

FANTASTIC ‘AT LEASTS’ AND HOW TO SIGN THEM: EPISTEMIC, CONCESSIVE, AND QUALIFYING READINGS OF SCALAR MODIFIERS OF THE ‘AT LEAST’ CLASS IN GERMAN SIGN LANGUAGE

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Abstract: *Scalar modifiers, such as the English at least, have been argued to have four different readings: a neutral, an epistemic, a concessive, and a qualifying reading. This paper investigates the expression of these four readings in German Sign Language against the background of the Bodily Mapping Hypothesis. This hypothesis states that there is a systematic mapping between the position of an operator in the syntactic structure and the height of the articulator expressing it: the higher in the structure an operator is located, the higher the body part used for its expression will be. It will be shown that the readings of ‘at least’ encoding CP-functions are expressed using upper face non-manual markings, while the neutral reading is expressed manually without any additional non-manuals—in line with the Bodily Mapping Hypothesis.*

Keywords: *scalar modifiers, at least, concessive, epistemic modality, German Sign Language, Deutsche Gebärdensprache, cartography, Bodily Mapping Hypothesis*

1. INTRODUCTION

This paper focuses on investigating the encoding of different readings of scalar modifiers of the ‘at least’ class in German Sign Language. Four such readings have been discussed in the literature: (i) a neutral use, which can be paraphrased as ‘ x or more’/‘at a lower limit’, (ii) an epistemic use in which the speaker/signer additionally expresses that s/he is uncertain whether higher scalar values can be truthfully asserted, (iii) a concessive use with which the speaker/signer evaluates some fact as bad and others as neither totally good nor totally bad, and (iv) a qualifying use with the speaker/signer uses the modifier to weaken the proposition expressed (see Section 2 for further details).

The starting points of this study were cartographic approaches to sign language (Bross & Hole 2017; Bross 2020a;b) where clausal structure is said to be systematically mapped onto the body in the visual modality. Bross and Hole (2017) and Bross

(2020b) hypothesised that categories located in the CP-layer are expressed non-manually with the face (higher CP-functions are expressed with the upper face and lower CP-functions with the lower face). Furthermore, these studies mentioned that IP-internal categories are expressed manually and that VoiceP-internal categories are expressed by manipulating the movement path of the verb sign. Based on this so-called “Bodily Mapping Hypothesis”, it was hypothesised that (i) the neutral use of ‘at least’ should be marked manually without any additional (obligatory) non-manuals since it is used to express a lexical concept, (ii) the epistemic use should be expressed non-manually through upper face markings since it involves a CP-category, and (iii) the concessive use should be similarly expressed with upper face non-manual markers since it contains a negative evaluation and marks concessivity, both of which are related to the CP-layer. Although the qualifying use might be related to a speaker/signer-oriented meaning hosted in the CP-layer, predict-

ing the use to be expressed via upper face non-manuals, no specific prediction concerning this use were made since its function is hard to describe and nothing is known about its syntactic position. A detailed discussion of why these predictions were made is provided in Section 4.

It will be shown that the neutral use of ‘at least’ is indeed expressed manually-only in German Sign Language using the sign FROM. As predicted, the epistemic use of ‘at least’ is expressed non-manually with the upper face while the manual sign FROM is banned in this reading. For the concessive use it will be shown that two different kinds of upper face non-manuals are found, one to indicate a negative evaluation and another to indicate concessivity. Concerning the qualifying use, upper-face non-manuals were found, however, some open questions remain.

This paper is organised as follows: Section 2 describes the different uses of ‘at least’. Section 3 provides a brief overview of German Sign Language and how epistemic modality, positive and negative evaluations, concessive clauses, as well as conditional clauses are expressed in this language (these concepts play a role in the discussion of the different readings of ‘at least’ presented in the paper). Section 4 presents a detailed discussion of the hypotheses addressed in the present study. Section 5 describes the data elicitation process, and Section 6 presents the results of the study. Finally, Section 7 discusses the findings of the study and Section 7 provides the conclusions of the paper.

2. INTERPRETIVE FUNCTIONS OF SCALAR ‘AT LEAST’

The present study focuses on the different readings of scalar modifiers of the ‘at least’ class. The most neutral reading of ‘at least’ can be paraphrased as ‘*x* or more’. This use is exemplified for English in (1).

(1) Neutral use:

Paul should buy at least three bottles of beer.

The meaning of *at least* in (1) is neutral since it simply means that ‘Paul should buy three bottles of beer or more’. It is present only in combination with a (universal) modal verb (Geurts and Nouw-

en, 2007) or in imperatives and has also been labelled an “authoritative reading” (Büring, 2008).

Apart from the neutral use, Kay (1992) distinguished three additional uses of *at least* in English: an epistemic use, a concessive (or evaluative) use, and a qualifying (or rhetorical) use. These three uses are illustrated in (2).

(2) a. Epistemic use:

Maria has at least three children.

b. Concessive use:

They do not serve pizza here, but at least they have beer.

c. Qualifying use:

I drink a glass of wine every day. At least when I’m in the city centre.

With the epistemic use, the speaker marks that s/he is uncertain whether higher scalar values may truthfully be asserted. In the case of (2a), this use of *at least* indicates that given what the speaker knows, it may well be that Maria may have more than three kids, but that she has three kids for sure.

