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RESEARCH

Scope-taking strategies and the order of clausal categories in German Sign Language

Fabian Bross and Daniel Hole
University of Stuttgart, Keplerstr. 17, 70174 Stuttgart, DE
Corresponding author: Fabian Bross (fabian.bross@ling.uni-stuttgart.de)

The scope order of clausal categories has been claimed to be universal. In this paper we adopt a universalist cartographic approach to clausal syntax. By discussing the categories of speech acts, evaluation, epistemic modality, scalarity, volition and deontic, as well as other kinds of modality, we illustrate a striking regularity in strategies of scope-taking in German Sign Language (DGS): the wider/higher the scope of a clausal operator, the more likely its expression will occur with a high body part by way of layering; namely, descending from the eyebrows to the lower face, tentatively to the shoulders, and finally switching to manual expressions. For intermediate operators a left-to-right concatenation strategy is employed, and low categories are expressed by way of a manual right-to-left concatenation strategy. Hence, we propose a highly regular natural mapping of the scope-order of clausal categories onto the body. This sort of mapping can also be observed in other sign languages and may turn out to be universal.

Keywords: Cartography; scope order; clausal categories; functional heads; sign language; German Sign Language

1 Introduction

Non-manual markings (NMMs) and their role in syntax have recently received increased attention in sign language linguistics (see, for example, Wilbur 2000; Sandler 2010; Sandler et al. 2011; or the volume edited by Herrmann & Steinbach 2013). Non-manuals are the "key to syntactical structure", as already pointed out more than 50 years ago by the pioneering sign language linguist William Stokoe (1960: 63). This paper aims to investigate the different strategies of scope-taking for high and low clausal operators in German Sign Language—with a special emphasis on NMMs. We will discuss the categories of speech acts, evaluation, scalarity, epistemic modality, volition, and deontic, as well as other kinds of modality. We adopt a cartographic approach to clausal syntax, as proposed by Cinque (1999) and supplemented by Hole (2015), to demonstrate that high operators, such as speech-act marking, evaluation, or epistemic modality, are expressed using non-manual markers of the upper face and are signed simultaneously with other signs ("layering"). Slightly lower operators (those providing not-at-issue judgments about high or low scalar values; cf. Section 3.3) are also expressed through layering, with the mouth, and tentatively with the shoulders. By contrast, lower operators are realized manually and make use of a left-to-right concatenation strategy—instead of layering—when they are intermediate in the hierarchy (volition, for instance), and of a right-to-left concatenation strategy when lower (root modality, for instance). This is schematically depicted in Figure 1.

It is well established that there is a division of labor between the hands and non-manual markers in sign languages in general: The hands are used for expressing lexical items, whereas NMMs are used for grammatical purposes (among other means). The latter are

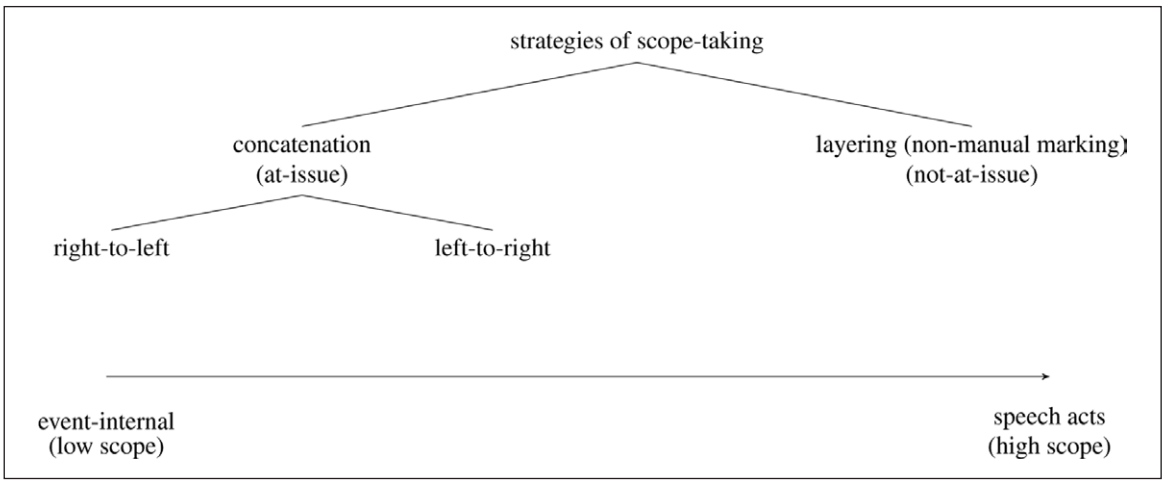


Figure 1: Hypothesized scope-taking strategies in German Sign Language.

produced by movements of the upper body, including the head, the face, and the torso. In contrast, movements of the lower body "by the legs, feet, and the hip do not have grammatical functions" (Herrmann & Pendzich 2014: 2150). Still, there exist no studies investigating the claim of a direct vertical mapping from operators with a relatively high or wide scope to high body parts, nor of a mapping from operators with a relatively low or narrow scope to low body parts where the lowest relevant body parts are the hands. What is more, there have been no principled attempts at sorting out structures with right-headed and left-headed structures in conceptually similar domains such as volition and modality. A third aim will be to demonstrate that layered NMMs contribute not-at-issue meaning, whereas lower operators are at-issue. The present paper strives to fill these gaps and proposes highly regular—and, as we claim, natural—mappings in these domains.

The goal of this article is twofold. On the one hand, we want to support the hypothesis put forward by cartographic approaches to syntax, namely that there is a universal functional design of clauses; and that this does not only hold for spoken, but also for signed languages. On the other hand, we want to shed light on how different clausal categories are expressed in a regular, "embodied" manner in German Sign Language, and perhaps in sign languages in general. We leave the question open as to why there exists such a regular mapping of the functional make-up of the clause and its signed expressions—thus, we take the usual, and maybe objectionable, stance of cartographic research in general and simply describe how different clausal categories are expressed and ordered (see also Cinque & Rizzi 2008: 45).

The organization of this paper is as follows. Section 2 provides background on German Sign Language, presents the sources of our data, and introduces our notational conventions. Section 3 will discuss the ways in which natural languages express scopal relations, and it will introduce the notions of at-issue and not-at-issue meaning. Section 4 gives a short overview of NMMs in sign languages. Finally, in Section 5, we will present and test our hypothesis. Section 6 concludes and provides an outlook.

2 Sign language data

2.1 Background information on German Sign Language

German Sign Language (*Deutsche Gebärdensprache* or DGS) is a sign language with basic SOV order, spoken by roughly 80,000 deaf people in Germany, and by an estimated 200,000 people in total. As is the case with other natural sign languages, DGS has evolved

into a full-fledged natural language over many generations in Deaf communities and is considered a (non-ethnically defined) minority language with a special sociolinguistic status. This special status is derived from the fact that fewer than 10% of deaf children are born into deaf families with exposure to DGS from birth. Additionally, most DGS users, as is the case with users of many other sign languages, are bilingual to a certain extent, having some experience with German—at least in its written form (Grosjean 1996).

Just like spoken German, DGS is SOV; but unlike German, SOV is also the surface word order in main clauses (Keller 1998; Steinbach & Herrmann 2013). However, topicalizations and other foregrounding or backgrounding processes may lead to surface linearizations that depart from the basic SOV order in DGS. Research on DGS suggests that it has a left-headed CP with a right-branching C° (e.g., Herrmann 2013). The OV character of DGS fits in well with the fact that determiners and adpositions are found after their complements, and that most modals and negation (if expressed manually) follow the verb—as is expected for a head-final language (see Zucchi et al. 2010 for a similar argument regarding Italian Sign Language). We will complement Herrmann's (2013) findings by arguing for several left-headed structures in the higher IP, or at least for projections whose surface linearizations suggest left-headedness.

2.2 Data sources

We consulted the research literature on DGS and the most comprehensive textbook to date (Happ & Vorköper 2014), elicited sentences using sign language consultants, and analyzed corpus data. Our consultants were two fluent signers who both grew up in southern Germany. Signer A is a 20 year-old hearing woman; her parents are both deaf fluent signers, which renders her a CODA ("child of deaf adults"). Signer B is a 41 year-old man, born deaf and an early learner of DGS who has been using sign language since the age of three. Both signers were presented with written sentences because both have a good command of written German. Context sentences were often presented together with the target sentences to facilitate the contextualizations needed for our research questions. This was also done to ensure that the consultants would arrive at the desired meaning. In the course of the elicitation sessions, the consultants read the sentences from a sheet of paper first. They were then asked to memorize the content of each sentence before it was covered up. After the sentence had been covered up, the consultants had some time to think over its meaning before being asked to translate it. This was done to prevent the signers from being influenced too much by the sentence's written structure. Then the consultants signed the sentence. All translations were videotaped. In most cases the sentences and possible paraphrases were discussed with another fluent signer who was present during the data collection sessions.[1] For some sentences the consultants were explicitly asked for grammaticality judgments.

We supplemented the elicited data with corpus data from the SIGNUM database, a DGS corpus containing 780 grammatical sentences signed by twenty-five fluent signers. SIGNUM was originally designed for continuous sign language recognition at the Institute of Man-Machine Interaction, RWTH Aachen University, Germany (von Agris & Kraiss 2007).[2]

[1] In the first case this was the deaf mother of Signer A, who is a native signer. It was taken care that Signer A and her mother always agreed upon the grammaticality of the elicited sentences. In the second case a sign language interpreter, also a CODA, was present. In both cases the those two signers helped with judgments and discussed other possiblities for expressing a sentence. These discussions also helped to ensure that the desired meanings were arrived at.

