDAY ZOO $\overline{\text{OPEN}}^{\text{hs}}$ $\overline{\text{HESITATE}}^{\text{hs}}$ — ‘Is the zoo not open on Sunday?’

(1)

	SB		
CE	+	0	-
+			
0			
-			

(2)

	SB		
CE	+	0	-
+			
0			
-			

(3)

	SB		
CE	+	0	-
+			
0			
-			

(4)

	SB		
CE	+	0	-
+			
0			
-			

(5)

	SB		
CE	+	0	-
+			
0			
-			

Functions of headshake. We can identify two main functions. In forms (1)-(3), headshake signals negation (a manual negator is optional in NGT). Note that in (1)-(2), headshake negates the sentence radical, while in (3) it does not negate the sentence radical but rather introduces a negative alternative (‘or not’). In form (4), however, we see a different function of headshake, previously unnoticed to our knowledge. Here, headshake does not express negation at all but rather functions as (part of) a question marker. In this use it occurs sentence-finally, typically in combination with the manual signs PALM-UP or HESITATE or a held sentence-final sign. Form (5) also features this inquisitive use of headshake, this time in combination with a headshake that signals negation of the sentence radical.

Distributional constraints. The observed distribution of the various forms across conditions suggests the following generalizations: (i) Questions involving a negative sentence radical with inquisitive headshake or other inquisitive NMM, (1) and (5), require negative CE or SB, and are incompatible with positive CE; (ii) Questions with a negative sentence radical and RIGHT (2) require negative SB; (iii) Questions with ‘or not’ (3) require neutral CE; and (iv) Questions with an inquisitive headshake, (4) and (5), require that the CE does not contradict the sentence radical, which means that if the sentence radical is positive, CE cannot be $-$, while if the sentence radical is negative, CE cannot be $+$.

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Mouthing Constructions as Social Indexes of Gender in ASL Pronouns

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Keywords: sign language linguistics, ASL pronouns, indexes of gender, mouthing constructions, mouthing, translanguaging, semiotics, trans linguistics.

This paper describes a preliminary study that focuses on the nonmanual markers, precisely mouth actions, produced in tandem with pronominal references in American Sign Language (ASL). While it has become a common belief far and wide within the ASL community and the field of signed language linguistics that ASL pronouns are “genderless” or unmarked in terms of gender (Liddell 2000; McBurney 2002; Sakel 2005), this paper provides evidence to the contrary for third-person singular ASL pronouns by way of mouthing constructions. Very recently, mouthing constructions have been observed to serve morpho-phonological, morpho-syntactic, and other linguistic functions across signed languages (Bismath, in press). Rather than taking a stand on the specific linguistic convention that mouthing constructions seen produced with ASL pronouns may be, the author provides evidence these constructions serve as social indexes of gender while presenting rationale as to the significance the presence that such social indexes may have on ASL discourse, especially for transgender and gender non-conforming signers.

In recognizing the reality that Deaf, hard-of-hearing, and hearing ASL signers are often multimodal and multilingual (Emmorey et al. 2008; Allard & Chen-Pichler 2018) the presence of these mouthing constructions seems to result from signers’ employment of their full semiotic repertoires. In other words, these mouthing constructions are the result of translanguaging practices in ASL communities (Kusters 2021). Further, using the tenets of sociocultural and trans linguistics, this paper observes that mouthing constructions co-articulated on third-person singular pronouns function as social indexes of gender (Hall & Bucholtz 2005; Zimman 2018; Zimman 2021). In noting this, the author advocates for a moral obligation to recognize the social indexing of gender in ASL pronouns as a mechanism of gender affirmation and potentially gender-based linguistic violence (i.e., misgendering).

In this preliminary investigation, the author conducted analysis of four open-source ASL videos, three of which were produced by Gallaudet University and one by MELIMIRA. While three videos were analyzed in their entirety, the fourth video was analyzed for up to four minutes of content. 20 mouthing constructions tokens co-articulated over third-person singular pronouns were annotated in ELAN using Johnston and Van Roekel’s (2012) mouth action coding schema. The findings revealed that complete articulations of M-type (mouthing) mouth actions often accompany ASL pronouns (especially for third-person singular), with some interesting exceptions observed. This study highlights a typical combination where the manual pronominal reference is unmarked in terms of gender, but the mouthing construction completely articulates the gender of the referent, thereby socially indexing the gender identity of the respective referent. To illustrate this point, Figure 1 shows the most typical example.

