On the weight of phrase-final prosodic words in a sign language

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This article seeks to explore a prosodic explanation for the frequent occurrence of pointing signs phrase-finally. Corpus data from Sign Language of the Netherlands (NGT) show that indeed pointing signs occur highly frequently at the end of sentences, and an elicitation study shows that pointing signs, other light lexical elements, and phonetic phenomena like final holds occur in alternation in NGT. The addition of a final mora to the end of a phrase is argued not to be sufficient to account for these alternations. A complementary analysis in terms of prosodic and metrical phonology is sketched, whereby the final foot or prosodic word is required to be minimally trimoraic.

Keywords: prosody, phonology, phonetics, pointing signs, indexical signs, final lengthening, mora, prosodic weight

1. Introduction

Phrase-final positions in sign languages have been noted to be special both in content and form. Important information often appears there, leading Petronio (1991) to propose a focus position. Wilbur suggests the phrase-final position to also be prosodically heavy: “ASL overwhelmingly prefers prominence in phrase final position” (1999a:238). The phrase in question is the Intonational Phrase (IP). Presumably based in part on empirical work by Grosjean & Lane (1977), Perlmutter (1992) proposes a phonological process of phrase-final lengthening in ASL, creating a final hold. In our earlier work on NGT, we have suggested that some indexical signs appear to occur in final position not because of a syntactic process like pronoun copy, but in order to fill some kind of prosodic position (Crasborn et al. 2009). In this paper we further explore the idea that the final position of a sentence (or rather its prosodic corollary Intonational Phrase or Utterance) tends to be filled with a full Prosodic Word, an idea first mentioned in Van der Kooij &
Crasborn (2008). Building on the theory of prosodic phonology and its prosodic hierarchy (Nespor & Vogel 1986; Nespor & Sandler 1999), we examine the manual and non-manual elements that can contribute to prosodic weight in sign language. We specifically focus on the role of pointing signs in final position.

Weight and prominence, while related, are not the same. Weight is an intrinsic property of syllables, syllables being light or heavy depending on their segmental build-up. In the current study we will argue that the pointing signs that are often found in phrase final position are light syllables, consisting of only one mora. Throughout the paper, monosyllabic function words like the pointing sign, the palm up sign\(^1\), and the sign PERSON are indicated as ‘light elements’ because in addition to their formal lightness, their semantic content is also limited. Prominence, on the other hand, is sometimes used as a general phonetic property, referring to high perceptual salience. However, it is also understood as the perceivable expression of information structure, as when pitch accents are assigned to focused constituents. It is this sense of prominence that is used in the quote from Wilbur (1999a) above. Prominence in the sense of a pitch accent or stressed syllable at phrase level plays an important role in many spoken languages. At the word level, stress assignment can be sensitive to weight. In languages such as Dutch, the segmental content of a syllable contributes to the weight of the syllable.

While at word level there are perceivable distinctions in stress in multisyllabic signs, these are not lexically distinctive in either NGT or ASL (Van der Kooij & Crasborn (2008) on NGT; Wilbur & Schick (1987) and Wilbur (2011) on ASL). The placement of stress in NGT does not appear to be sensitive to weight, as we will show in Section 2 in a review of the literature on prosodic weight in sign languages. Section 3 discusses phrase-final phenomena in speech and sign, ending with the hypothesis that there are various phenomena that all contribute to the minimal requirements of sentence-final Prosodic Words. To test this hypothesis, we analysed data from the Corpus NGT and conducted a targeted empirical study that is presented in Section 4. Section 5 discusses the implications of the findings. Our conclusions are in Section 6.