[2] The corpus' PID is 11858/00-1779-0000-0019-8A9A-2, available via http://hdl.handle.net/11858/00-1779-0000-0019-8A9A-2.

2.3 Notational conventions

Manual signs are glossed using small capitals. Note that grammatical categories are also glossed using small capitals as it is common in spoken language linguistics. However, this will not lead to confusion. The grammatical categories that appear in sign language glossing in this article are modifications of manual (verb) signs. The modification of a manual sign, for example, a modification in speed is glossed using a subscript. To give an example: The verb sign TO-FALL ('to fall') is signed with one hand while the index and middle finger are extended. When the sign starts, the palm faces downwards. When the sign ends, the palm faces upwards (i.e., the hand is twisted). When this sign is modified for durative aspect, the movement is prolonged. This is glossed as $\text{TO-FALL}_{\text{ASP:DURATIVE}}$.

As is customary in sign language linguistics, we use hyphens to indicate complex glosses that correspond to a single segment in sign language (e.g., TO-FALL represents one manual sign). We are aware of the fact that this is not in accord with the glossing conventions in other branches of linguistics. As signs in sign language research are commonly written using small capitals, we gloss grammatical categories as subtext on the small capital glosses ($\text{LOSE}_{\text{ASP:PERF}}$, for instance). Pointings used as pronouns or for localizing absent referents are glossed as IDX (short for 'index'). Subscript numbers indicate the direction in signing space (1 = towards the signer's chest, 2 = towards an addressee, 3 = towards some other point in space). Addition symbols (++) after glosses represent reduplications of signs.

Non-manuals have their glosses underlined, thereby marking their on- and offsets. The most common markers are labelled 'br' for brow raise, 'fb' for furrowed brows, 'hs' for head shake, 'hn' for head nods, 'hb' for a single head bow, 'ec' for eyes closed; but see also the explanatory notes in the main text. In sentence (1), for example, three non-manual markings were used. One ('br') accompanying the manual signs PETER AT-HOME and two ('hn + ec') accompanying AT-HOME.

(1) hn + ec
br
THERE LIGHT IDX_3PETER AT-HOME
'The light is on, Peter must be at home.'

Before turning to our hypotheses and their testing, the following Section 3 will introduce the notion of scope, the strategies of scope-taking that are known from spoken languages, and the partial hierarchy of scope-taking operators to be made use of in subsequent sections. Furthermore, the notions of at-issue and not-at-issue meaning will be introduced.

3 Ways of scope-taking in natural languages

3.1 Scope-bearing elements and scopal ambiguities

In this section, we will review the concept of scope as it manifests itself in spoken language. Readers who are well acquainted with the notion of scope-taking can proceed directly to Section 3.2.

Example (2a) is a sentence with a single quantifiying expression, and (2b) is a paraphrase.

(2) a. No more than five letters arrived today.

b. 'There were no more than 5 letters x [such that x arrived today].'

The scope-bearing element, or quantifier, in (2a) is (*there were*) *no more than five letters (x)*.[3] The content of the square brackets in (2b) is the scope of the quantifier. In (2b), *x* is a variable, which means that there have to be as many values of the variable as required by the quantifier introducing or binding it, such that the scope is true of these values. In (3a), two quantifying expressions are used. Again, (3b) provides a semi-formal paraphrase (cf. Heim & Kratzer 1998: 136–137).

(3) a. On four consecutive days, no more than five letters arrived.

b. 'There were 4 consecutive days d [such that there were no more than 5 letters x [such that x arrived on d]].'

The reading paraphrased in (3b) has it that at most 20 letters arrived altogether. Again, everything to the right of the two quantifiers is their respective scope (indicated by the bracket). This time the scope of the quantifier with wider scope encompasses the quantifier with the narrower scope.

Example (3a) is actually ambiguous. Its second reading is paraphrased in (4b).

(4) a. On four consecutive days, no more than five letters arrived.

b. 'There were no more than 5 letters x [such that there were 4 consecutive days d [such that x arrived on d]].'

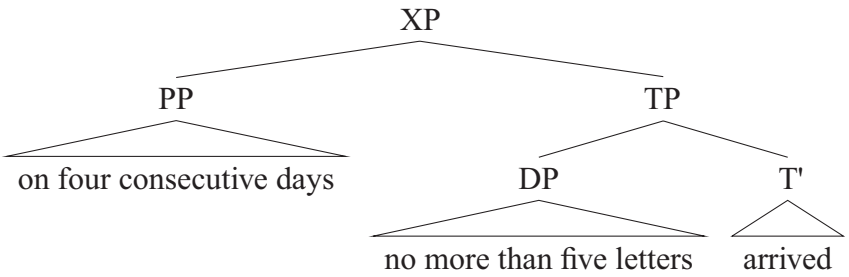
On this reading, at most five letters arrived altogether. If we compare the two paraphrases in (3b) and (4b), the difference in meaning can be attributed to the way in which the two quantifiers are nested in one another. Either the quantifier *on four consecutive days/there were four consecutive days d* takes scope above the quantifier *(there were) no more than five letters (x)*, or vice versa. A useful shorthand for these two possibilities is introduced in (5a)/(5b).

(5) a. on 4 consecutive days > no more than 5 letters
'*On four consecutive days* takes scope above *no more than five letters*.'

b. no more than 5 letters > on 4 consecutive days
'*No more than five letters* takes scope above *on four consecutive days*.'

Quite generally, then, the scope of a quantifier *Q* may be defined as that domain in which variables get bound by *Q*. We may also say, in a slightly less precise fashion, that the scope of a quantifier *Q* is that portion of an utterance which is affected by *Q*. Intuitively, it makes sense that *on four consecutive days* should be syntactically higher than *no more than five letters* in (3a), if we are aiming at the reading provided in (3b). The larger scopal potential of *on four consecutive days* vis-à-vis *no more than five letters* is reflected in the syntax tree, as depicted in (6).

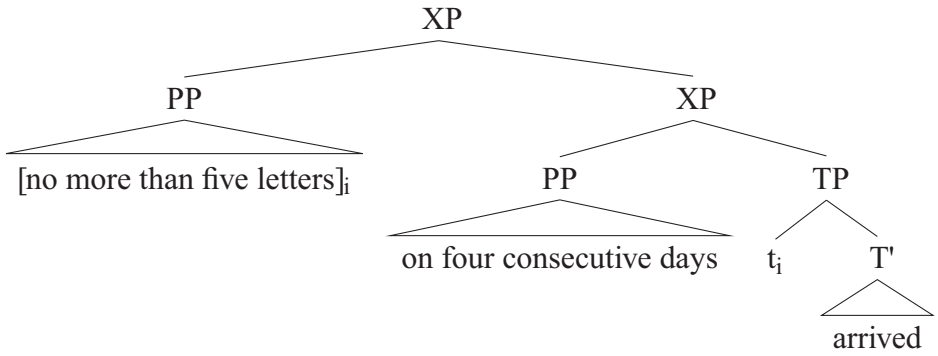
(6)



[3] To be more precise, *there were no more than five letters x* encompasses the quantifier *there were no more than five x* and its restriction *x is a letter*. In what follows, we will use paraphrases that do not disentangle quantifiers and their restrictions. We will continue to use the format of (2b) instead.

A syntax-and-semantics like the one proposed by Heim & Kratzer (1998), in the spirit of May (1978, 1985), requires the scope-taking element that takes higher scope to c-command the scope-taking element that takes lower scope. Like this, the syntax directly reflects the semantic scope of a quantifier. This condition is fulfilled in the tree above. It is obviously not fulfilled at the surface for reading (4b). The solution that linguists in the tradition of May (1977, 1985) or Heim & Kratzer (1998) propose is to assume movement of the quantifier to a position where it c-commands the other quantifier and its scope. This movement is frequently invisible in the pronounced sentence because it may happen after the syntactic derivation has been split up into two branches. One branch leads to the interface responsible for the pronunciation of utterances; the other branch leads to the interface responsible for interpretation. Movement which is not represented in the pronounced structure, but has an interpretive or semantic effect, is called *LF movement* (where LF stands for "logical form"). The following tree depicts the LF syntax of a sentence with reading (5b) if LF movement is assumed for *no more than five letters*.

(7)



As can be seen in the tree, the subject DP *no more than five letters* has moved to the sentence-initial position. It c-commands the other quantifier. Like this, it can take scope above *on four consecutive days*.[4] Note that whenever two quantifiers co-occur in a single sentence, one of them must take scope above the other one. It is impossible for two quantifiers to have the exact same scope.

Sometimes what looks like reverse scope-taking of quantifiers, or operators, is really a more complex phenomenon. To see this, we may begin by comparing the most prominent readings that (8) has.