The author utilizes sociocultural and trans linguistics principles (Zimman 2017) to argue for the ethical foundation of acknowledging the social indexing of gender in ASL pronouns to prevent linguistic abuse of marginalized communities. This paper offers a unique perspective on the intersection of sign language linguistics, semiotics, and gender studies, beginning the conversation regarding the actual and potential gender-affirming and gender-invalidating language practices that affect transgender, nonbinary, gender-diverse, Deaf, and signing communities. This also brings implications for the need of ASL pronoun acknowledgment, introduction, and practice.

Fig. 1: The most typical example where the signer uses a gender-marked mouthing construction to indicate that the referent of the clause is a man.

MouthGesture F	MouthGesture M
M-type, complete, [hɪz]	His
Socially Indexes	*A man*

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Manual and non-manual cues used for the prosodic encoding of contrastive focus in LSFB (French Belgian Sign Language)

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Signed languages (SLs) exploit prosodic variations for a variety of purposes (Pfau & Quer 2010), including the marking of information structure (IS) (Wilbur 2012). Signers rely on a multitude of non-manual resources to accomplish this, including eyebrow or head movements, body leans, changes in gaze direction, and mouthing and mouth gestures (Pfau & Quer 2010). Manual markers also play a role in SL prosody and consist of changes of signed parameters, such as modifications of the location (displacement higher or lower in space), movement (holding or repetition), duration, or hand used (dominance reversal) (Sandler 2012).

We can identify various types of information units in languages, including contrastive focus, which is defined as the opposition between (at least) two explicit alternatives that are included in a limited set already present in the discourse (Repp 2010). Contrastive foci can be categorised into the following subtypes (Umbach 2004): discourse opposition (1), selection (2), and correction (3).

(1) Some of them have [**a square shape**] (…). Some are [**rather triangular**] (…).

(2) A: Dark or light blue?
B: [**Light**].

(3) You told me "a triangle-shaped eyebrow". It is more like [**a circumflex**].

The field of IS research is characterised by various debates regarding the possibility of a linguistic marking specific to contrastive focus. Some SL linguists have claimed that contrastive focus is encoded by distinct manual and non-manual patterns (e.g. Crasborn & van der Kooij 2013; Kimmelman 2014; Navarrete-González 2021) while others have stated the opposite (e.g. Schlenker et al. 2016). Furthermore, little is known about the prosodic differences between discourse opposition, selection, and correction, as contrastive focus and its subtypes have remained understudied in many SLs, such as LSFB (French Belgian Sign Language).

This presentation aims to address these gaps by answering the following questions: which manual and non-manual prosodic cues of LSFB are used to encode contrastive focus and its subtypes? Do these markers combine? To investigate these questions, we examined videos extracted from the LSFB Corpus (Meurant 2015). The selected data were produced by six native deaf signers who interacted with someone familiar during several spontaneous tasks. The prosodic encoding of 400 contrastive foci was evaluated in comparison to the marking of the signed units (i.e. sequences of signs delimited by stops of the hands) that preceded or followed contrasts, and thus formed their surrounding context. From this perspective, 1500 manual signs were annotated in ELAN for holding, sign repetition, dominance reversal, duration, and displacement. A total of 1200 non-manual cues (eyebrow, head and body movements; mouthings and mouth gestures; changes in gaze direction) were also taken into account.

The results, based on quantitative and qualitative analyses, show that contrastive focus is expressed by specific manual markers in LSFB compared with the surrounding non-contrastive context. More specifically, the duration of contrastive signs is longer than that of non-contrastive items. Manual holds are also more frequent on contrastive foci as well as height variations. Dominance reversals and movement repetitions are not prosodically used by the

LSFB signers as markers of contrastive focus, contrary to what has been pointed out for other SLs (e.g. Crasborn & van der Kooij 2013). Furthermore, body leans, eyebrow, head and mouth movements are more prevalent on contrastive foci than on preceding or following elements. Non-manual cues can also combine to signal contrastive focus, with the most frequent pattern being a combination of body, head, and eyebrow movements