\(^1\) The palm up sign (PU) appears to have a similar form in different sign languages, namely one or two flat hands with the palms facing upward held in neutral space. It has been identified as a discourse regulator, either for turn taking (ASL, Baker-Shenk 1977), for providing backchannel information (Danish Sign Language, Engberg-Pedersen 2002), or as a discourse particle with several functions (ASL, Hoza 2011; New Zealand Sign Language, McKee & Wallingford 2011). A more general prosodic boundary function of the phrase final PU sign is proposed in van der Kooij, Crasborn & Ros (2006), as the occurrence of PU is not restricted to discourse level boundaries. As a phrase final sign, it is analysed as a semantically and pragmatically empty manual form, hosting non-manual signals with a specific meaning. Phrase-finally, the \([\text{PU} + \text{non-manual}]\) may functions as an evaluative marker.
2. Prosodic weight

Prosodic weight is an intrinsic property of syllables that may be relevant for word stress patterning both in spoken and in sign languages. We will argue that although prosodic weight is not relevant for stress assignment in NGT, it may be relevant for expressing minimal requirements at phrasal level.

2.1 Prosodic weight in spoken languages

The prosodic weight of different syllables in a word determines stress patterns in many languages (Hayes 1995). Heavy syllables may bear stress, while light syllables do not, in languages like Dutch or English. In other languages, heavy syllables are the ones that can carry a lexical tone, while light syllables cannot. Further, compensatory lengthening can be related to syllable weight. To account for these facts, a unit of weight similar to the mora was first introduced by Hyman (1985). McCarthy & Prince (1986) and Hayes (1989) explicitly proposed a mora tier in the autosegmental representation and argued that this moraic representation is what motivates weight related phenomena such as stress assignment, tone bearing, and compensatory lengthening.

The mora plays two roles in phonology. First of all, it can be used to represent segment length: a vowel length contrast can be expressed through a mono- vs. bimoraic distinction as in (1a), while singleton and geminate consonants may differ in that the former is non-moraic while the latter is monomoraic, as in (1b) (McCarthy & Prince 1986; Hayes 1989). For sign languages, such a lexical length contrast has never been observed.

(1) a. /V/ vs./V:/
   / a /   / a: /

   µ     µ     µ
   a

b. /VCV/ vs. /VC:V/
   / ata /   / at:a /

   σ     σ
   µ     µ
   µ     µ
   µ     µ
   µ     µ
   a t a a t a
More importantly for the present study, the mora can be used to represent the heavy versus light syllables in weight-related processes. A heavy syllable has two moras while a light syllable has one. Hayes (1989) proposes that CV is inherently monomoraic while CVV is bimoraic; for CVC, a language has the choice of treating the coda as moraic or not. Consequently, the mora encodes the asymmetries between onsets and codas in weight-related processes. In stress assignment, for instance, the presence of an onset never determines whether a syllable receives stress (but see Everett & Everett 1984), while the presence of a coda may do so. Likewise, the loss of a coda triggers compensatory lengthening of the nucleus, while the loss of an onset rarely does (Hayes 1989).

There is on-going debate in the literature about whether or not moras as separate weight-expressing units are necessary for various languages, but many authors agree that weight is not always predictable on the basis of syllable structure, and should receive some form of representation for at least some languages. For an overview of the history and arguments for the mora, we refer to Broselow (1995).

2.2 Prosodic weight in sign languages

Many researchers have argued for the presence of a syllable unit in sign languages (Wilbur 1985, 1990a; Edmondson 1986; Wilbur & Nolen 1986; Wilbur & Schick 1987; Wilbur 1990a; Allen, Wilbur & Schick 1991; Perlmutter 1992; Corina 1996; Miller 2000; Jantunen 2006; van der Kooij & Crasborn 2008). The syllable roughly corresponds to a single movement cycle in surface forms, but at the level of the underlying specification in phonology it is an abstract domain that dominates elements like distinctive features and their (co-)temporal ordering without a specific phonetic interpretation in terms of movement. Thus, the syllable concept has two faces. There has been extensive debate in the literature about the existence of segmental structure below the syllable and whether the syllable is needed at the lexical level (e.g. Newkirk 1981; Liddell 1984; Wilbur 1993; van der Kooij & van der Hulst 2005), but there is general consensus that the syllable as one of the smallest units in the prosodic hierarchy is a useful concept for various reasons (see Jantunen & Takkinen (2011) and Wilbur (2011) for an overview).