With the concessive use, the speaker indicates that the upper limit is evaluated as being neither totally good nor totally bad (referred to as the “better-than-nothing” effect by Alrenga, 2018) in contrast to some other fact in the world which is evaluated as bad. For this reason, the concessive use is also referred to as evaluative use (Kay, 1992). In (2b), the speaker negatively evaluates the fact that there is no pizza. The fact that beer is served is not evaluated as good, but as better than nothing. At the same time, the speaker adds that this is also not the worst state of affairs (referred to as a “settling for less” scenario by Grosz, 2011). That it is possible to insert an overt negative evaluative adverb into the clause is consistent with the fact that the proposition that is contrasted with the ‘at least’ clause is negatively evaluated. That the proposition expressed in the *at least* clause itself is not positively evaluated can be shown by the fact that it is hardly possible to insert a positive evaluative adverb into the clause. Both generalisations are illustrated in (3).

(3) a. Unfortunately, they do not serve pizza here, but obviously they at least have beer.

- b. ??They do not serve pizza here, but fortunately they at least have beer.

It is hard to describe the meaning contribution of the qualifying use, also referred to as rhetorical use. Kay (2004) characterises the interpretive function of this use as somehow weakening what is being expressed in the prejacet:

It is difficult to characterize with precision the illocutionary force, or other interpretative function, of rhetorical *at least*. One wants to say that a sentence, employing an adjunct introduced by this *at least* is somehow weaker or less forceful than the sentence would be without the adjunct, but it is difficult to specify just what one means here by “weaker” or “less forceful.” (Kay, 2004: 682)

In (2c), the speaker first claims that he or she drinks a glass of wine every day, but then (partly) limits the wine drinking to cases in which he or she visits the city centre.

It is worth pointing out that, unlike English, the different readings of ‘at least’ are expressed through different lexical items in certain languages. This is, for example, the case in German (cf. Gast, 2013), as illustrated in (4).

(4) a. **Neutral use**

Paul soll mindestens fünf Bier kaufen.
 Paul should at.least five beer buy
 ‘Paul should buy at least five bottles of beer.’

b. **Epistemic use**

Maria hat mindestens drei Kinder.
 Maria has at.least three children
 ‘Maria has at least three children.’

c. **Concessive use**

Immerhin/Zumindest/Wenigstens gibt es Bier.
 at.least give
 it beer
 ‘At least there is beer.’

d. **Qualifying use**

Ich trinke immer Wein. Zumindest, wenn ich in der Stadt bin.
 I drink always wine at.least when
 I in the city be

‘I always drink wine, at least when I’m in the city centre.’

As shown in (4), German exhibits one lexical item for the epistemic, the concessive, and the qualifying use. While the neutral and the epistemic readings share the same surface form (*mindestens*), *zumindest* can be used to express the concessive and qualifying uses, and *wenigstens* can be used to express the concessive use.

3. GERMAN SIGN LANGUAGE

This section presents a brief introduction of German Sign Language, as well as background information about the expression of categories that are relevant for the present study.

3.1 General background

German Sign Language (*Deutsche Gebärdensprache*, DGS) is a sign language that is used in Germany. There are approximately 80,000 deaf people living in Germany (Deutscher Gehörlosenbund, 2019). The number of signers is estimated to be somewhere between 80,000 (e.g., Schwager and Zeshan, 2014) and 200,000 (e.g., Simons and Fennig, 2018). The word order of DGS has been described as being mainly SOV (e.g., Keller, 1998; Steinbach and Herrmann, 2013) although SVO sentences are also frequently used (this is not an uncommon pattern in sign languages in general; cf. Napoli and Sutton-Spence, 2014). Additionally, other orders can be found due to information-structural foregrounding and backgrounding (for the influence of information structure, see Herrmann, 2015). Functional projections have been described as being right-headed in DGS. Inter alia, it has been proposed that the TnsP (Pfau and Quer, 2002; 2007) and NegP are right-headed (Pfau, 2002; Pfau and Quer, 2002), and that modal verbs occur in clause-final positions as might be expected in a head-final language (Pfau and Quer, 2007).

3.2 Epistemic modality, evaluation, concessivity, qualification, and conditional clauses in DGS

The following paragraphs briefly describe how epistemic modality, the evaluation of something as

good or bad, concessivity, qualification, and conditional clauses are expressed in DGS: all of these concepts play a role in the different readings of ‘at least’. All examples presented in this section stem from data elicitation sessions with native signers from Southern Germany, similar to the ones described in Section 5.

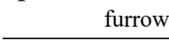
Epistemic modality: Epistemic modality is the modality concerned with necessary or possible truths regarding what the speaker/signer knows. This is different with other modal flavours. Deontic modality, for example, is another modal flavour that is concerned with possibilities or necessities with respect to how the power relations are. The example in (5a) illustrates deontic modality, while the example in (5b) illustrates epistemic modality. While the universally quantifying modal *must* in (5a) expresses that Paul is obliged to be at home early, the very same modal verb in (5b) expresses that the speaker uttering the sentence is sure, given what she or he knows about the world, that Paul is at home.

- (5) a. **Deontic modality:**
 (Paul’s parents are strict.) He must be at home early.
 b. **Epistemic modality:**
 (The light in Paul’s room is on.) He must be at home.