(8) Paula may not go out.
  a. 'It may be the case that Paula will not go out.' (MAY > NOT)
  b. 'It is not the case that Paula may go out.' (NOT > MAY)

Reading (8a) is easily available in a context in which someone tries to predict whether Paula will go out, and the speaker bases her guess on the evidence that she has; it could be the case that Paula told her a day ago that she may not go out. This reading of (8) is called "epistemic". It relates to a possibility which is the result of a knowledge state or a belief of the speaker. Reading (8b) is easily available in a context in which Paula's strict parents do not allow her to go out. This reading of (8) is called "deontic". In the present paper, we reserve the term "deontic" for possibilities and necessities that arise from asymmetrical power relations among individuals or groups of individuals. A deontic possibility thus amounts to a permission, and a deontic necessity amounts to an obligation. With this in

[4] Cf. Heim & Kratzer (1998: ch.7/8) for details of composition, and also for strong evidence to the effect that such unpronounced movement operations can be rendered plausible.

mind, it may look as if the MAY quantifier and the negation may take scope either as in the surface configuration, or in a reverse configuration. This is not altogether wrong, but it misses one important point: The different readings of (8) are not just caused by the different scopal relations, but also by the different readings of *may*, namely the epistemic and the deontic reading as mentioned a moment ago. The scope-bearing elements of (8a)/(8b) should therefore be described in more exact terms, viz. as $\text{MAY}_{\text{EPISTEMIC}}$ > NOT and NOT > $\text{MAY}_{\text{DEONTIC}}$, respectively. (We do not spell this out in the following, but the standard way of formalizing modal categories such as *may* in (8) involves (existential) quantification over worlds or situations; Kratzer 1991. Once this is done, operators like *may* have a semantic and syntactic structure that is entirely analogous to our introductory examples in (2a) through (4a), in terms of quantification.)

There is a third—less easily available—reading of (8), which has it that Paula's parents allow Paula to stay at home (to not go out, that is) ($\text{MAY}_{\text{DEONTIC}}$ > NOT). There is one reading, though, that (8) may not get, however hard we try. This is the reading on which it is not the case that the evidence suggests to the speaker that Paula will go out with some likelihood (NOT > $\text{MAY}_{\text{EPISTEMIC}}$). (8′) provides the available and unavailable readings of (8) which arise if an epistemic and a deontic use of *may* are distinguished.

(8′) Paula may not go out.

a. ✓ $\text{MAY}_{\text{DEONTIC}}$ > NOT: 'Paula is allowed to stay at home.'

b. ✓ $\text{MAY}_{\text{EPISTEMIC}}$ > NOT: 'Given the available evidence, the speaker concludes that it may be the case that Paula will not go out.'

c. ✓ NOT > $\text{MAY}_{\text{DEONTIC}}$: 'Paula is not allowed to go out.'

d. * NOT > $\text{MAY}_{\text{EPISTEMIC}}$: 'It is not the case that, given the available evidence, the speaker concludes that Paula may go out.'

A way to predict this distribution of readings is as follows: (i) the scope of negation in (8)/(8′) is fixed; (ii) the base position of $\text{MAY}_{\text{DEONTIC}}$ is below negation as in (8′c), but LF movement to the left may apply so as to give it scope above negation as in (8′a);[5] (iii) the base position of $\text{MAY}_{\text{EPISTEMIC}}$ is above negation as in (8′b). This gives us the relative base order of elements in (9).

(9) $\text{MAY}_{\text{EPISTEMIC}}$ > NOT > $\text{MAY}_{\text{DEONTIC}}$

With (9) and (i)–(iii) in place, the unavailability of (8′d) is predicted. Returning to our initial contrast of readings in (8), we may summarize our argument now by saying that (8a) features $\text{MAY}_{\text{EPISTEMIC}}$, whereas (8b) features $\text{MAY}_{\text{DEONTIC}}$. We were not only dealing with different scope orders of negation and MAY, but, in addition, with two different variants of possibility with different scope-taking potentials. An analogous interaction of semantics and syntactic structure in DGS will be discussed with deontic and root modals in Sections 5.7 and 5.8. A phenomenon to be discussed in the realm of body leans in Section 5.5 may likewise be interpreted as involving polysemy of this kind.

[5] In Iatridou & Zeijlstra (2010), negation is argued not to take scope above deontic possibility modals such as *may*. According to this generalization, reading (8′c) should not be available. According to our consultants, this reading is, in fact, available. However, it is certainly a slightly peculiar and hard-to-process reading. If it turns out that Iatridou & Zeijlstra (2010) are right in the end, or if the incriminated reading is possible only under circumstances of metalinguistic negation, not much hinges on this. It would only mean that deontic possibility modals may not move across negation in the LF branch of syntax.

3.2 Cinque (1999) and Hole (2015) on scope positions of clausal quantificational categories

Cinque (1999) develops arguments similar to those in (8), (8′), and (9) to determine crosslinguistically stable scopal base orders among a multitude of aspectual, temporal, modal, evaluative, and speech-act categories. The tradition which has developed out of this pioneering work is known as "cartographic". An almost complete selection of high categories discussed by Cinque (1999) which will prove useful in subsequent sections is found in (10).[6]

(10) a. Speech-act-indicating operators
Question marking, assertion marking, topic marking

b. Evaluation as good or bad
Unfortunately, luckily

c. Epistemic modality
[*The light is on.*] *Paul ought to/may be here.*

d. Volition
Paul wants to learn sign language.

e. Deontic modality$_{\text{MUST/CAN}}$
Paul must tidy up./Paula may go out.

f. Root modality$_{\text{MUST/CAN}}$
Paula must cough every ten seconds./Paul can perform magic.

It appears to be clear that speech-act operators, as in (10a), have very wide scope in a clause or sentence (but cf. Rizzi 1997 for yet higher focus and topic positions; Endriss 2009 argues convincingly that topics contribute speech acts of their own). The operators in (10b) contribute speaker-dependent evaluative categories. The categories of epistemic and deontic modality in (10c) and (10e) were discussed in the previous subsection. Epistemic modality concerns possibilities and necessities that result from knowledge states of speakers. Deontic modality concerns possibilities and necessities which are the result of asymmetric power relations. Volition, as in (10d), is a future-oriented (or rather posteriority-oriented) kind of modality based on wishes only found with agentive subjects. Root modality (or participant-internal modality, as it is sometimes called; van der Auwera & Plungian 1998), as referred to in (10f), is a further type of modality. It pertains to an ability or a necessity that is rooted in the internal make-up of a referent. In (10f) Paul has the inherent (though maybe acquired) ability to perform magic.

The hierarchy in (10) allows one to state predictions concerning the scopal hierarchy of operators in simple clauses (i.e., clauses with no other finite clauses embedded in them). For instance, it predicts that there is no language in which a translational simple sentence equivalent of (11) receives the interpretation in (11b), as opposed to the (only available) interpretation in (11a). Note that scope orders are fixed, irrespective of whether *unfortunately* precedes or follows *must*.

(11) Unfortunately, Paul must stay at home./Paul must, unfortunately, stay at home.
a. ✓ 'It is unfortunate that Paul must stay at home.'
b. * 'It has to be the case that it is unfortunate that Paul stays at home.'

[6] Cinque's (1999) extremely influential study encompasses many more, especially lower, categories (altogether 32).

Hole (2015, in press) discusses evaluative and scalar readings of German, Dutch, Vietnamese, and Chinese 'only'-sentences, and he determines the syntactic positions of the evaluative and scalar operators that are present in many sentences with 'only' foci. On Hole's analysis, a sentence such as (12) has the basic meaning that is given in the paraphrase, and it may have the additional presuppositional, or not-at-issue (cf. Section 3.3), meaning components listed in (12a–c).[7]

(12) Paul only eats cookies.
'Paul eats nothing apart from cookies.'
a. Possible evaluation as 'little': Eating nothing but cookies is considered little by the speaker.
b. Possible evaluation as 'bad': Eating nothing but cookies is considered bad by the speaker.
c. Possible evaluation as 'bad' and 'little': Eating nothing but cookies is considered bad and little by the speaker.

The syntactic position of the 'bad' predicate is identified with the position of Cinque's (1999) evaluative operators; cf. (10b). The position of the 'little' operator is argued to be above negation (which we do not discuss here), and in between deontic and epistemic modality operators. Combining Cinque's (1999) and Hole's (2015) insights, we arrive at the partial cartographic representation of clausal quantificational categories in (13).

(13) a. Speech-act-indicating operators
Question marking, assertion marking, topic marking
b. Evaluation as good or bad
Unfortunately, luckily
c. Epistemic modality
[*The light is on.*] *Paul ought to/may be here.*
d. Scalarity (evaluation as much or little)
He's even a CEO./He's only a small employee.
e. Volition
Paul wants to learn sign language.
f. Deontic modality$_{\text{MUST/CAN}}$
Paul must tidy up./Paula may go out.
g. Root modality$_{\text{MUST/CAN}}$
Paula must cough every ten seconds./Paul can perform magic.

3.3 The at-issue/not-at-issue divide

Not all scope-taking elements that were discussed in the previous subsection convey meanings of the same type. The lower ones contribute entailments, whereas the higher ones contribute not-at-issue meaning (Simons et al. 2010) or projective meaning (Tonhauser et

[7] Hole (2015) also demonstrates that the evaluative predicate 'good', as opposed to 'bad', is never part of the presuppositional endowment of 'only' sentences, even though contextual inferencing to this effect may be observed (in a discourse like the following: *My diet is going really well. I only ate salad today*).

al. 2013).[8] What this means can, for the purposes of our investigation, best be illustrated with discourses as in (14).