Moreover, a part of the SL literature claims that manual and non-manual markers occur simultaneously on contrastive focus, forming a single prosodic pattern (e.g. Wilbur 2012; Crasborn & van der Kooij 2013). However, the analysis of LSFB indicates that manual and non-manual markers are used separately rather than in combination, which echoes the observations of other studies on the independence of these two kinds of prosodic cues (e.g. Kimmelman 2014 for NGT and RSL)

Regarding contrast types, our prediction based on other SLs was that prosody becomes more intense in increasingly contrastively marked contexts: discourse oppositions are less contrastive than selections and corrections, and hence, less prosodically encoded (e.g. Navarrete-González 2021). However, in LSFB, we observe either (i) a gradual marking of the contrast subtypes (from discourse opposition to correction, or vice versa) or (ii) the use of specific markings for one subtype (e.g. selection) that are distinct from the other two (e.g. discourse opposition and correction). Patterns (i) and (ii) manifest differently depending on the prosodic cues and articulatory properties (i.e. types of sign, movement, and position in an utterance), as it will be explained during the presentation.

Ultimately, this research opens new avenues for a more thorough definition of prosody and contrastive focus in LSFB.

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Indexicals under role shift in Sign Language of the Netherlands: experimental insights

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Introduction. In order to report speech and other attitudes, sign languages (SLs) make use of a dedicated construction known as role shift (RS), in which the signer embodies the matrix attitude holder to report the content of the original utterance by using a complex of non-manual markers (RS-NMMs) such as eye gaze shifts, body leans, and head turns. These constructions famously exhibit total or partial shifting of indexicals, where the meaning of expressions such as *I* and *you* is 'shifted' from the context of utterance to the reported context [1, 2]. This is exemplified in (1) for the SL of the Netherlands (NGT), where RS-NMMs are noted above the glosses, with underscore marking scope:

(1) IX$_3$ SAY QUICK $\overline{\text{IX}_1\ \text{DISABLE}}^{\text{gaze, head and body left}}$ [NGT corpus, [3]]
'He$_i$ said straight away: "I$_i$ am disabled".'

A popular analysis in the formal semantics literature treats RS-NMMs as realizing a context-shifting operator, analogous to the one proposed for the indexical shift in spoken languages [4, 5]. However, previous studies suggest that this might be too strong a conclusion. First, indexicals can fail to shift even when under the scope of RS-NMMs, as demonstrated in (2) for German SL (DGS), where the second person indexical IX$_2$ denotes the actual addressee:

(2) a. Felicia: IX$_1$ DREAM ANNA IX$_3$ LOTTO WIN [DGS, [6]: (28)]
'I have dreamed that Anna won the lottery.'
b. Tim reports to Anna: FELICIA $_3$INFORM$_1$ $\overline{\text{IX}_1\ \text{DREAM IX}_2\ \text{LOTTO WIN}}^{\text{rs}}$
'Felicia$_i$ told me$_T$, she$_i$ dreamed that you$_A$ won the lottery.'

Second, while the presence of RS-NMMs seems not to force a shifted interpretation upon indexicals, the reverse seems also true: RS-NMMs might not be required for indexicals to shift, as data from Russian SL (RSL, [7]) and Hong-Kong SL (HKSL, [8]) suggests. Such results are hard to accommodate under current context-shifting theories, and suggest that RS-NMMs are neither necessary nor sufficient for the interpretation of indexicals. This raises the following questions: i) what is the semantic status of RS-NMMs? and ii) are there any constraints on the way indexical expressions in structures such as (2) are interpreted and if yes, what are they? The present study aims at answering these questions, focusing on NGT.

Methodology. An experiment combining interpretation tasks and felicity judgments (5-point Likert scale) was carried out to investigate the interaction between RS-NMMs and indexical shift. 13 native NGT signers (26-58 y.o; 2 males) participated, each being presented with multiple sets of video-recorded pairs of signed dialogues. In each pair, the first video consisted of a dialogue between two signers, T. and C. (3a, 4a), and the second one, involving two different signers M. and J., consisted in M. reporting T's utterance (3b, 4b). They were three different conditions: (i) the type of indexical involved (IX$_1$ in (3), IX$_2$ in (4)), (ii) presence vs absence of RS-NMMs, and (iii) the original quote (3a, 4a) being presented or left out.