While there are polysyllabic signs at the surface level (namely signs with repeated movements), there is no lexically contrastive stress in either ASL or NGT, nor in any other sign language we know of. The syllable receiving stress in NGT is not a heavy syllable, but rather it is the first or the last syllable in a sign with more than one movement cycle, depending on the details of the phonotactics (van der Kooij & Crasborn 2008). As van der Kooij (2002) argues, the relevant phonotactic properties can be represented as manner of movement features within a representation of a sign as a single segment. It is the nature of the movement
representation that determines the stress on the surface for polysyllabic signs, although in terms of feature content, signs are typically single segments. The surface appearance of a sign segment that has the feature [repeated] is polysyllabic with prominence on the first syllable or movement cycle. The relevant manner of movement feature is [repetition], which leads to initial stress. By contrast, when there are two subsequent dissimilar syllables in one lexical item, the surface appearance is prominence-final. As in ASL, disyllabic signs that have different feature specifications are rare in NGT, and stem from compounding processes, for instance (Liddell & Johnson (1986) for ASL). For ASL compounds, Klima & Bellugi (1979) had already established that the first sign in a compound ‘loses stress’ to become an upbeat to the second part of the compound, the following syllable. They note that “[i]n some compounds the second sign actually takes on added stress (characterized by tension of the muscles and rapid movement)” (1979: 216). The second part may be realised with additional stress, they note. Further, both parts lose their repetition, if there was any in the source signs. Thus, the same stress patterns appear to occur in NGT and ASL.

While some authors have argued that syllables are composed of segmental units, in the models of Brentari (1998) and van der Kooij (2002) sign features are linked to two abstract sequential slots (labelled ‘x’), that together form a syllable. Brentari argues that this unit of two timing slots carries weight depending on the nature of the movement. While simplex movements consist of one weight unit, a combination of a path movement and a hand-internal movement would count two weight units. In this way, distinctions in weight are expressed. Jantunen (2006) argues that for Finnish Sign Language non-manual activity also contributes to syllable weight, in addition to the manual weight units proposed by Brentari.

As we mentioned above, Wilbur has argued that phrasal stress is rightmost in ASL (Wilbur 1999a). Thus, the rightmost position in a sentence does not only contain prominent information (such as a focused constituent), but it also has a perceivable change in appearance that leads to a phonetically prominent syllable (Wilbur & Nolen 1986; Wilbur & Schick 1987; Wilbur 1990a; Allen, Wilbur & Schick 1991). Stressed signs are marked by sharper boundaries, they are realised higher in space, may show (an increased number of) repetitions, and are articulated with increased muscle tension.

2.3 The mora as a weight unit in sign language

If movement weight is a non-distinctive property in sign languages, should it then be represented in terms of moras? In the moraic model of ASL phonology proposed by Perlmutter (1992), moras are argued to explicitly represent the length of (parts of) a syllable. The sequential representation of movement in terms of
Positions (P) and Movement (M) segments and the associated movement features projects a mora that connects it to the syllable level. Path movements and non-path movements (handshape and orientation changes) can both be associated to such a mora. Perlmutter is not explicit about the representation of complex movements, where a path movement combines with a handshape change or an orientation change, but one could imagine these to be bimoraic, and thus ‘heavier’ than single movements. In terms of phonology, phrase-final lengthening is represented by adding a mora to the final segment of the prosodic word (consisting of one or two syllables). The segmental make-up of the sign in turn determines whether this extra weight at the end of the prosodic word is realised as a perseveration of the final state of the articulator, or whether the hand-internal movement is lengthened (as in signs with, for instance, wiggling movements of the fingers).

A similar distinction in weight is adopted in the prosodic model of Brentari (1998), but this model emphasises the distinction between weight (the number of movements and size of the movements) and length or duration. Only segmental weight is represented by a weight unit, symbolised by an asterisk. Length phenomena are represented in terms of operations on the skeletal slots as proposed by van der Hulst (1993) and also adopted by van der Kooij (2002), while segmental weight is expressed in terms of segmental complexity (e.g. the number of branching nodes representing movement components).