(14) a. Speech-act-indicating operators
A: Is Paula at home?
B: #That's not true.

b. Evaluation as good or bad
A: Luckily, Paula is at home.
B: That's not true. #It's unfortunate that she is at home.

c. Epistemic modality
A: The light is on. Paul ought to be at home.
B: That's not true. #You have first-hand knowledge that he is at home!

d. Scalarity (evaluation as much or little)
A: Paula eats only salad.
B: That's not true. #I think for her to eat salad is a lot!

e. Volition
A: Paul wants to learn sign language.
B: That's not true. They force him to learn it.

f. Deontic modality$_{\text{MUST/CAN}}$
A: Paula must tidy up.
B: That's not true. Her parents explicitly said they would do it. She simply wanted to do it.

g. Root modality$_{\text{MUST/CAN}}$
A: Paula must cough every ten seconds.
B: That's not true. If she relaxed a little bit, the tickle in her throat would go away.

All of B's replies in (14) start with a denial of the truth of A's statement. It turns out that only the lower categories (i.e., the examples from (14e) to (14g)) can be refuted this way, but not the higher ones. (The first example in (14a) is a bit special, as here the refutation of truth in itself is infelicitous, and not just the ensuing explanation. The reason for this is that it is not possible to deny the truth of an action—here, an interrogative speech act). This shows that every category below and including volition in our hierarchy is entailed (= contributes truth-conditional content), whereas the higher categories ((14a) to (14d)) are not-at-issue (= contribute non-truth-conditional content). We will return to this distinction throughout the sections to follow. In the conclusions, we will also note a correlation between eye gaze and the at-issue/not-at-issue divide that calls for further scrutiny.

3.4 Sequencing and layering: A taxonomy of scope-taking strategies

It may seem natural that scope-taking frequently translates as precedence, or left-to-right concatenation, in natural language. To give an example, the unmarked word order of (11) (*Unfortunately, Paul must stay at home*) went hand-in-hand with the fact that the left-hand operator *unfortunately* took scope above the right-hand quantifier *must*. However, this is

[8] To be more precise, with modal categories, there is modal force and modal flavor/accessibility relations. Modal force, i.e. existential versus universal quantification over possible worlds, is entailed/at-issue for all modal categories. Modal flavor is at-issue, too, for the lower categories and not-at-issue for epistemic modality.

just one way of indicating scopal relations. Next to left-to-right ordering, there is also right-to-left ordering and layering, where "layering" refers to the simultaneous expression of scope-bearing elements.[9] To see the equivalent potential of left-to-right concatenation and right-to-left concatenation, cf. the translational equivalents from English and German in (15).

(15) a. … because Paula must$_{\text{EPISTEMIC}}$ have$_{\text{TENSE}}$ been able$_{\text{ROOT}}$ to repair her bike.

b. … weil Paula ihr Fahrrad reparieren gekonnt$_{\text{ROOT}}$ haben$_{\text{TENSE}}$
because Paula her bike repair been.able have
muss$_{\text{EPISTEMIC}}$.
must
'… because Paula must have been able to repair her bike.'

English is a left-headed VO language. In accordance with its VO character, scopal relations are mostly left-to-right, too. In contrast, German is an OV language, a fact which makes itself most clearly felt in subordinate clauses, where sequences of verbs appear in the reverse order of English. (15a) and (15b) illustrate this in an impressive fashion. Quite generally, left-to-right concatenation typically signals scopal dominance in English, whereas in German subordinate clauses, right-to-left concatenation signals scopal dominance among verbal elements.[10] We thus have the two general ways in (16) in which sequencing translates into scopal dominance.

(16) Sequencing of operators and scope-taking

a. O > P
'If operator O is pronounced before operator P, then O takes scope above P.'

b. P < O
'If operator O is pronounced after operator P, then O takes scope above P.'

However, the sequencing of operators in German subordinate clauses is not fully uniform. Subordinators such as *weil* 'because' in (15b) precede their scope (the subordinate clause minus the subordinator, that is). Thus, German may be said to switch from right-headedness (P < O) for its verbal categories, to left-headedness (O > P) for subordinators and conjunctions.

If scopal relations are expressed by layering, the scope-taking element and its scope are realized simultaneously. A first pair of sentences that exemplify layering in spoken languages is found in (17).

(17) a. HL L
She departed.

b. HL H
She departed?

(17a) is a declarative speech act (an assertion). The letters H and L stand for high and low targets of intonation contours (in the tradition of Pierrehumbert & Hirschberg 1990;

[9] Or in a broader sense: "Layering is the separation of available phonological elements in such a way that particular functions are associated with productive phonological elements so that, when simultaneously performed, the phonological elements and their associated functions can be clearly identified" (Wilbur 2000: 216).

[10] It should be noted that *dominance (from left to right or from right to left)*, as used in the main text, really amounts to temporal priority of pronunciation. What is pronounced first takes scope above elements that are pronounced later. In the German example, the verb forms that are pronounced later take scope above those that are pronounced earlier.

Beckman & Ayers Elam 1997. Note that we make use of a simplified notation in (17)). The falling intonation on *-par-* arises as a result of the transition from the high tonal target to the low one. In the case of an assertion, the whole utterance ends with a low tone; as seen by the second L in (17a). In (17b), the focal accent on *departed* is as before, but now the sentence ends with a high tonal target. Like this, the utterance comes out as a question of a specific type. In contradistinction to the standard yes/no-question *Did she depart?*, (17b) is heavily biased towards an answer in the positive (Gunlogson's 2003 "rising declaratives"). What matters here is that the tonal change suffices to modify the assertive force of the speech act. If one thinks of the final tones which are pronounced simultaneously with the concatenated material as morphemes, it becomes clear what layering is. Namely, instead of having assertive or question force expressed by a concatenated segment, it is expressed as a suprasegmental, "on top" of the concatenated material. The representations in (18) convert layering into a concatenation notation, which makes use of our previously introduced shorthand for scopal relations.

(18) a. IT-IS-TRUE > she departed (cf. (17a))

b. IS-IT-TRUE > she departed (cf. (17b))

In (17), it is not immediately visible that a suprasegmental speech-act operator has other operators in its scope (the past tense, for instance, is one such operator). This is different in (19). (Focal tones are left out in this representation).

(19) a. H
Paula must depart?

b. IS-IT-TRUE > NECESSARY > Paula's departing

There is no reading of (19a) in which the necessity operator *must* takes scope above the speech-act operator. This means that information encoded by means of layering takes higher/wider scope than concatenated information. In the next section, we will discuss how suprasegmental, or layered, structures are produced in DGS and other sign languages, and how they are categorized traditionally.

4 Non-manual marking in sign languages

DGS, like other sign languages, makes extensive use of non-manual markings (NMMs) produced with the head, face, and upper body. NMMs complement movements of the arms and hands. NMMs can, on a more traditional account, serve several different functions, some of which are non-linguistic in nature and some linguistic. Non-manuals serving non-linguistic functions, i.e., affective gestures for expressing emotions, are clearly different from linguistic uses, in that the non-linguistic NMMs are processed in the right hemisphere (Corina 1989; Kegl & Poizner 1991; Poizner & Kegl 1992; Kegl & Poizner 1997; Loew, Kegl & Poizner 1997; Corina, Bellugi & Reilly 1999) and differ in how they are acquired by children (e.g., Reilly, McIntire & Bellugi 1990). Most importantly, however, non-linguistic NMMs do not have strict temporal alignment restrictions vis-à-vis the onsets and offsets of manual signs (Baker-Shenk 1983; Emmorey 1999; Wilbur 2003).

Traditionally, NMMs are sorted into lexical, adverbial, and syntactic categories (for a more detailed discussion, refer to Baker-Shenk 1983; Coerts 1992; Neidle et al. 2000). Lexical NMMs are those that are an integral part of the sign. An example from DGS is the verbal sign TO-CHEAT, which is obligatorily accompanied by a tongue protrusion; this is depicted in Figure 2. In contrast to such lexical NMMs, there are specific non-manuals that can be added to manual signs (or to their phrasal projections), leading to

Figure 2: The DGS sign TO-CHEAT is obligatorily accompanied by a tongue protrusion.

an adverbial or attributive change in the meaning (see Pfau & Quer 2010; Neidle et al. 2000: 43). Puckered lips constitute an example from DGS, which, when applied to verbal signs, add the meaning that an action is performed with ease. As their name suggests, syntactic NMMs are used for syntactic purposes, for example, to mark sentence type. Their suprasegmantal structure and use has led many researchers to compare them to spoken language intonation (e.g., Padden 1990; Reilly, McIntire & Bellugi 1990; Wilbur 1991; Sandler 1999; Dachkovsky & Sandler 2009).

Crucially, then, as in spoken language, suprasegmental marking in DGS does not just fulfill phonemic functions but also carries a morphemic functional load. We would like to submit that all NMMs which are not affective facial or body gestures and which do not involve the mouth proper do serve syntactic purposes. Notwithstanding this gross distinction between the categories, it is not always easy to distinguish between affective and grammatical facial expressions. For this reason, we chose examples with clear non-affective facial expressions in this article. Another class of NMMs that we excluded from our proposal are so-called "semantically empty mouth gestures" and "enacting mouth gestures" (Crasborn et al. 2008), which are lexically-specified and cannot spread over other manual material.[11] We explicitly include other lexical NMMs when the possibility of

[11] An example of a semantically empty mouth gesture in DGS is a variant of the verb sign TO-HAVE that is accompanied by a mouthing resembling the rounded variant of the phoneme [ʃ] (this mouthing probably also has an enacting background as the turbulent flow of the fricative [ʃ] usually seems to appear on manual signs that include wiggling movements). An example of an enacting mouth gesture which simply mirrors

spreading is given (e.g., the sign UNFORTUNATELY in DGS is specified for a specific facial expression that can spread over several signs, as will be discussed in (24) in Section 5.2 below.