Deontic and epistemic modality differ not only with respect to the meaning being conveyed, but also with respect to syntax. While deontic modals are located in a structural position below the tense projection, epistemic modals are located in a higher CP-position (cf., for example, Wurmbrand, 2001). However, this difference is not visible at the surface structure in English.

While deontic modality is expressed manually in DGS, for example with the manual signs *MUST*, *CAN*, or *MAY* (e.g., Pfau and Quer, 2007; Bross and Hole, 2017; Bross, 2020b), epistemic contexts ban the use of manual modal verbs and epistemic modality is expressed only non-manually. To be more precise, epistemic modality is expressed via furrowed brows (Herrmann and Pendzich, 2003;

Bross and Hole, 2017; Bross, 2020b).¹ This is exemplified in (6).

- (6) a. **Deontic modality:**
 PAUL EARLY AT-HOME MUST
 ‘Paul is obliged to be at home early.’
 b. **Epistemic modality:**

 PAUL AT-HOME
 ‘Paul must be at home (given what I know).’

As shown in (6b), the furrowed brows spread over the whole clause in epistemic contexts. Manual modals are, as mentioned, not allowed in epistemic sentences, as shown in (7).

- (7) 
 *PAUL AT-HOME MUST
 Intended: ‘Paul must be at home (given what I know).’

Figure 1 depicts a photographic illustration of epistemic modality (taken from Bross, 2020a). Note that while epistemic modality bans the use of modal verbs, manual adverbs may additionally be used. As illustrated in (8), these manual adverbs occur in a clause-initial position in DGS.

- (8) 
 PROBABLY PAUL AT-HOME
 ‘Probably, Paul is at home.’

Evaluation: The evaluation of something as good or bad is often expressed via speaker-oriented adverbs in English and many other languages, often accompanied by intonational markers. Examples are given in (9).

- (9) a. **Negative evaluation:**
 Unfortunately, I missed the bus.
 b. **Positive evaluation:**
 Fortunately, I didn’t miss the bus.

In DGS, the evaluation as bad is expressed via a combination of furrowed brows and raising the inner parts of the eyebrows. The evaluation as good is expressed via a combination of raising

¹ While furrowed brows are the main markers of epistemic modality, closed eyes and small repeated head nods are also frequently observed in epistemic contexts.



‘The light is on. Paul must be at home.’

Figure 1. Representative images depicting epistemic modality expressed using upper face non-manuals.

the eyebrows and often wide open eyes (cf. Bross, 2020b). Sometimes, the cheeks are also involved as an articulator. Figure 2 depicts a photographic illustration of both cases: the top row shows examples of negative evaluations and the bottom row shows examples of positive evaluations.

In both cases, the respective non-manuals spread across the whole clause. Additionally, clause-initial manual adverbs can be used, as seen in example (10).

- (10) bad
 (UNFORTUNATELY) BUS MISS
 ‘Unfortunately, I missed the bus.’

Concessivity: Concessive clauses are embedded clauses expressing a proposition which suggests some contrary circumstance with regard to the matrix clause. In English, concessive clauses are often introduced by the subordinator *although*, as illustrated in (11).

- (11) Paul prepares a soup, although he is not hungry.

In DGS, concessive ‘although’ is expressed via the same lexical sign used for coordinative ‘but’. However, while the sign BUT is not accompanied by non-manual markers, the sign ALTHOUGH is



Figure 2. Role of upper face non-manuals in negative (top row) and positive (bottom row) evaluations.



Figure 3. The lexical items for coordinating *but* and subordinating (concessive) *although* are the same. However, *while but* is not accompanied by any non-manuals, *although* receives a brow-raise.

obligatorily accompanied by an eyebrow raise (Bross, 2019). Examples are given in (12).

- (12) a. PAUL HEALTH GOOD BUT FINANCE BAD
 ‘Paul is healthy, but financially he’s not doing well.’
- brow raise
- b. PAUL SOUP COOK ALTHOUGH (INDEX₃) EXISTENTIAL-NEG HUNGER
 ‘Paul prepares a soup, although he is not hungry.’

A photographic illustration of the sentences in (12) is found in Figure 3. Note that the sign *BUT* is usually accompanied by the mouthing of *aber* (the German word for ‘but’) and the sign *ALTHOUGH* is likewise accompanied by the mouthing of *obwohl* (the German word for ‘although’).

Qualification: So far nothing is known about the expression of qualifications in DGS. As mentioned earlier, this may have to do with the fact that the exact meaning of a qualification is hard to describe. It may well turn out that few languages have grammaticalised this sort of meaning.

Conditional clauses: Conditional clauses are embedded clauses that introduce a condition under which the event encoded in the matrix clause

holds true. An example is given in (13). The conditional clause is bracketed in the example.

- (13) [If it rains] the street is wet.

Conditional clauses in DGS are marked by raised brows (Pfau, 2008; Happ and Vorköper, 2014) with the embedded clause typically preceding the matrix clause. Conditional clauses can optionally be introduced by the manual marker *IF* (at least in the DGS variant used in Southern Germany). An example is provided in (14), along with photographic illustrations in Figure 4. Note that the non-manuals are spread over the whole clause.

- brow raise
- (14) (IF) RAIN STREET WET
 ‘If it rains the street is wet.’