(3) a. IX$_1$ LOVE CYCLING
'I love cycling.'
b. T. SAY IX$_1$ LOVE CYCLING
'T. said I love cycling.'

(4) a. IX$_2$ SIGN VERY.WELL T. to C.
'You sign very well!'
b. T. SAY IX$_2$ SIGN VERY.WELL M. to J.
'T. said you sign very well!'

Each participant saw each combination of conditions (i-iii) in three different lexical variants, hence 24 stimuli + fillers. For each stimulus, participants first assessed the felicity of the report, then had to provide an interpretation for the indexical by choosing among the list of potential signers T., M., C. or J. Multiple choices were allowed.

Results. There was considerable variation across participants, whose responses formed three different clusters. Cluster 1 (5 participants) always interpreted IX$_1$ as being shifted, i.e., referring to the original author, T. For these, RS-NMMs did not influence the reference for IX$_1$. However, RS-NMMs did play a role in interpreting IX$_2$: if present, RS-NMMs elicited a shifted interpretation of IX$_2$, i.e., referring to the original addressee, C. Otherwise, IX$_2$ was interpreted as non-shifted., referring to the reported addressee, J. Cluster 2 (3 participants) exhibited a different response pattern, interpreting both indexicals as shifted in all of the conditions. Last, cluster 3 (5 participants) interpreted IX$_1$ as being unshifted or ambiguous irrespective of RS-NMMs. When asked to produce sentences with a shifted meaning, cluster 3 produced sentences involving a null form $\emptyset$ or a reflexive SELF. For all clusters, the presence of the context never influenced interpretation of indexicals, but did affect felicity scores: if interpretation clashed with the original utterance context, the respective mean score was significantly lower.

Analysis: IX$_1$. The fact that signers from clusters 1 and 2 systematically interpreted IX$_1$ as shifted suggests that it might in fact be a logophoric pronoun similar to those found in some African languages, as first suggested by [9]: we therefore propose that IX$_1$ is the morphological spellout of a feature LOG (5), with the corresponding presuppositional semantics in (6) [10]:

(5) /IX$_1$/ $\leftrightarrow$ [LOG, SG] (6) $[\![$ LOG $]\!]^{g,c,i} = \lambda x : s(c) \vee s(i) \sqsubseteq x.x$

Since the LOG feature presuppositionally restricts its referent to the author of any context (not just the utterance context), the entry in (6) also captures impersonal uses of IX$_1$ found in some SLs, as well as bound readings under universal quantifiers in other SLs [11]. However, data from cluster 3 poses a challenge for such an analysis. Following what has been proposed for American SL [12], we suggest to capture variation by assuming that NGT makes use of a scale of competing anaphoric expressions, where an efficiency algorithm analogous to Grice's brevity maxim [13] enforces the use of the lowest element in the scale allowing for the identification of a unique referent in discourse compatible with its denotation, (7):

(7) $\emptyset <$ SELF $<$ IX$_1$

In speech reports environments, (7) predicts that signers will prefer using the null form to refer to the reported speaker, capturing pre-theoretical insights from Cluster 3, in line with similar HKSL data [8]. The data from clusters 1 and 2 is explained by positing that they considered both the presented stimuli and their alternatives when computing examples such as (3) (cf. [14] for analogous conclusions about the processing of focus particles).

Analysis: IX$_2$. The interpretation of IX$_2$ in speech reports, contrary to IX$_1$, seems highly sensitive to RS-NMMs, as well as to contextual information; RS-marked sentences where perceived as odd when the referents of indexicals did not match those of the original context. We propose that RS-NMMs realize a presuppositional version of the context-shifting operator *RS-OP* ([5]) that presuppose shifting the kaplanian parameters of the utterance context to the reported context, including the addressee parameter:

(8) $[\![$ RS-δ ϕ $]\!]^{g,c,i}$ = 1 iff $[\![\phi]\!]^{g,i,i}$, # otherwise.