One caveat is in order here: our hypotheses do not predict that NMMs falling under our definition must have highly abstract morpho-syntactic functions. Quite the contrary, all elements reviewed in Section 3.2 have a rather straightforward semantic side to them, and still they have the status of heads or specifiers involved in the projection of syntactic structure in the larger inflectional domain, as described by Cinque (1999) and the subsequent tradition. One problem with analyzing NMMs in sign languages is that they usually bundle in clusters. This renders it a difficult task to ascribe a specific function to each of them. Nevertheless, most NMMs seem to have a specific, inherent function, and combinations of NMMs can be analyzed as having compositionally complex meanings (see Herrmann 2013 for convincing arguments to this effect).[12]

5 Three hypotheses and their justification

In what follows, we propose and defend three hypotheses spelling out a very general intuition concerning the expression of scope-bearing elements in DGS, and most likely beyond that. The general intuition behind the hypotheses in (20) is that the width of the scope of an operator correlates with both the body part used to encode it, and with the encoding strategy (i.e., layering or left-to-right concatenation and right-to-left concatenation).

(20) a. **High body parts for comprehensive operators**
The wider/higher the scope of an operator is, the more likely it will be expressed by layering with a body part that can be ordered relative to other expressions on a vertical axis. In this way, a relatively wide/high scope correlates with a relatively high body part.

b. **Left-to-right concatenation for operators with intermediate scope**
Intermediate operators are produced with a manual left-to-right concatenation strategy.

c. **Right-to-left concatenation for least comprehensive operators**
The lower/narrower the scope of an operator is, the more likely it will be expressed by way of a manual right-to-left concatenation strategy.

On the whole, our hypotheses are concerned with a vertical mapping that relates to the relative place of the articulators (e.g., the eyebrows are above the cheeks, the cheeks are above the hands).[13] We are not concerned with the place of articulation of manual

a real action or the movements of the hand is the DGS sign TO-CHEW, which is accompanied by enacted chewing (see Crasborn et al. 2008; Pfau & Quer 2010 and also Woll 2001 on so called "echo phonology"). Those two types of mouth gestures are excluded from our proposal as well as mouthings. We would like to submit that all the described actions of the mouth are mere performance phenomena (see Hohenberger & Happ 2001 for a similar proposal for mouthings).

[12] She shows, for example, that a brow raise as a marker of a polar question can compositionally combine with a squint as a marker for indicating the retrieval of accessible information or shared knowledge in German Sign Language, Sign Language of the Netherlands, and Irish Sign Language. This combination of these two NMMs with two distinct meanings combines to a new overall meaning: asking for actually known information or for information that has been forgotten; see Herrmann (2013: 172–175).

[13] A different system using a similar verticalization strategy to the one we describe in this article can be found with scopal operators that have a non-fixed position in the domain of locations. As was described for Catalan Sign Language (Barberà 2012) and for American Sign Language (Davidson & Gagne 2014; Barberà 2014), quantifiers with wider domains are signed higher in signing space than quantifiers with narrower domains. This holds true of DGS, too (as was confirmed by our consultants). We would like to thank an anonymous reviewer for pointing out Barberà's related, though distinct, proposal.

signs (traditionally called "location" in sign language linguistics). Each clausal category of our partial representation in (13), repeated here as (21), will be discussed individually in order to justify our claims. Our sample categories were chosen because they span a broad range of different categories (almost all high ones) of roughly equidistant steps in the Cinquean hierarchy. What is more, most of the categories we discuss in this article are sufficiently covered in the literature. The same does not hold true for other Cinquean categories (e.g., evidentiality or alethic modality), or they lack a grammatical expression in DGS (there is no grammatical tense system in sign languages). Needless to say, future research will have to incorporate more categories. One obvious omission in our discussion is, as one anonymous reviewer noted, negation. Although it would be interesting to take a closer look at negation in DGS, we reserve this topic for future research for two reasons. Negation behaves in an extremely complicated manner. Exploring this topic would therefore require a whole new article. The second and more important reason is that the focus of this article is on categories whose positions are fixed on the clausal spine. As already noted by Cinque (1999: 121–122), negative markers occur in several distinct positions in a clause (see also Zanuttini 1997 and for negation in DGS see Pfau 2008).

As we descend the hierarchy of (13), repeated in (21), in the following sections, one will be able to see how layered facial expressions and movements of the shoulders give way to left-headed, and, ultimately, right-headed concatenation.

(21) a. Speech-act-indicating operators
Question marking, assertion marking, topic marking

b. Evaluation as good or bad
Unfortunately, luckily

c. Epistemic modality
[*The light is on.*] *Paul ought to/may be here.*

d. Scalarity (evaluation as much or little)
He's even a CEO./He's only a small employee.

e. Volition
Paul wants to learn sign language.

f. Deontic modality$_{\text{MUST/CAN}}$
Paul must tidy up./Paula may go out.

g. Root modality$_{\text{MUST/CAN}}$
Paula must cough every ten seconds./Paul can perform magic.

5.1 Speech-act-indicating expressions

In DGS, as in sign languages in general, speech acts are marked non-manually. Yes/no-questions, for example, are marked by raised eyebrows in DGS.[14] As can be seen by comparing (22) and (23), the brow raise is the only indication that a sentence should be understood as a question. A change in word order to indicate non-assertive speech acts does not occur in DGS.

(22) TODAY PAUL OFF
'Paul is off today.'

[14] Head nods and a forward movement of the shoulders or the upper body can, optionally, be used in addition to indicate yes/no-questions (Papaspyrou et al. 2008: 171).

(23) br

TODAY PAUL OFF

'Is Paul off today?'

Other speech acts are likewise marked by NMMs that are articulated by the upper part of the face. Wh-questions, for instance, are marked by lowered eyebrows; imperatives with squints (this involves lowered eyebrows and pursed lips) and an overall stronger articulatory intensity. Note that the generalization that speech acts are marked non-manually also holds true of embedded structures. Embedded questions, for example, are invariably marked for clause type with the upper face. Nevertheless, we concentrate here only on simple, non-embedded cases.

5.2 Evaluation: Good/bad

Evaluative expressions in DGS, signs like DISLIKE, GOOD, BAD, CRITICIZE, for example, are produced with a lexically-specified facial expression, sometimes accompanied by an optional posture of the head, and often by a forward or backward body lean. We take it that the manual segments encode at-issue content, whereas the NMMs encode not-at-issue content (refer back to Section 3.3 for background on these notions). Evaluation as good or bad may be encoded by using a sentential adverb (usually clause-initially) that is specified for a facial expression. In example (24) from Happ & Vorköper (2014: 366), this is the sentential adverb UNFORTUNATELY, which is accompanied by raised and furrowed brows and a wrinkled nose (glossed here as 'unfortunate'). As is shown in the example, the lexically specified facial expression spreads over the whole clause. As confirmed by our consultants, it is possible to use evaluative expressions without a manual sentential adverb altogether, just using a NMM. In most cases this is a squint.

(24) unfortunate

(UNFORTUNATELY,) YESTERDAY IDX_1 POSS_1 MONEY $\text{LOSE}_{\text{ASP:PERF}}$

'Unfortunately, I lost my money yesterday.'

We can conclude that evaluative predicates are obligatorily encoded by NMMs involving portions of the face including the eyebrows and underneath the eyebrows. In some cases, they may be accompanied by manual markers. In accordance with our hypotheses, body parts no higher, and typically lower, than those for encoding speech acts are used to express not-at-issue evaluation.

5.3 Introductory notes on modality in DGS

In DGS, necessity is, quite generally, expressed by the sign MUST and possibility by the sign CAN, as illustrated in Figure 3. The sign MUST is produced with a downward movement of the dominant hand's extended index finger. The sign CAN is produced in a similar way: With the fist closed but with an additional movement of the wrist. It can be produced with one or two hands.[15] Some authors, most notably Happ & Vorköper (2014: 362–363), note that the modals MUST and CAN are not used in epistemic readings. This is in line with our observations, as will be discussed in Section 5.4 below.

As in ASL (Humphries, Padden & O'Rourke 1980; Wilcox & Wilcox 1995), modals can occur to the left or to the right of the VP in DGS; see the sentences in (25) and (26), taken from Papaspyrou et al. (2008: 174). Most authors dealing with modality in DGS note that

[15] Note the similarity of both signs to their translational equivalents in American Sign Language (please refer to the pictures in Wilcox & Wilcox 1995).