Miller (2000, 2004) adopts the mora as a weight unit in his analysis of LSQ, with a specific use for moras in representing repetitions of movement. As in the models of Perlmutter and Brentari, he adopts the syllable as a phonological and phonetic unit that covers one set of phonological features and roughly equals one movement. However, like Perlmutter for ASL, Miller emphasises that there are different types of movement, which may behave differently under final lengthening in LSQ. For instance, circular movements that can sometimes be reduced to incomplete circles (such as arcs), would be realised as a full circle sentence-finally when an extra mora is added. A final extra mora thus can have different effects, depending on the phonological make-up of the sign. Moras further serve to represent the weight present in bimanual movements in Miller’s analysis: these together form a single syllable, but in his representation they are linked to two moras rather than one.

While it is clear that researchers have attempted to analyse sign phonology and phonetics in terms of weight, there is no general consensus on what exactly it is a mora should represent. In a sense, Miller is most detailed in his analysis of LSQ in looking at the surface forms of signs. As we indicated in the previous section, there is consensus about the concept of a syllable as a single movement unit yielding the input for prosodic structure. Repetition of movement is typically a feature, and it is left to the phonetic spell-out of surface forms how this repetition actually comes out: how many movement cycles are actually produced? Miller (2000)
looks at the number of movement cycles in surface forms, and proposes a complex surface representation (a “prosodic analysis”, in his words) in terms of multiple syllables, each syllable bearing one or more moras. We will come back to this type of approach in Section 5, when we discuss our findings about surface forms in phrase-final position.

2.4 Summary: phonological weight in spoken and sign languages

In summary, sign researchers have attempted in various ways to find parallels between sign language structure and spoken language structure. Where Perlmutter proposes to represent phonological final lengthening by adding a mora to the end of a phrase, Miller represents the alternations between full and reduced circular movements in terms of moras. Both are phenomena at the level of prosody, as is the very concept of syllable that is endorsed by many researchers in characterising the form of lexical signs. In the present paper, we empirically investigate phrase-final prosodic domains in Sign Language of the Netherlands and show that final lengthening is also found in NGT. However, we also find lengthening to alternate with other strengthening or enhancing features. We therefore explore the idea that there is a minimal requirement for a prosodic domain in phrase-final position and that there can be additional features other than those leading to increased duration or an increased number of movement cycles that also appear phrase-finally. These features include simultaneous properties of movements and non-manual expressions. The fact that such features are simultaneously realised with lexical phonological material can be considered as a specific consequence of the signed modality, but we will argue that in terms of structure and representation these can be cast in a similar framework as that used for spoken languages.

3. Phonetic marking of the end of domains

This section discusses a variety of phenomena that all occur phrase-finally, phrase being either a syntactic or a phonological unit.

3.1 Domain-final phenomena in spoken languages

In spoken languages, the ends of sentences can be marked by specific boundary cues. A pause separating two sentences is perhaps the clearest cue, but perhaps one that is not very frequent. Other cues are related to the speech material that is produced, and that is altered in some way. These include language-specific boundary cues like syllable complexity and boundary tones. In addition, there is
lengthening of the final part of the phrase (Klatt 1975; Lindblom 1978; Turk & Shattuck-Hufnagel 2007). Phrase-final lengthening is phonetic in spoken languages in that it is not conditioned by linguistic variables such as syllable structure, and it typically affects the whole syllable, rather than specific segments. Final lengthening has been argued to be a universal phonetic process in speech (Vaissière 1983; Tyler & Cutler 2009), just as final lowering of the pitch contour (Liberman & Pierrehumbert 1984). Other boundary cues are language specific, and include syllable complexity at various places in the word and boundary tones.

In addition to duration phenomena, the articulation of segments has been shown to differ according to the position in a phrase, stronger consonantal articulations occurring at the start of a domain than in the middle and at the end (Fougeron & Keating 1997; Cho & Keating 2001; Keating, Cho, Fougeron & Shu 2003). Summarising the literature in this domain, Fougeron & Keating (1997) emphasise that the final lengthening and initial strengthening phenomena cannot be directly related to the number of syllables in a string, longer sentences showing more reduction and lengthening at the end. Rather, the strength of the prosodic boundary is related to the size of the phonetic effects (in the sense of the prosodic hierarchy of Nespor & Vogel (1986), utterances being stronger than intonational phrases and phonological phrases being stronger than prosodic words).