4. HYPOTHESES

The categories discussed in the previous section are expressed via upper face non-manuals in DGS, with the exception of qualifications whose status remains unclear. Additionally, they are all examples of categories located in a structural position above the IP/TP. To be more precise, epistemic modality is thought to be located in the CP-layer (e.g., Wurmbrand, 2001). The

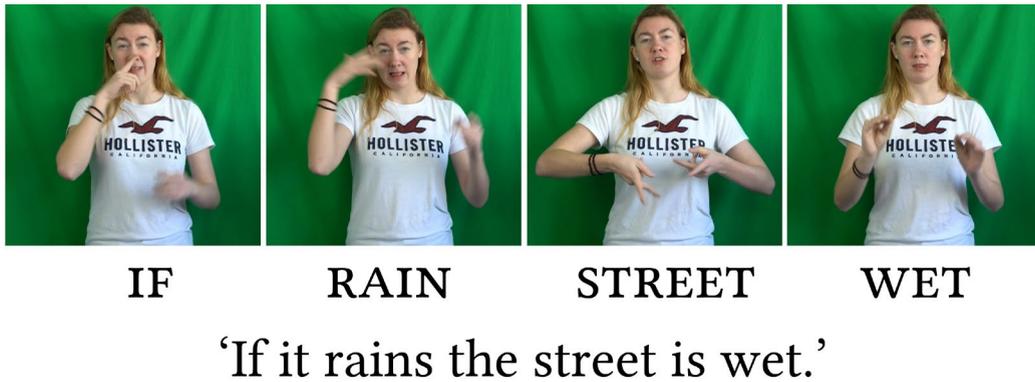


Figure 4. Conditional clauses are marked with a brow-raise accompanying the whole clause; optionally, a clause-initial manual conditional marker can be used.

same is true for evaluation, which is thought of as being encoded in a functional projection in the CP-domain (e.g., Cinque, 1999). Similarly, concessive *although* is an example of a subordinator and, thus, should be located in the CP-layer.² Only qualifications have an unclear categorical status. Nevertheless, qualifications seem to be a speaker/signer-oriented category rendering a CP-analysis likely, although this remains a speculation. Finally, conditional clauses also exhibit a connection to the left periphery (i.e., to the CP-layer) since they instantiate cases of embedding where the embedded structure has a CP-field.

Based on a cartographic framework (Rizzi, 1997; Cinque, 1999; 2006), Bross and Hole (2017) and Bross (2020b) propose that the organisation of the clausal spine is mirrored in the choice of articulators in sign languages in a systematic way (i.e., the Bodily Mapping Hypothesis, BMH). This hypothesis states that the higher a category is located in the syntactic tree, the higher the position of the articulator used for its expression in a sign language will be (this does not preclude that neighbouring categories might be expressed using the same articulators). Based on data from DGS, the above-mentioned authors show that all CP-functions are expressed via facial articulators. Higher CP-functions such as sentence-type encoding, topics and foci, epistemic modality, or evaluations

are expressed via the highest articulators possible, namely the eyebrows (sometimes with additional manual signs or with additional fronting operations such as topicalizations). Descending the clausal spine, categories are thought to be expressed using the lower face, then the shoulders, and, finally, the hands. While CP-categories were found to be correlated with facial non-manuals, IP-internal categories were found to be expressed only manually, without any obligatory non-manual markers. Examples include different kinds of modality such as deontic modality, bouletic modality, or outer aspectual categories like frequentative aspect I (cf. Cinque, 1999). Additionally, Bross (2020b) argued that lower aspectual categories hosted inside the VoiceP-domain, such as frequentative aspect II, are expressed via a manipulation of the movement path of the verb sign. Two versions (strong and weak) of the BMH are conceivable:

- (15) **Strong version of the BMH:** The structure of the clausal spine is directly mapped onto the body in sign languages in that CP-functions are encoded via facial non-manuals, IP-internal categories are expressed manually, and VoiceP-internal categories are expressed by manipulating the movement of the verb sign.
- (16) **Weak version of the BMH:** Scope is systematically mapped onto the body: the higher the scope of an operator, the higher the articulator, but sign languages may differ with respect to the exact cut-off points.

² In some cases, concessivity does not occur in an embedded environment, instead it is connected to the discourse – another indication of it being positioned in the CP-layer.

Both versions of the hypothesis predict the use of high articulators with higher CP-functions, although it has to be noted that neither version states clearly whether the mapping between syntactic structure and articulators is uni-directional or bi-directional. The uni-directional version of the BMH would predict that CP-functions are expressed with facial non-manuals, but that (even when used systematically) facial expressions do not necessarily reflect CP-categories. The bi-directional version, in contrast, would predict that CP-functions are expressed with facial non-manuals and that these facial non-manuals reflect CP-functions. This distinction, however, is not crucial for the purpose of this paper (for more details on different versions of the hypothesis see Bross, 2020a).