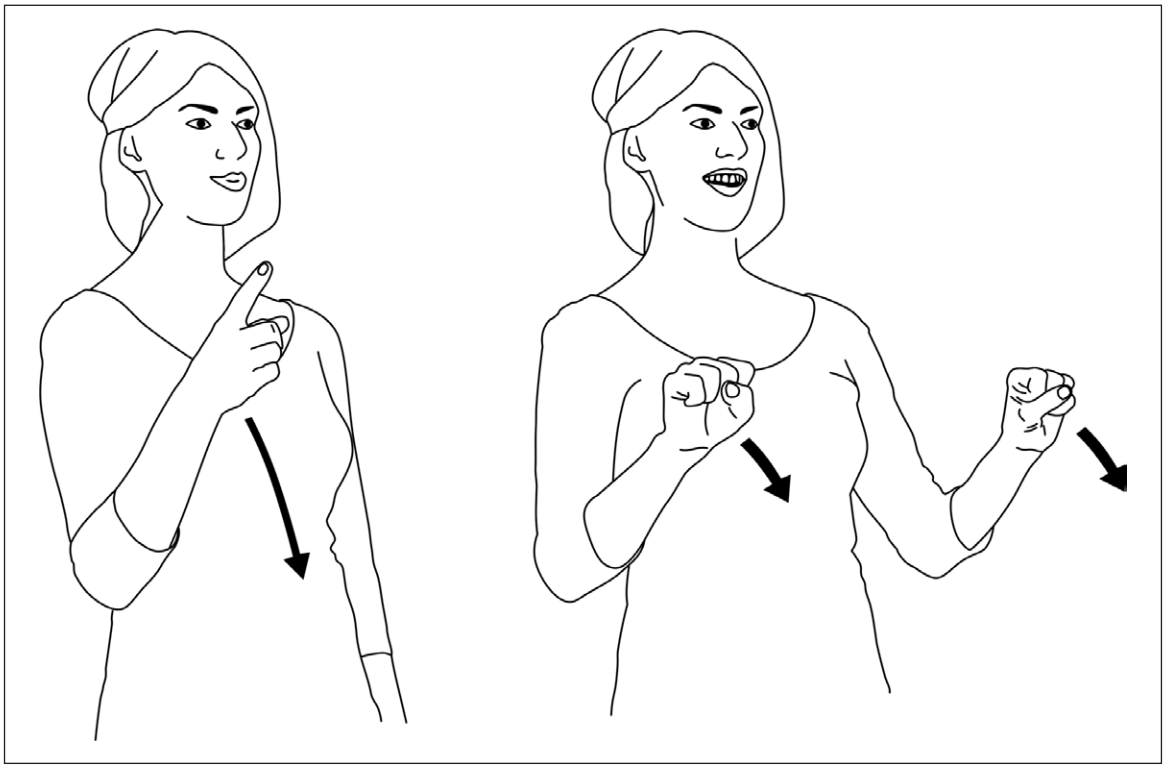


Figure 3: Left: The sign MUST in DGS. Right: The two-handed sign CAN, which can also be produced single-handedly. It means 'possible' when signed with smaller, reduplicated movements and combined with the suitable mouthing.

it is not yet clear when the modals appear in which position or simply state that there is variation without suggesting a regularity (e.g., Papaspyrou et al. 2008: 174; Herrmann 2013: 112; Happ & Vorköper 2014: 361–362).

(25) hs
I CAN-NEG DIVE
'I cannot dive.'

(26) hs
I DIVE CAN-NEG
'I cannot dive.'

It has often been observed that in unmarked cases, modal verbs in DGS appear in a clause-final position—as is true for other SOV sign languages like Spanish Sign Language (Herrero-Blanco & Salazar-García 2010). The only robust regularity described so far in the literature concerns longer enumerations. In such cases, the modal tends to precede the VP, as the sentence in (27) illustrates (from Papaspyrou et al. 2008: 174).

(27) I CAN DIVE RIDE SWIM CLIMB
'I can dive, ride, swim, and climb.'

We are quite confident in assuming that the major factor determining the preverbal position of the modal in (27) is rightward movement/extraposition of the phonologically heavy verbal string to the right periphery. In the following subsections, we will

argue, however, that the different positions in which modals can occur in DGS may also be due to differences in scope. We will argue moreover that the high scope of a modal correlates with left-to-right concatenation, and the low scope with right-to-left concatenation.

5.4 Epistemic modality

As stated above, modals like MUST or MAY do not have epistemic readings in DGS. Instead, to convey the meaning of epistemic necessity or possibility, a specific facial expression with a wide scope is required.[16] Sentential adverbs like PROBABLY or POSSIBLY can be used additionally, appearing—with a few exceptions—sentence-initially (Happ & Vorköper 2014: 362–364; Herrmann 2013: 112). The minimal pair in (28a) and (28b), taken from Happ & Vorköper (2014: 363–367), illustrate this possibility of using a manually signed sentential adverb alongside NMMs to express epistemic possibility.

(28) a. br, hn
(PROBABLY) SWEN WORK$_1$ [GO$_{\text{to-1}}$]$_{\text{ASP:PERF}}$
'Probably Swen went to work./It could be that Swen went to work.'

b. fb, hn
(SURELY) SWEN WORK$_1$ [GO$_{\text{to-1}}$]$_{\text{ASP:PERF}}$
'Swen must be at work.'

A brow raise or furrowed brows, respectively, and head nods spread over the whole sentence in these examples. Slow-to-fast head nods can be used in such cases to indicate the degree of certainty or uncertainty (cf. Herrmann 2013: 131). Happ & Vorköper (2014: 365) emphasize the fact that these facial expressions are highly variable. This is corroborated by (29) from our corpus, where the signer slowly closed her eyes (glossed as "ec" in (29)) to indicate certainty, an epistemic NMM not found in (28b).

(29) hn + ec
br
THERE LIGHT IDX$_3$PETER AT-HOME
'The light is on, Peter must be at home.'

From this evidence, we may conclude that epistemic necessity and epistemic possibility both receive expression by NMMs involving brow, eyelid, and head movements.

5.5 Scalarity: Much/little

So far, we have demonstrated that speech-act distinctions, evaluation in terms of good or bad, and epistemic modality are all realized by using the upper face and/or the whole head, sometimes accompanied by manual signs. In the present subsection we discuss some examples involving scalar not-at-issue evaluation ('much'/'little'). Recall from Section 3.2 above that Hole (2015) argues for an intermediate scalar clausal projection below C and above T/volition. We identify the lower face, and tentatively the shoulders, as articulators used for coding these categories.[17] In accordance with our hypotheses, the

[16] For a similar observation and the role of NMMs in Austrian Sign Language, see Lackner (2013).

[17] We are aware of the fact that the mouth region is often associated with adverbial or attributive functions in sign languages (Wilbur 2000). However, we do not see these claims as contradicting the position that we defend in the main text. If modification inside a DP is, for instance, indicated by puffed cheeks and does not spread across the DP boundaries, then the propositional domain for this scalar NMM is the NP constituent inside the DP, and not the larger clausal context.

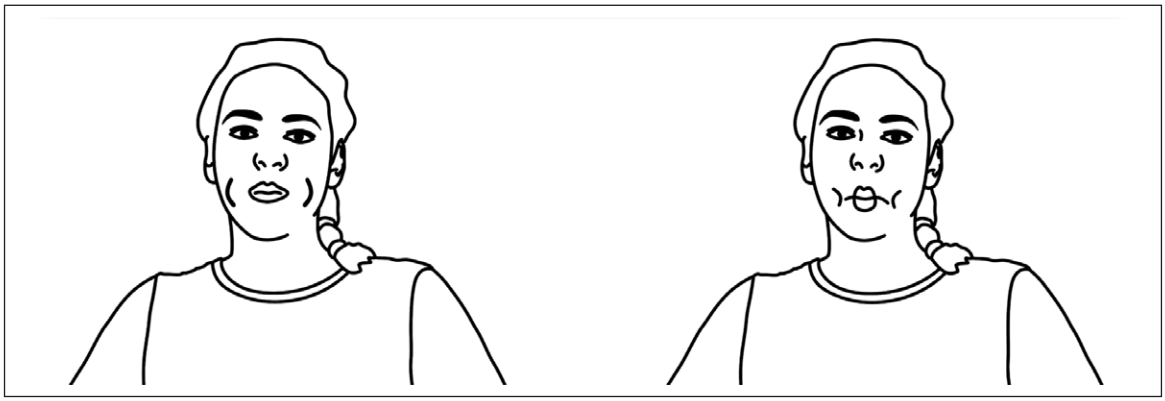


Figure 4: Puffed and sucked-in cheeks as used in DGS.

scalar predicates at hand are produced with articulators lower than the upper face, but higher than the hands.

In most cases in which something is evaluated as 'little', we observe NMMs produced with the mouth, either sucked-in cheeks or tensed lips with a frontal (and sometimes lateral) tongue protrusion.[18,19] In a similar way, evaluating something as 'big' or 'much' may be expressed by the opposite mouth gesture, namely by puffed cheeks. See Figure 4 for an illustration. A frontal tongue protrusion was shown in Figure 2. Example (30) from the SIGNUM corpus shows the use of puffed cheeks.[20] In this sentence, the signer evaluates (at the not-at-issue level) the fact that the brother-in-law has written eight letters as a lot. This example is especially interesting because most signers in the corpus produced puffed cheeks but not all (signer number 2 is, for example, an exception). Our consultants confirmed that the example gets the additional meaning that the signer evaluates eight application letters as a lot when the cheeks are puffed. Without this NMM, the sentence stays neutral.

(30) $\overset{()()}{\text{LAST MONTH POSS}_1\ \text{BROTHER-IN-LAW}\ 8\ \text{APPLICATIONS ALREADY}\ \overline{\text{WRITE}}}$

'My brother-in-law has already written eight letters of application in the past month.'