The operator does not affect reference for IX$_1$, since per (6) it is compatible with any context; however, the referent of IX$_2$ in its scope is presupposed to refer to the original addressee; the sentence is therefore predicted to be perceived as infelicitous when addressees do not match, as in (4b). When no RS-NMMs are realized, signers can accommodate a silent version of RS-δ in order to interpret contexts as homogeneous, i.e., where both signer and addressee indexicals are shifted. Further data, elicited from 3 participants, seems to confirm this: signers tend to interpret IX$_2$ as shifted when the a discourse referent corresponding to the shifted addressee is realized as an argument of the matrix sentence, even in the absence of RS-NMMs:

(9) T. SAY C. IX$_2$ SIGN VERY.WELL M. to J.
'T. said to C.$_i$ you$_{i/*J}$ sign very well!'

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Neg-raising in three sign languages

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The phenomenon. *Empirically*, a negative marker in the main clause is understood as if belonging to the dependent clause in Neg-raising (NR) constructions. The low interpretation of negation is possible only with some verbs (e.g. *think*; (1a) vs. *claim*; (1b), i.a. Jespersen 1917).

(1) a. I do**n't** think Maya will move to Paris. ≈ I think Maya will **not** move to Paris.
b. I do**n't** claim Maya will move to Paris. ≠ I claim Maya will **not** move to Paris.

Theortically, two explanations have been offered: Some argue that it is a syntactic phenomenon involving movement of the negation from the dependent to the main clause (i.a. Fillmore 1963, Collin & Postal 2014), while others claim that NR predicates come with an inference of the type $p \vee \neg p$ which leads to an interpretation of 'I don't think that p' as 'I think that not-p' (i.a. Bartsch 1973, Gajewski 2007). More recently, some have suggested that NR is best captured by a hybrid approach (e.g. Horn 2020).
In *sign languages* (SLs), NR is attested in AUSLAN (Johnston 2018) and TID (Göksel & Kelepir 2016) and partially described for NGT (Oomen et al. 2019).

Objectives. We present here the most in-depth study on the properties of NR constructions in SL to date, based on newly elicited data from LSF, LIS, and NGT. We apply syntactic and semantic diagnostics to probe the properties of NR in SL. In addition, SLs offer an entirely new perspective on NR: in (some) SLs, non-manual markers of negation like headshake can 'spread' over larger parts of a sentence, marking syntactic and scopal domains (Neidle et al. 2000). Building on Oomen et al. (2019), we investigate headshake patterns in NR constructions in NGT, which allows such wide spreading.

Negation in LSF, LIS & NGT. LSF (Millet 2019) and LIS (Geraci 2006) require a manual negative sign to negate a proposition, making them 'manual dominant' (cf. Zeshan 2004). NGT is 'non-manual dominant': a manual negator is optional and a headshake can negate a proposition on its own (Coerts 1992). Headshake also usually spreads over at least the predicate in NGT, while it generally acccompanies the manual negator only in LIS and LSF.

Methods. Acceptability and felicity judgments on a 7-point scale have been collected from native signers of LIS, LSF, and NGT using the playback method (Schlenker 2014 & Davidson 2020)

Baseline data. We used mini-dialogues like (2) as a first diagnostic for NR-predicates: The answer in **A** is only compatible if Signer 1 is using a NR-predicate at the beginning of the exchange. The answer in **B** is only accessible if non-neg-raising readings are targeted.

(2) **Signer 1:** IX_1 BELIEVE-NOT/NOT SAY PIERRE PLAY 'I don't believe/say Pierre left.'
Signer 2: IX_2 BELIEVE/SAY WHAT 'What is it that you believe/say?'
Signer 1 A: PIERRE NOT LEAVE 'Pierre didn't leave.' (=NR)
Signer 1 B: IX_1 BELIEVE/SAY NOTHING 'I believe/say nothing.'

Neg-raising in LIS, LSF & NGT. The three SLs pattern similarly to one another and to spoken languages for two key NR-constructions: negative quantifiers and strict Negative Polarity Items (NPI).
Negative quantifiers in subject position (e.g. NOBODY) license neg-raising reading. This is true for both NGT and LIS, as shown in (3) (the test cannot be applied for LSF for independent reasons).