Concerning the categories relevant for the present study, all versions of the BMH make the following predictions: (i) the neutral use of ‘at least’ does not involve any categories of the CP-domain and is thus predicted to be expressed only manually; (ii) the epistemic use involves an epistemic commitment and thus would be located in (or connected to) the CP-layer, predicting the use of upper face non-manuals; (iii) the concessive use of ‘at least’ involves two CP-categories, namely a negative evaluation and a concession where again, this predicts the use of upper face non-manuals; and (iv) the exact status and structural position of qualifications is unclear. Therefore, no prediction can be made, although a speaker-/signer-oriented meaning is likely, which could suggest upper face non-manuals. For the purpose of the present study, the following scope order was assumed for the categories under discussion:

- (17) Concessive
- | | | |
|--------------------|---|----------|
| Evaluation | } | CP-layer |
| Epistemic modality | | |
| Tense | | |
| Deontic modality | | |
| Neutral reading | | |
| VP | | |

The representation is based on the following ideas: Evaluation and epistemic modality take

scope above tense, as discussed in Section 3.2. Evaluation takes scope above epistemic modality, as argued by Cinque (1999). Based on data from Italian dialects, Munaro (2011) concludes that concessives (and conditionals) take scope above evaluation. This makes sense since we can assume that clause-typing is encoded high up in the structure (cf. Rizzi 1997). The neutral reading is assumed to be hosted either inside the TP/IP or inside the VP, but, in any case, below the projection hosting deontic modality. The fact that deontic modals take scope above the neutral reading is obvious from examples like the one in (1) (*Paul should buy at least three bottles of beer*): □[Paul buy[at least[-three beer]]]. This representation seems to suggest that the neutral reading is located inside the VP. One could, however, also assume that the neutral reading always leads to quantized objects in such examples which need to leave the VP in any case (see, for example, Ritter and Rosen, 2001). Considering the assumption that the object in such examples remains in their base-generation position, the BMH would predict them to be expressed manually since they fall outside the syntactic area in which the hypothesis predicts concepts to be expressed via a manipulation of the movement path of the verb sign (see Bross, 2020b:30). Taken together, the BMH predicts everything above tense in example (17) to be expressed non-manually (or manually and non-manually) and the categories below tense should not receive obligatory non-manual markings.

There is, however, one caveat when it comes to the hypotheses presented. There is very little evidence showing that, for example, the evaluative reading of *at least* in English indeed involves a CP-function (except for the fact that a positive evaluative adverb cannot be added to an evaluative *at least* clause cf. (3)). However, the fact that epistemic, evaluative, and qualifying uses of scalar modifiers of the ‘at least’ class involve categories above tense is at least evidenced by semantic considerations. The epistemic, evaluative, and qualifying meaning contributions of the scalar modifiers are always meaning contributions tied to the speaker at speaking time, irrespective of the tense encoded in the clause they appear in. If this

meaning is indeed represented syntactically, it is, thus, connected to a projection above tense (i.e., in the CP-layer). The issue of finding syntactic evidence for this idea, however, needs to be investigated further. The present study will focus on the question of how these meanings are encoded in German Sign Language.

5. DATA ELICITATION

The data presented in this paper was elicited with 14 signers (7 women) from cities in Southern Germany, including Heidelberg (3 signers), Munich (4 signers), Karlsruhe (2 signers), and Stuttgart (5 signers). The mean age of all 14 consultants was 28.93 years ($SD = 10.74$). All signers are deaf from birth. 4 signers are early learners of DGS, with early learners being defined here as those who have acquired DGS before the age of four years. One signer was considered as a late learner based on the above-mentioned definition. The remaining 9 signers are native signers in the narrowest sense since they grew up with deaf parents using DGS.

All consultants had completed their secondary education at the minimum and were proficient in their written language abilities. Data was elicited in face-to-face interactions and recorded on video. These videos were cut using Adobe Premiere Pro software for further qualitative analysis. The procedure was incremental: the analysis of data from one session – or the comparison of multiple sessions – often raised questions that were addressed in subsequent sessions with the same and/or other consultants. All examples in the figures and all glossed examples in this paper with no corresponding reference are representative samples from these videos.

During the elicitation sessions, consultants were presented with written sentences that they were asked to translate into German Sign Language (see Matthewson, 2004, 2006 for a discussion of the advantages of translation tasks). Each sentence was presented on a sheet of paper and consultants were asked to read and memorize the meaning of the sentence. The sheet was then covered up in order to reduce bias due to the sentence's written structure. The consultants were instructed to take some time

to consider the sentence and sign what they considered to be the best translation.

This procedure, of course, does not come without problems since it is based on (a written version of) spoken German. One major problem that this procedure could cause is that the consultant's translations could be influenced by the linguistic structure of German. However, as the results show, the structures elicited were drastically divergent from German and were, on the whole, very stable across participants. This indicates that the influence of spoken German was not very substantial (cf. Cecchetto, Geraci and Zucchi, 2009: 281 for a similar argument). The major reason why this particular procedure was chosen is that it allowed us to directly target the four different readings of 'at least' under controlled contextual environments. Commonly occurring instances of 'at least', for example, in corpora (if it is possible to find them at all) are often embedded in sentences containing additional functional categories which are hard to filter out. Neutral uses of 'at least', for example, occur, as mentioned earlier, in imperatives. Imperatives themselves involve an active CP-category taking scope over the entire clause and are accordingly marked by upper face non-manuals in DGS (Bross, 2020b). Similarly, qualifying uses of 'at least' are often mixed-up with other CP-functions, such as conditional structures, epistemic modality, or evidentiality (see below). This method of elicitation was chosen in order to reduce bias in the data as much as possible, as well as to obtain enough comparable data for further analysis.