That puffed or sucked-in cheeks are employed for modifying manual signs has been reported for many sign languages. In Swiss-German Sign Language, for instance, these devices may accompany a noun like CAKE or a verb like SIGNING to indicate (at the not-at-issue level) that one refers to a big cake or to someone who is signing a lot (see Boyes Braem 1990: 102–103, who translated puffed cheeks as *much*). This is also true for DGS. Note that puffed cheeks are also used as a general signal for intensification.

Apart from signs involving the mouth and cheeks, we also found shoulder thrusts in contexts where scalarity was at stake. This is exemplified in sentence (31).[21]

[18] Cf. Matsuoka, Yano & Minamida (2013) for similar observations concerning Japanese Sign Language.

[19] Also note that, as one anonymous reviewer correctly mentioned, in many cases furrowed brows can be observed in contexts in which something is evaluated as being little. We think this is so, because the evaluation as being little is in many cases accompanied by an evaluation as being bad. Examples must therefore be chosen carefully.

[20] Puffed cheeks are represented using parentheses: '()()' (each pair for one cheek).

[21] As mentioned in the introduction, we will not speculate much why the mapping between clausal categories and their expression is the way it is. But in the case of intensification, the mouth and the shoulders are good candidates to be used because a gradable articulator is necessary for expressing scalarity.

(31) thrust
PAUL SMALL EMPLOYEE G:PU
'Paul is only a minor employee.'

By literally shrinking the signing space, the thrust may indicate that the signer of (31) considers Paul's being a minor worker insignificant (the gloss 'G:PU' indicates a palm-up gesture). We would like to submit that the active articulator in cases of shoulder thrusts is the same as in the case of body leans, which we turn to now.

It has been noted for several sign languages that sentences translating into English with the focus particle *only*, indicating the exclusion of alternatives (cf. (12)), are realized with a backward body lean, with the shoulders moving backwards, that is. Wilbur & Patschke (1998) note that the manual sign for restrictive *only* is accompanied by a backward body lean in ASL. Moreover, Wilbur & Patschke argue that forward body leans are used to indicate additive meanings, i.e., the inclusion of alternatives. That forward body leans are associated with inclusion and affirmative meanings and backward body leans with exclusion and negative meanings holds true of DGS too (cf. Happ & Vorköper 2014: 243, 366, 559) as well as for other sign languages like the Sign Language of the Netherlands (van der Kooij, Crasborn & Emmerik 2006). While we wish to remain neutral about the intricate syntax of body leans that may include or exclude alternatives, we would like to capitalize on another observation from the literature. Happ & Vorköper (2014: 367) identify two more domains in which forward and backward leans, shoulder movements, that is, may be employed. They note that it is sometimes possible to use forward and backward leans to express positive or negative evaluation in DGS, respectively, and that signers sometimes use backward leans to indicate their doubts in a context of epistemic uncertainty (see also Happ & Vorköper 2014: 559). We did not observe any forward or backward leans with this function in our data, but we would like to state that it is compatible with our hypotheses to find forward and backward shoulder movements with epistemic and evaluative functions, simply because those functions are associated with positions in the hierarchy adjacent to the scalarity projection under scrutiny in the present subsection. Grammatical polysemy of this kind (one marker for adjacent syntactic projections) is very common. At the same time, we acknowledge the need for more research efforts in this domain.

5.6 Volition

Cinque (1999) argues that volitional operators are located in between the projections for deontic and epistemic modality. In DGS, the volitional markers PLAN and WISH appear systematically to the left of the VP (Happ & Vorköper 2014: 326), and they are not systematically accompanied by NMMs. Sentence (32a), from Happ & Vorköper (2014: 362) shows the unmarked order of a clause with the sign WISH. While it is also possible for WISH to appear to the right of the VP, as illustrated in example (32b), this order is, according to our consultants, possible in fewer discourse contexts.[22]

(32) a. SWEN WISH DGS LEARN
'Swen wants to learn DGS.'

b. SWEN DGS LEARN WISH
'Swen wants to learn DGS.'

[22] Our consultants agree that the right-peripheral position of WISH renders this morpheme contrastively stressed. However, we lack evidence at this point to decide whether we are dealing with some kind of extraposition of WISH (movement of the verb to the right, that is) in these cases, or whether, on the contrary, the VP DGS LEARN moves to the left of an initially left-headed structure WISH DGS LEARN.

We are not concerned with tense in any detail in this article, but we would like to note the following points concerning the close proximity of volition and tense in Cinque's hierarchy. DGS, like most sign languages, has no grammatical tense. However, when it is necessary to situate an event in time, DGS uses independent lexical items, namely time adverbials, to indicate the time at which the event takes place. Interestingly, those time adverbials that do occur, do so clause-initially, i.e., to the left of the modal verb, and are produced manually. It appears to be the case that the neighboring categories of tense and volition both make use of a left-to-right concatenation strategy, and this fits in well with the hypothesis formulated in (20b) that operators with intermediate scope are produced by left-to-right concatenation.[23]

Returning to the discussion of volition, it seems plausible that PLAN and WISH head control constructions. If this is true then this means that they embed (somewhat reduced) CPs or TPs to their right. We will see in the following subsection that modal verbs in DGS generally appear in sentence-final position, albeit with some exceptions, as seen in example (27). It is only WISH and PLAN that frequently appear before the VP (Happ & Vorköper 2014: 362). We therefore have a clear instance of a left-to-right concatenation strategy of verbal categories with PLAN and WISH. It is not quite clear which modeling option is to be preferred to derive this layer of left-headedness in our hierarchy, and whether, in the end, this left-headedness effect may not just be a superficial by-product of some movement operation, viz. extraposition. Furthermore, we still lack evidence as to whether the underlying structure at this volitional level of the clausal spine features left- or right-headedness. The point to take home here, however, is that, the volitional operators WISH and PLAN are no longer in the domain of NMMs in DGS. Instead, as with temporal adverbs, a left-to-right concatenation strategy for scope-taking is enforced, at least at the surface and if clear instances of extraposition are disregarded.

5.7 Deontic modality

So far, we have seen that the high categories (speech-act-indicating expressions, evaluation as good or bad, and epistemic modality) are expressed by layering. Additionally, we have adduced evidence to the effect that a slightly lower category, scalar evaluation, is realized by layering with the lower face or the shoulders. Further down the hierarchy, volition exploits a manual left-to-right concatenation strategy. Now we will take a closer look at deontic modality, which is, as stated in Section 5.3, expressed only manually in DGS.

Deontic markers may either appear to the left or to the right of the verb. This is true both for deontic necessity and deontic possibility. Therefore we argue that the turning point from a left-to-right-concatenation strategy to a right-to-left one is somewhat distributed across neighboring categories in DGS. The sentences in (33a) and (33b) both express deontic possibility (the gloss $\text{AWAY}_{\text{PERSON-CL}}$ indicates that a person classifier was used when signing AWAY, the gloss ++ indicates reduplication). The sentence in (33a) shows an example with the modal appearing to the left of the VP; in the sentence in (33b), taken from Happ & Vorköper (2014: 359), it is the other way around. The same

[23] Volition and future tense share a common feature, of course: They both relate to events after the reference time. The fact that epistemic modality and future tense are close together in the hierarchy is mirrored, for example, in ASL: In this sign language, a speaker who is convinced that an event will most likely come true in the future may mark a sentence with the manual sign FUTURE and a specific NMM to express epistemic modality. It is also possible to use the sign FUTURE twice in a sentence. In this case the first (preverbal) occurrence indicates temporal reference, and the second (sentence-final) one, certainty (Wilcox & Shaffer 2006).

variation is found with deontic necessity; this is illustrated by the sentences in (34a) and (34b) (34b is taken from Happ & Vorköper (2014: 359), too; the gloss # indicates compounding).

(33) a. br hb
(LISA PARENTS EASY) CAN UNTIL 12-O'CLOCK AWAY$_{\text{PERSON-CL}}$
'(Lisa's parents are not strict.) She is allowed to stay out until 12 o'clock.'

b. br
ADMINISTRATIVE OFFICE VISIT++ DEAF SIGN LANGUAGE INTERPRETER ORDER CAN
'When visiting an administrative office, a deaf person has the option to consult with a sign language interpreter.'

(34) a. br fb
(PAUL PARENTS STRICT) MUST 8-O'CLOCK HOME
'(Paul's parents are strict.) Paul has to be at home at 8 o'clock.'

b. DEAF#EDUCATOR EACH-AND-EVERY SIGN-LANGUAGE LEARN MUST
'Every deaf educator must learn sign language.'

Epistemic modality is produced via NMMs alone, without the use of a manual modal verb, as was seen in Section 5.4. It is not possible to use the same NNM construction as it was used, for example, in sentence (29) to arrive at a deontic reading, as illustrated in (35).

(35) hn + ec
br br
(PAUL PARENTS STRICT) *PAUL AT-HOME
'(Paul's parents are strict.) Paul has to stay at home.'

We hope to return at a later point to the issue of why deontic modals sometimes appear to the right and sometimes to the left of the VP.

5.8 Root modality

As far as we can observe, all sentences expressing root modality use a right-to-left concatenating strategy, i.e., the modal appears clause-finally. An example is provided in (36), taken from Happ & Vorköper (2014: 359). This is also true of sentences expressing a kind of root modality not anchored to the subject referent, but to a topical locative referent, as shown in sentence (37).[24]

(36) MIRACULIX PERFORM-MAGIC CAN
'Miraculix can perform magic.'

[24] Note again that pairs of empty parentheses gloss puffed cheeks.

(37) ()() hn
SOIL GOOD FLOWERS GROW CAN
'The soil is rich, flowers can grow here.'