3.2 Domain-final phenomena in sign languages

Grosjean (1979) compared English and ASL in terms of durational patterns, finding that like English, ASL sentences show final lengthening. Grosjean & Lane (1977) found that in a register that can be compared to ‘read speech’, ASL signers pause at major syntactic boundaries, rather than at random locations. Pauses were mainly found to occur as ‘holds’, perseverations of the final state of a sign. The number of holds decreases as signing speed goes up and vice versa, and in slow signing, the additional pauses occur at lower syntactic boundaries. Wilbur (2009) has similarly found evidence for larger durations of manual signs phrase-finally.

As was already referred to above, Perlmutter (1992) argued that this process of phrase-final lengthening in ASL is different from the phonetic lengthening in spoken languages, whereby whole syllables are lengthened. Instead, only the final position of a movement is lengthened in ASL, and it is thus not the syllable as a whole or the syllable nucleus that is longer, but only the end state of that movement, a P segment in Perlmutter’s analysis. As Perlmutter (1992: 431) states: “The lengthening observed in phrase-final position in ASL, however, differs from phonetic phrase-final lengthening in oral languages in ways that argue that it is phonological (rather than phonetic)”. In more recent literature it is argued that phrase-final lengthening extends over the whole syllable (Tang et al. 2010; Tyrone et al. 2010; Brentari 2011).
Wilbur has argued that the final position in a sentence is special in terms of being a 'focus position' (Allen, Wilbur & Schick 1991; Wilbur 1999a). Thus, primary prominence in terms of information status is at the end of a syntactic string. In principle, a final position in terms of syntactic structure could still be a syntactic unit of several signs. In terms of the phonetic appearance, Wilbur argued that the equivalent of a pitch accent, is assigned to the right-most lexical item in the phrase in ASL — and thus not to a larger domain. This rule applies to the intonational phrase, a phrase below the level of the utterance (the prosodic equivalent of a full sentence), as the phrase-final prominent element is often followed by a 'hedge' and other right-attached material in her data.

As a general observation of the prosodic weight of phrase final positions, Brentari states that “[t]he number of subcomponents of movements can influence sentential word order; that is, the greater the number of subcomponents, the more likely that the word will appear sentence-finally” (1998: 245). Thus, she suggests that phonological complexity can sometimes play an important role in determining word order in ASL. The quote above illustrates that not only phonological lengthening (the insertion of mora as a timing unit as in Perlmutter’s analysis) but also segmental or syllabic complexity can be a relevant feature with respect to the relation between position and prosodic weight. This idea is a starting point for the investigation in this paper, which looks at the possible expressions of prosodic weight by studying manipulations of the final position of elicited sentences.

3.3 Final pointing signs

In initial observations on final pointing signs in NGT (van der Kooij, Crasborn & Ros 2006), we noticed that if a sentence final element was already prosodically heavy, consisting of multiple syllables or complex movements, it was not followed by a pointing sign. There is no pointing sign following an utterance-final polysyllabic predicate (as in polymorphemic classifier predicates or adverbially modified verbs). Pointing signs otherwise appeared to frequently occur at the end of sentences. We found some initial evidence that if the final sign of a clause was neither phonologically complex nor followed by a light sign, some compensating strategies were used. Leaving out a final pointing sign appeared to be compensated by enhanced movement of the final sign or added non-manual features (head nod, stronger facial expression). An example of lengthened movement as a function of an adverbial modification is presented in (2).
Two functions for final pointing signs have been put forward: expressing emphasis or focus, and serving referential identification. Padden (1988) and other studies since then have argued that pronoun copy may generate a sentence-final pointing sign to express focus in ASL. Secondly, pronoun copy helps identify the subject in the absence of verb agreement, Bos (1995) argued for NGT.