The data elicitation sessions were part of a bigger project. Neutral, epistemic, concessive, and qualifying readings of 'at least' were elicited. Not all signers received the same examples, but different lexicalisations were used to ensure that the effects observed were not due to individual characteristics of the target sentences. Here are a few example sentences:

(17) Neutral use:

- a. Es müssen sich mindestens fünf
it must REFLEXIVE at.least five
Personen anmelden, sonst findet der
people register otherwise find the

Vortrag nicht statt.

talk not occur

'At least five people have to register otherwise the talk will be cancelled.'

- b. Paul soll mindestens fünf Bier kaufen.

Paul should at.least five beer buy

'Paul should buy at least five beers.'

(18) **Epistemic use**

- a. Paul hat mindestens fünf Kinder.

Paul has at.least five children

'Paul has at least three children.'

- b. Paul hat mindestens drei Bücher

Paul has at.least three books

geschrieben.

written

'Paul has written at least three books.'

(19) **Concessive use:**

- a. Hier gibt es zwar kein Bier, aber

there give it indeed no beer but

immerhin gibt es Pizza.

at.least gives it pizza

'There is no beer here, but at least there is pizza.'

- b. Ich habe nicht im Lotto gewonnen

I have not in.the lottery won

aber immerhin bin ich gesund.

but at.least am I healthy

'I did not win the lottery, but at least I'm healthy.'

(20) **Qualifying use:**

- a. Ich kaufe immer Wein, zumindest wenn

I buy always wine at.least if/when ich in der Stadt bin.

I the city am

'I always buy wine. At least if/when I'm in the city centre.'

- b. Ich treffe Paul jeden Tag. Zumindest

I meet Paul every day at.least

wenn ich in der Stadt bin.

if/when I in the city am

'I meet Paul every day. At least if/when I'm in the city centre.'

Note that the examples of the qualifying use in example (20) contain conditional/temporal clauses (there is some ambiguity here since the German term *wenn* is used in both constructions). It is possible to create examples of this use that are not conditional/temporal, but this was avoided since other examples always include epistemic modality or evidentiality (e.g., *Paula is at home. At least there is light in her room* or *Paul won the lottery. At least that is what he said*).

Often, consultants were explicitly asked to judge the acceptability of slightly modified examples (which were produced by the author). In cases of the neutral use, for example, deontic necessity modals often trigger facial non-manuals that are related to the signer evaluation of how strict the obligation is. If a consultant produced such a non-manual, s/he was asked whether the same sentence would be well-formed without the respective non-manuals and asked to produce the relevant structure. This procedure was carried out informally (i.e., there was no rating scale).

Since the data elicitation process was incremental, all uses were not elicited with every signer. This resulted in a total of 52 videos with 13 instances of the neutral use (signed by 8 signers), 21 of the epistemic use (signed by 14 signers), ten of the concessive use (by 9 signers), and 8 of the qualifying use (signed by 8 signers).

6. RESULTS

The following four subsections provide a detailed description of the different expressions of the 4 uses of scalar modifiers of the 'at least' class in DGS.

6.1 Neutral uses of 'at least'

Although there is a manual sign AT-LEAST, most of the signers consulted stated that they would not use it (further details on the question of how many signers used it and in which contexts are provided below). It is likely that the sign has its roots in Manually Coded German and it is produced by putting the index finger and the thumb together, while the rest of the fingers are not extended, the palm is facing downwards, and the whole hand



Figure 5. Representative images depicting the neutral use of ‘at least’, which does not require any obligatory non-manual markers. Note that movements of the mouth are related to mouthings.

performs a downward movement. All signers stated that they know the sign, but most stated that they would not use it in everyday signing.

In neutral contexts, the sign FROM is used instead. The sign is produced with a B-handshape (x) with the palm facing downwards or sideways. The sign is accompanied by the mouthing *ab* (German: ‘from’).³ An example is given in (21).

- (21) PAUL SHOULD FROM FIVE BEER BUY
 ‘Paul should buy at least five beers.’

As indicated by the glosses, the use of FROM does not require, as predicted, any additional non-manual markings. Although examples containing universally quantifying modals like MUST or SHOULD in deontic uses are often found to be accompanied by upper face non-manuals that express the signer’s evaluation of the obligation as strict. However, these non-manuals are neither obligatory nor are they related to the scalar modifier. A photographic illustration of the example is found in Figure 5.

Only 3 signers (of a total of 8 signers) used the sign AT-LEAST in the neutral use, and all other signers stated that they would not use it. An example is given in (22). Note that both FROM and AT-LEAST always occurred directly preceding the numeral.

- (22) PAUL SHOULD AT-LEAST FIVE BEER BUY
 ‘Paul should buy at least five beers.’

³ Note that the sign FROM also has a temporal use meaning ‘starting from’.

Again, the use of this sign does not require the use of additional non-manual markers. Thus, as predicted, upper face non-manuals do not play a role in the encoding of the neutral use of ‘at least’ in DGS. There was, however, some variation as to which manual sign was used, but this is not uncommon for a language with a small number of users.