In (36) the ability to perform magic is rooted in the subject referent. In (37) it is a property of the soil that allows the flowers to grow. Whereas it was possible to use a left-to-right concatenation strategy for the morpheme CAN in deontic contexts (cf. the example in 33a), this is, according to our informants, impossible with root modality as shown in (38)—if the same broad discourse potential as in the English translation is aimed at. Examples like the one provided in (38) are hence not ungrammatical (see also Happ & Vorköper 2013: 362), but are possible in fewer discourse contexts. Presumably, they can be used to indicate narrow/contrastive focus on the modal.

(38) MIRACULIX CAN PERFORM-MAGIC
* 'Miraculix can perform magic.'
✓ 'Miraculix CAN perform magic.'

The insight that the position of the modal depends on the modal flavor (epistemic, deontic, root etc.) is a first step to answer the yet unsolved question of why modals sometimes appear to the left and sometimes to the right of the VP (cf. Papaspyrou et al. 2008: 174, Herrmann 2013: 112). Recall from Section 3.1 above that the positional options of epistemic *may* and deontic *may* vis-à-vis negation in English allow us to identify different shades of modal verb meanings. The case of root modal uses of DGS CAN versus deontic uses of the same morpheme with differing positional options constitutes an instantiation of the same overall phenomenon of a principled, yet syntactically underpinned, polysemy of grammatical markers as introduced in Section 3.

5.9 Summary

This concludes our combined survey of a subset of Cinquean, and other scope-taking clausal categories, with their expression in DGS (and possibly beyond DGS). Descending in the hierarchy from top to bottom, we found a neat succession of layering, left-to-right concatenation and right-to-left concatenation. This succession is in full accordance with the hypotheses stated at the beginning of Section 5. Speech-act-indicating expressions, evaluation, epistemic modality, volition, deontic and root modality and scalarity expressed by cheek action are those categories for which our claims appear to hold most straightforwardly. More research is needed, however, to determine whether scalarity really finds layered expression with the shoulders. Also, the specific turning point from left-to-right concatenation to right-to-left concatenation in the domain of deontic modality requires further scrutiny.

There are of course other categories, further below the ones discussed in this article. These are, however, all aspectual in nature (aspect is marked manually in DGS, usually via manipulating the form of the verb sign, e.g., via reduplication). Below the aspectual domain, the realm of pure event description begins (i.e., the VoiceP; Kratzer 1996). We would like to emphasize one final point concerning these lower categories to prevent any misunderstandings. It is clear beyond doubt that layering is also employed with categories that are lower in the hierarchy than the categories we have surveyed in this article. It has, for instance, been established that the force with which a manual sign is signed provides different kinds of information, e.g., it can refer to the velocity of a moving object, to the degree of commitment, or express intensification. Our hypotheses at the beginning

of the present section do not preclude such layering in the manual domain. What our hypotheses predict to be impossible is that, say, a low aspectual category would receive layered expression by way of a NMM. Our prediction would then be that such aspectual operators, if layered, must always be signed with the hands.

Another point to be clear about is that hypothesis (20a) is concerned with verticalization. A problem to be solved is the question of mereological nesting: Is a body part as a whole, when it performs an action, higher than a subpart of this body part? Is a nodding head, for instance, higher than raised eyebrows or lower? It may turn out that such issues can be resolved empirically by investigating what kind of visual information signers rely on when observing the respective movements. For example, it may turn out that the critical point to evaluate how a nod is perceived is the position of the tip of the nose. If this was the case, then one could convincingly argue that a nod is lower than the eyebrows. Since such questions are outside the scope of the present study, we concentrated here on cases in which the relative positions of articulators were clear and mostly disregarded nods and body leans.

6 Conclusions

Like other signed languages, DGS uses facial expressions and other non-manual means for syntactic purposes. We have shown that clausal categories with wide scope, i.e., those which are higher in our partial representation of the hierarchy proposed by Cinque (1999) and Hole (2015), are marked non-manually. As far as we can see, this holds true not only for DGS, but for other sign languages as well. In all sign languages studied to date, sentence types different from assertions are marked non-manually (Zeshan 2004a, b; Zeshan 2006).[25] Thus, in line with previous research, we argued that NMMs are a means of expressing abstract syntactic features (see Neidle et al. 2000 or Neidle & MacLaughlin 2002 for a similar argument).

Other high operators, like evaluation or epistemic modality, are also expressed in literally high positions and are realized non-manually. At least for epistemic modality, this also seems true for other sign languages: In DGS, Sign Language of the Netherlands, Irish Sign Language (Herrmann 2007, 2013) and in ASL (Shaffer 2000, 2004; Wilcox & Shaffer 2006), epistemic modality is expressed by manual items accompanied by NMMs, or even by NMMs alone. In ASL, for example, epistemic modality is expressed with the lexical items POSSIBLE and MAYBE, accompanied by NMMs or only with NMMs; whereas the modal signs MUST and SHOULD (with some exceptions) do not have epistemic readings (Wilcox & Wilcox 1995; Wilcox 1996).[26]

On our analysis, all NMMs encode not-at-issue categories above tense (in the Cinquean hierarchy). In other words, they are not asserted and do not contribute to the truth-conditions. What they do instead is render propositions fit for embedding in the larger conversational background while conveying certain emotive or evaluative dimensions of meaning. Speech acts impose certain requirements on subsequent or preceding speech acts

[25] One reviewer called attention to the fact that some sign languages have (typically clause-final) manual question markers. As such manual question markers, for example in ASL (Neidle et al. 2000: 122), in Spanish, Finnish, Taiwanese or Hong Kong Sign Language (Zeshan 2004a: 32, 2013) are accompanied by NMMs, this is in line with our argumentation. If a manual-only question marker was found in a sign language, it would be necessary to check if it is situated in a clause of its own. And if this was the case, this would be in line with our argumentation. Note, furthermore, that the notion of speech act does not coincide with the notion of polarity. We contend that NMMs are used to mark speech acts in the morpho-syntax, whereas the question particle may indicate a variable over the polarity values negated/non-negated in individual languages.

[26] This could be different in Brazilian Cities Sign Language (BCSL). The data in Ferreira Brito (1990) seems to suggest that the BCSL modal verb CAN is used in sentences both with epistemic and deontic readings. This would parallel the situation in many spoken languages.

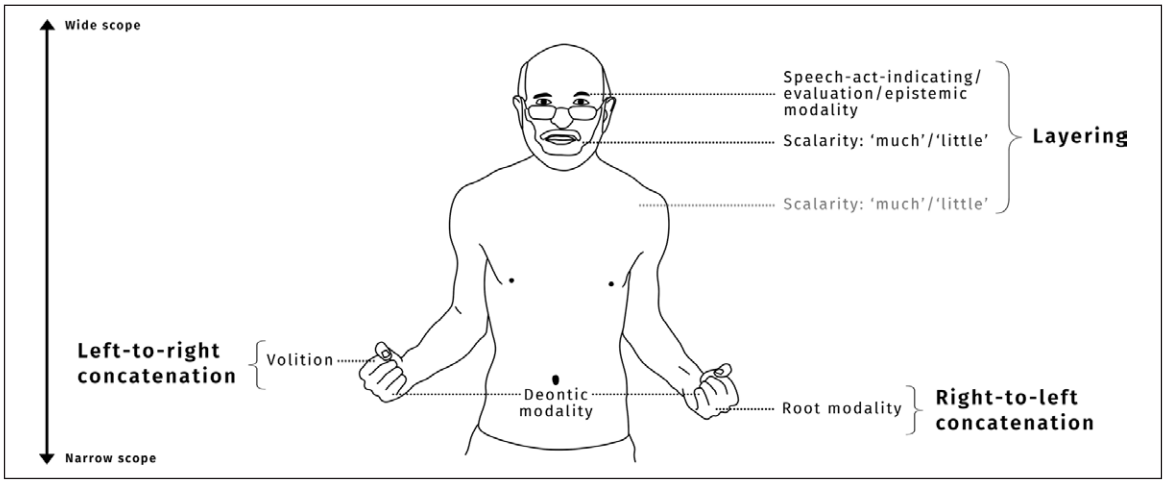


Figure 5: Summary of the different scope-taking strategies mapped onto the body: High categories are expressed via layering and lower categories by way of temporal sequencing (i.e., by the way of ordering signs in a clause). Note that the concatenation types refer to temporal concatenation and not to the positions of the articulators.

or other actions (for instance, questions are typically followed by assertions/answers). Epistemic modal operators are often accompanied by clauses asserting the kind of evidence that has led to the not-at-issue knowledge state, and so on. A cursory look at the machinery needed to formalize these kinds of embeddings in conversational backgrounds (Groenendijk & Stokhof 1984; von Fintel & Iatridou 2003; von Fintel & Gillies 2010) renders it quite plausible that signers want to direct their full attention—at eye level—to the articulators encoding these components of meaning. This would leave the comparatively clear asserted portions underneath tense to peripheral portions of their gaze. And indeed, as pointed out by Swisher, Christie & Miller (1989), signers typically focus on each other's faces, not on each other's hands during conversation.

We are quite confident that the organizing principles we have laid out in this paper may prove useful for the analysis of a variety of further phenomena in sign languages generally. Figure 5 summarizes our findings of a bodily mapping of clausal categories in DGS.

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Competing Interests

The authors have no competing interests to declare.

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