(3) NOBODY THINK GIANNI LEAVE *vs.* NOBODY SAY GIANNI LEAVE LIS
Reading: 'Everybody thinks / # said Gianni stayed (= didn't leave).'

NPIs are grammatical words that require a 'negative' environment in order to be licensed (e.g. English *any*). Certain NPIs like English *until* require the negative environment to be syntactically local. Typically, a negation in the matrix clause can license a weak NPI like *any* (cf. (4a)), but not a stric one like *until* (cf. (4b)), unless the main clause contains a NR-predicate (cf. (4c)).

(4) a. I don't claim that Mary saw anyone.
b. * I don't claim that Mary will arrive until 5pm.
c. * I don't think that Mary will arrive until 5pm.

We independently verified that the sign UNTIL, under a punctual reading (e.g. Karttunen 1974; Condoravdi 2009), behaves as a strict NPI in all three SLs: UNTIL is licensed in basic negated sentences ('The baby wasn't born until 3pm [. . . but at/after 3pm].'), but not in positive sentences (*'The baby was born until 3pm.'). In all three SLs, UNTIL is licensed in NR constructions only, as demonstrated for LSF in (5a). In addition, licensing is no longer possible after left-dislocation of the embedded clause (5b), in which case the NPI is no longer in the right syntactic domain (e.g. Collins & Postal 2014).

(5) a. IX$_1$ { THINK-NOT / * NOT ANNOUNCE } [MARIE LEAVE UNTIL THREE AFTERNOON]
'I don't think / * announce that Marie left until three in the afternoon.' LSF
b. *[PIERRE LEAVE UNTIL FRIDAY] IX$_1$ { THINK-NOT / NOT ANNOUNCE } LSF
*'That Pierre left until Friday, I don't think/announce.'

Neg-raising and headshake spreading in NGT. Oomen et al. (2019) showed that headshake spreading from matrix to embedded clause is interpreted differently in NR vs non-NR-constructions. Our data corroborate this finding: in the case of a NR-predicate (EXPECT), the sentence is interpreted as involving a single negation and gets the expected NR interpretation (cf. (6a)), while in the case of a non-NR predicate (ANNOUNCE), the construction gets a (degraded) reading in which *both* matrix and embedded clause are negated (cf. (6b)).

(6) a. $\overline{\text{IX}_1\ \text{EXPECT}}^{\text{hs}}$ LUCAS $\overline{\text{LEAVE}}^{\text{hs}}$
'I don't expect Lucas will leave.' (= NR: 'I expect Lucas won't leave.)
b. ?? $\overline{\text{IX}_1\ \text{ANNOUNCE}}^{\text{hs}}$ LUCAS $\overline{\text{LEAVE}}^{\text{hs}}$
'I didn't announce Lucas will **not** leave.'

Since there are no other syntactic or semantic effects, we suggest that the break between the two occurrences of headshake in (6) is prosodic: it tends to be briefly interrupted during the articulation of the embedded clause subject, and headshake resumption in the embedded clause is optional (contra Oomen et al.'s earlier findings). We also add a new data point: constructions with similar headshake spreading patterns in combination with an UNTIL-phrase. (7) yields the expected NPI-reading, clearly showing that a headshake suffices to license an NPI in NGT.

(7) $\overline{\text{IX}_1\ \text{EXPECT}}^{\text{hs}}$ LUCAS $\overline{\text{LEAVE}}^{\text{hs}}$ UNTIL FIVE-HOUR AFTERNOON NGT
'I don't expect Lucas will leave until five pm. (= 'I expect Lucas won't leave before).'

Conclusions. We have reported on the properties of NR-constructions in three SLs, clearly showing that NR is a modality-independent phenomenon. We found that LIS, LSF and NGT pattern similarly to one another as well as to a host of spoken languages in various construction types. As in spoken languages, the patterns provide mixed evidence for syntactic vs. pragma-semantic approaches toward NR, suggesting that a hybrid analysis may be best equipped to capture the phenomenon (cf. Horn 2020). But SLs – at least those which are non-manual dominant – also offer an entirely new dimension to the topic under discussion. We corroborated earlier findings that the same headshake spreading pattern in constructions with NR vs. non-NR predicates in NGT lead to a difference in interpretation, and provided evidence that headshake can license an NPI in NGT.

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