In a syntactic study of doubling in ASL, Petronio (1991) argued that for some categories (wh-words, modals, quantifiers and verbs) the word is doubled into final position; that is, a sign occurs both in situ and in final position. Petronio proposed the final position to be the head of a ‘Focus Phrase’. Wilbur (1999b) contends that the actual function of the doubling is more one of emphasis than of focusing, especially for pronouns (indexical signs), which rarely express new information by themselves. This makes them unlikely to form the assertion of the utterance. (This might well be different for locative pointing signs, of course.)

Bos (1995) found that NGT pronouns may be doubled as well, to express agreement twice. Bos found that this only occurred for subject arguments. Crasborn, van der Kooij, Ros & de Hoop (2009) argued that the doubled indexical sign does not refer to the subject of the sentence, but rather to the topic: both subjects and object pronouns are found at the end of sentences in their data, but they appear to occur only if the original pronoun occurred as part of a topicalised constituent. The example in (3), an NGT example of a repeated pointing to an object topic is presented (from Crasborn et al. 2009: 359).

(3) Final pointing sign referring to the object topic of the sentence

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BOOK PT\text{right} PT\text{left} THROW-\text{AWAY} PT\text{right}
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‘He throws away the book.’

Where Bos (1995) explicitly notes that NGT sentence-final doubled indexes are unstressed, Wilbur (1999b) argues that doubled elements, including final pronouns, are stressed but not focused. In her earlier study of stress assignment in ASL, Wilbur also found that most of the post-verbal unstressed pronouns occurring in final position are experiencer subject arguments. The stress in these cases

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2. Here and below, the codes between brackets refer to the original data, and are composed of a subject number followed by a sentence number. All transcribed examples are available in The Language Archive, http://corpus1.mpi.nl/ds/imdi_browser?openpath=MPI1457447%23.

3. The following glossing conventions are used throughout this text. Pointing to the signer’s chest to refer to the first person (‘self-pointing’) is glossed as PT\text{-1}. Pointing to other referents and locations is simply PT, where needed with a description in lowercase of the direction of the pointing. The palm up sign is glossed as PU.
falls on the psych-verb preceding the unstressed pronoun. She analyses these pronouns as clitics that are extrametrical to the phrase. However, she notes that in four signers the handshape of the post-verbal unstressed final pronouns often assimilates to the preceding verb and suggests that this phonological reduction may be an indication of a clitic on its way to becoming a (subject) agreement suffix (cf. Sandler (1999) on the prosody of cliticization in sign languages). Conversely, we will argue that many cliticized pointing signs are not extrametrical, but are there to ‘rescue’ a defective phrase-final Prosodic Word.

3.4 A hypothesis on sentence-final positions

Our aim is not to argue in favour of or against such a grammaticalization analysis of unstressed final pronouns, but we wish to examine the phrase-final position from a broader prosodic perspective. The two functions of the final pointing signs, focus and referential identification, may provide part of the motivation for why they occur, but the functions cannot explain the alternation of the final pointing sign with other articulations. The idea we would like to investigate, then, is that final pointing signs at least sometimes occur because of prosodic motivations. This leaves open that the actual form of the pointing sign, that is the direction of movement or its orientation, may still be determined by the syntactic context of the sentence in which it appears.

The context of our investigation is the analysis of sign language using Nespor and Vogel’s (1986) prosodic hierarchy, argued by Wilbur, Sandler, and Miller to be pertinent to sign language structure as well. Lower prosodic units like the syllable or foot are included in higher-level units like the prosodic word. The full hierarchy is displayed in (4). The weight unit mora is not included in this hierarchy as it is not a domain, but rather a property of a syllable or foot. It is dominated by the syllable and foot in the sense that it represents the weight of syllables, and not of segments.

(4) The prosodic hierarchy
   Utterance (υ)
   Intonational Phrase (IP)
   Phonological Phrase (PP)
   Prosodic Word (PWd)
   Foot (F)
   Syllable (σ)

The general hypothesis then is that phonological phrases need to end in a full prosodic word, where it remains to be seen how ‘full’ can be further spelled out. If the lexical sign does not include enough phonological material to produce such a form
on the surface (whether underlyingly or for instance by a final hold as in Perlmutter’s (1992) observations or by reduplication of the specified syllable), then additional material is needed to fill the prosodic domain, and pointing signs as phonologically and semantically light elements may fulfil this function. Whether this requirement for sufficient weight is to be stated in terms of moras, syllables, or feet, is an open question at this point, which we will address in our discussion in Section 5.