6.2 Epistemic uses of ‘at least’

Similar to the fact that manual modal verbs are disallowed in epistemic contexts in DGS, the use of FROM is also banned in epistemic contexts, as shown in (23a). This judgement was given by all 14 participants who provided an epistemic reading. Only 2 consultants allowed the manual sign AT-LEAST in this context, as illustrated in (23b) and in Figure 6. In this case, epistemic upper face non-manuals can be observed, although much weaker than with the non-manual only strategy described below. The epistemic non-manuals used in these cases were strongest on AT-LEAST. All the other participants did not allow the use of this manual sign.

- (23) a. ^{epistemic} *MARIA EXISTENTIAL FROM FIVE CHILD+++
 Intended: ‘Maria has at least five children.’
- b. ^{epistemic} MARIA EXISTENTIAL AT-LEAST FIVE CHILD+++
 ‘Maria has at least five children.’

Instead, they expressed the epistemic use of ‘at least’ non-manually. The main strategy was sim-



‘Maria has at least five children.’

Figure 6: The manual sign AT-LEAST in an epistemic context.

ply to sign that Maria has five children and to add that there may be more children, as illustrated in (24). The epistemic non-manuals (i.e., furrowed brows) either accompanied the entire construction or specifically the second clause. Figure 7 depicts a photographic illustration of example (24).

epistemic

(24) -----
 MARIA EXISTENTIAL FIVE CHILD+++ OR MORE
 ‘Maria has at least five children.’

An additional non-manual that is often observed are pulled down corners of the lips, also observed in Figure 6. This non-manual marker, often called “horseshoe mouth” (Oster and Ekman, 1978), “lip corner depressor” (Ekman and Friesen, 1976), or “mouth shrug” (Debras, 2017), is known to be related to a lack of knowledge or the inability to decide whether information is true or not in gesture and sign (cf., for example, Bitti, Bonfiglioli, Melani, Caterina and Garotti, 2014; Debras, 2017; Siyavoshi, 2019). However, the eyebrows were the most stable articulator used in this construction.

Taken together, the prediction that the epistemic use of scalar modifiers of the ‘at least’ class is ex-

pressed via upper face non-manuals was confirmed by the data elicited in the present study. However, there was some variation with respect to the question of whether or not to use the additional manual sign AT-LEAST. Additional manual signs are, however, always needed to express the relevant meaning.

6.3 Concessive uses of ‘at least’

As predicted, the concessive use is expressed using two different non-manual markings. First, the clause with which the ‘at least’ clause is contrasted is negatively evaluated and therefore receives the corresponding upper face non-manuals (mainly furrowed brows/inner parts of the eyebrows raised). Additionally, the manual sign BUT (which is normally not marked non-manually) is expressed along with an eyebrow raise. This makes it similar to the concessive ALTHOUGH. However, the mouthing used by all signers still was *aber* ‘but’ and not *obwohl* ‘although’. An example is given in (25a).

As shown in the example, there is no particular marking of the ‘at least’ clause itself. It seems like it is not possible to use non-manuals to indicate a positive evaluation – this finding is as previously



‘Maria has at least five children.’

Figure 7: The basic strategy to express the epistemic use.



Figure 9. With the qualifying use an eyebrow raise was produced on the manual subordinator.

- (26) a. $\overline{\text{br}}$
INDEX₁ ALWAYS BUY WINE IF INDEX₁ MON-
EY EXISTENTIAL
‘I always buy wine. At least if I have money.’
- b. $\overline{\text{br}}$
INDEX₁ DAILY PAUL MEET IF GIVEN CITY
‘I always meet Paul. At least if I’m in the city.’

The meaning associated with raised eyebrows specifically on the manual subordinator and not on the entire embedded clause probably leads to a reading that is similar to stressing the word *if* in an English conditional clause (i.e. ‘if and only if’).⁵ One signer produced a regular conditional clause with no detectable non-manuals related to a qualifying meaning. The remaining signer produced an unusually long palm-up gesture between the main and the embedded clause in a conditional construction. Additionally, the palm-up gesture was accompanied by closed eyes (glossed ‘ec’) and pressed lips (glossed ‘pl’), as shown in example (27).

- (27) $\overline{\text{hs}}$ $\overline{\text{ec, pl}}$
INDEX₁ LIKE PAM₃ PAUL₃ NEG PALM-UP IF
 $\overline{\text{hs}}$
DRUNK LIKE NEG
‘I don’t like Paul. At least if/when he’s drunk,
I don’t like (him).’

What happens in other cases of the qualifying use that are not conditional clauses remains unclear and should be investigated in future research. On the whole, however, the assumption that the qualifying use would trigger upper face non-manuals turned out to be accurate.

7. DISCUSSION

Based on the data discussed above the findings seem to largely confirm the initial hypotheses: it was found that the domains above tense in the structure denoted in (17) (as mentioned in Section 4 – repeated below for convenience), receive non-manual markings, while the domains below are marked manually.

- (28) Concessive
Evaluation
Epistemic modality
Tense
Deontic modality
Neutral reading
VP
} CP-layer

To be more precise, the concessive use was marked by a negatively evaluative facial expression (furrowed brows/raising of the inner parts of the eyebrows) along with a brow raise on the manual sign BUT. The epistemic reading was marked by furrowed brows along with other manual ma-

⁵ Or ‘when and only when’ in temporal cases.

Table 1. Summary of the different strategies used to express the meanings under discussion.