4. Testing the hypothesis

4.1 Introduction: Sentence-final signs in the Corpus NGT

In order to corroborate our impression that indeed pointing signs often occur sentence-finally in Sign Language of the Netherlands, we looked at data from the Corpus NGT (Crasborn, Zwitserlood & Ros 2008; Crasborn & Zwitserlood, 2008). At the time of our investigation (summer 2010), the Corpus NGT contained 5902 sentence units that were glossed. Half of these sentences units contained a translation in Dutch (approx. 2 hours), and half were simply demarcations of the start and end of sentences (approx. 3.5 hours). The selection of sessions segmented at sentence level from the 2,375 total sessions of 92 people in dialogue settings was not specifically made for this study. Sentence annotations were found for all 92 signers, with a focus on 17 different signers who each produced more than 100 sentences. These were people between 18 and 55 years old from the Amsterdam and Groningen region. Although the glosses were not yet ID-glosses at the time of access, conventions for glosses for pointing signs were well established. (We refer to Johnston (2010) and Crasborn & de Meijer (2012) for a discussion of ID-glosses). All relevant annotations will be made available in a second public release of the Corpus NGT in the course of 2012.

The question we asked is how often light elements like pointing signs and the palm up sign appear in sentence-final position. To answer this question, a Perl script was created that searched for the final gloss in a sentence. As the left and the right hand are glossed separately, the last sign on either hand was selected. In case of simultaneous articulations of different signs, we included pointing and palm-up signs in our count when they were realised by only one of the hands. The findings are presented in (5). Pointing signs are glossed as PT or PT-1 (for pointing at the signer’s own body), and the palm up sign was glossed as pu.
(5) Sentence-final signs in the Corpus NGT

<table>
<thead>
<tr>
<th>Sign</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT</td>
<td>636</td>
<td>11</td>
</tr>
<tr>
<td>PT-1</td>
<td>229</td>
<td>4</td>
</tr>
<tr>
<td>PT and PU*</td>
<td>32</td>
<td>.5</td>
</tr>
<tr>
<td>PU</td>
<td>1667</td>
<td>28</td>
</tr>
<tr>
<td>Other</td>
<td>3303</td>
<td>56</td>
</tr>
<tr>
<td>Unclear</td>
<td>35</td>
<td>.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5902</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

* This category refers to signs that have characteristics of both a pointing with the index finger and of the palm-up sign. The other fingers (middle, ring and pinkie) may be slightly bent and the thumb may be extended.

Taken together, pointing and self-pointing take up 15% of the sentence-final position, and palm up is the last sign in 28% of the sentences. Thus, we conclude that indeed these signs are highly frequent sentence-finally in spontaneous and semi-spontaneous dialogues. Given their frequency, it is not likely that they are used as discourse markers only, although strictly speaking this would need to be confirmed by a discourse analysis of the same data.

As the Corpus NGT is not fully annotated for syntactic or prosodic structure, we decided to elicit sentences that potentially end in a pointing sign and to try to compare these to as similar as possible sentences that had no final pointing sign. This study is presented in the next section.

4.2 Elicitation study: The prosodic effect of avoiding final pointing

4.2.1 Introduction

In order to study the prosodic alternatives of final predicate signs in the presence and absence of final pointing signs we construed a set of sentences that were potentially ending in a pointing sign. The test sentences were construed analogous to some of the complex sentences with final pointing in van Gijn (2004).

4.2.2 Data

The stimuli consisted of 21 embedded sentences in written Dutch (see Appendix). Four signers were asked to translate these sentences to NGT, three are deaf native users and one is a deaf L2 learner. The set of sentences was offered in two different orders and recorded four times per signer. The first and second time no instruction was given to the signers. After the second set, the signers were asked to reduce the use of pointing. The signers typically did not use alternative phrasings, but rather used the same construction with various small differences in appearance. One of the four signers (the L2 learner) used role taking as an alternative
strategy; this signer was excluded from the analysis below. The full recordings from all four signers are archived in The Language Archive of the Max Planck Institute for Psycholinguistics and publicly accessible. The examples that are used below are indicated by annotations on a separate tier in the accompanying ELAN annotation files in the archive.