Type of use	Number of signers consulted	Main strategy (number of signers using the strategy)	Other strategies (number of signers using the strategy)
Neutral use	8	Manual sign FROM (5)	Manual sign AT-LEAST (3)
Epistemic use	14	Explicitly signing that there might be a higher limit along with furrowed brows (12)	Manual sign AT-LEAST along with furrowed brows (2)
Concessive use	12	The 'at least' clause is accompanied by negatively evaluating non-manuals (furrowed brows/inner parts of the eyebrows raised); the manual sign BUT is used accompanied by an eyebrow raise (12)	Sometimes, a slightly positive facial expression is found on the second clause (depending on the particular example)
Qualifying use	8	Use of the manual sign IF accompanied by a brow raise, along with the main clause preceding the IF-clause (6)	Regular conditional (1 signer); use of an unusually long palm-up gesture accompanied by closed eyes (1 signer).

terial, while the neutral reading was expressed solely with manual markings. The qualifying uses also triggered non-manual markers, but a syntactic analysis of this reading is beyond the scope of this paper. Additionally, it is unclear what happens in cases where no conditional structures are involved with this particular reading. An overview of the strategies used to express the different meanings is shown in Table 1.

In some cases, the mouth (the “horseshoe mouth” with the epistemic reading) and the cheeks (with evaluation) were also involved. These non-manual markers were not discussed in detail as BMH has yet not much to say about this area, except that it is below the eyebrows and the above the shoulders. This means that this area should be used to express lower CP-functions. Previous works on the BMH have discussed only puffed and sucked-in cheeks as expressions of scalar modality (e.g., Bross & Hole, 2017; Bross 2020b). It may turn out that the cheeks are generally responsible for encoding not-at-issue scalar categories. It could also be possible that a strong version of the BMH assuming a partition of the fact (with higher facial articulators encoding higher and lower facial articulators encoding lower CP-functions) is simply not on the right track and that the face is generally responsible for CP-categories irrespective of their order. This would explain why the upper and the lower face is often active at the same time in evaluative constructions (see also Fornasiero, 2020).

When comparing DGS to English and German, it turns out that DGS behaves more like Ger-

man since both languages use different strategies to express different readings. The main difference between DGS and German is that German uses different lexical items. The strategies used in DGS are more diverse since they involve a lexical item only for the neutral reading, while the other readings involve more complex constructions involving non-manual markings or combinations of non-manuals and manuals. Interestingly, however, some signers used a lexical item both for the neutral and the epistemic reading (i.e., the sign AT-LEAST), similar to spoken German. This item is, however, as mentioned probably rooted in Manually Coded German. A last point of comparison is the fact that German uses different lexical items for the epistemic and the concessive use. While the main strategies to express these functions in DGS do not depend on manual lexical items, it was observed that the non-manuals used to encode the different readings of ‘at least’ also differ.

Coming back to the caveat pointed out at the beginning of this paper, there is very little evidence supporting the idea that the different functions of scalar modifiers are represented syntactically. It might well turn out that the different meaning contributions discussed are hardwired into the semantics of the relevant lexical items in certain languages (e.g., German), while others do not have such lexical items and, thus, need to use syntactic evasion manoeuvres, such as in DGS. If this is the case, it would be interesting to find out why this occurs. A more general question that requires further research is why specific languages use a semantically underspecified lexical item to

express different functions, while others do not. It should also be noted that it is, in general, quite surprising that categories that are far away in the clausal spine are expressed by the same lexical item since it is often assumed that syncretism of this kind only occurs with neighbouring categories (see, for example, Starke, 2010). These questions, however, cannot be answered without further analysis of the syntax of scalar modifiers and additional cross-linguistic research.

8. CONCLUSIONS

This study focused on the four possible readings of scalar modifiers of the 'at least' class and how they are expressed in German Sign Language. Against the background of the Bodily Mapping Hypothesis, it was hypothesised that: (i) the neutral use of 'at least' should be expressed using only manual markers (i.e., without any additional non-manual markers); (ii) the epistemic use needs additional upper face non-manuals (along with manual materials); (iii) the concessive use involves two different upper face non-manuals (one for the evaluation as bad and one for concessivity); and finally (iv) there were no clear predictions regarding the qualifying use. The results showed that the neutral use indeed was expressed manually only (mainly) with the sign FROM. This sign was found to be banned in epistemic contexts

where upper face non-manuals were used instead. Similarly, the concessive use did not allow for the use of an additional manual marker, but instead triggered non-manual markings. Although the results regarding the qualifying use were not one hundred percent clear, upper face non-manuals could be observed. Taken together, the findings support the idea that upper face non-manuals are used to encode CP-categories, although there was some variation regarding the manual signs used for the neutral reading since this use did not trigger any obligatory facial non-manuals. Some variation was also observed with respect to the epistemic use: while some signers used a manual sign in epistemic contexts with additional upper face non-manuals, most signers preferred a non-manual-only strategy. The concessive use consistently triggered two different types of non-manuals - the first type was used to express a negative evaluation, while the second type was used to express a concession. Some signers additionally expressed the 'better-than-nothing' effect described in Section 2, but this was not expressed with the eyebrows. Finally, the qualifying use yielded rather unclear results. While upper face non-manuals could be observed, the meaning expressed is probably related to a biconditional logical connective ('if and only if') that, in this case, also has some kind of qualifying meaning.

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