We elicited two types of sentences, as shown in (6). Although all sentences were presented in isolation without a discourse context, the structure of the sentences most likely produced a broad focus reading on the whole embedded sentence, as most new information appears there. However, the variation within the embedded sentence ensured that it was not the case that a single word or sign was focussed.

(6) Two types of elicitation sentences
1. Final verbal predicates
   This/that \{X\} sees \{Y\} walk/read (+/- modifier) 72
   e.g. That man sees the girl read (fast, careful).
   This/that \{X\} knows that \{Y\} visits \{me/you/him\} 36
   e.g. That neighbour knows that that man visits me
2. Final adjectival predicates
   This/that \{X\} knows that \{Y\} is/are \{A\} 120
   e.g. That woman knows that her colleague is weird

The sentences were checked by the third author for fluency and annotated with glosses in ELAN. Of the sentences ending in an adjectival predicate, 113 were approved and annotated. Annotation of the final signs included the properties listed in (7).

(7) Annotation layers used for the final signs in each sentence
   - facial expression
   - eye gaze
   - body and head position
   - repetition, in terms of the total number of sequential movement units
   - prosodic words
   - the syntactic role of the referent of the final pointing sign
   - one vs. two-handed articulations of signs

4.2.3 Results
4.3.2.1 Use of pointing with different types of predicates. The final verbal predicates were never followed by a light element. The unmodified verbal predicates typically consisted of multiple movement cycles (read, walk). The predicate visit, which consists of spatially modified path movement, was found to agree with a first, second or third person goal argument. Based on this limited set of phrase-final verbal predicates we can speculate on why verbal predicates are not followed
by light elements. Prosodically, the predicates are ‘heavy’ enough, consisting either of multiple syllables, as in read and walk, or of a path movement that is specified for the initial and final location, as in visit. We cannot exclude that morphological complexity of the spatially modified forms of visit also plays a role. In order to solve this issue, more data are needed, especially on final plain verbs, which typically cannot be modified morphologically. One participant added a pronominal pointing sign after the verbal predicate in the sentences with visit, but only in the cases of a second person goal argument. These final second person pronominal pointing signs were not cliticized and had a full or a repeated movement. Unlike the elements following the adjectival predicates below, these final second person pronouns could not be analysed as light elements.

When the verbal predicates were modified adverbially they were both morphologically complex and their duration and number of movement cycles increased. In the adverbial modifications of read and walk (fast vs. slow or attentively), the duration and the number of movement cycles increased in the slow/attentive versions.

Contrary to the verbal predicate, the final adjectival predicates were often followed by a semantically light element, which could be a pointing sign, the palm up sign, and the sign person. These light elements may incorporate into the preceding adjectival predicate, together forming one continuous movement. The adjectival predicates to which these light elements cliticize include dirty, shy, weird, difficult, innocent, confusing, impossible, wet, and different. A light element or a combination of light elements follows the adjectival predicates in 64 of the 109 sentences (59%). In 45 occurrences the adjectival predicates were the final element of the sentence (41%). Since only the adjectival predicates and not the verbal predicates showed an alternation between presence and absence of the final pointing sign (or some other light element), we focus on these adjectival predicates in more detail.

An example of an adjectival predicate followed by a pointing sign is given in (8). The sign wet has a repeated closing hand-internal movement, and is followed phrase-finally by a pointing sign.

(8) **girl pt person know sweater pt **wet pt** (S095_9b)  
‘That girl knows that the sweater is wet.’

All instances of pointing signs following the adjectival predicates referred back to the embedded subject. In the example in (8) above, the last pointing sign is semantically void and referentially redundant, being co-referential with sweater. The same holds for the final pointings in the embedded sentences in the examples below (9b, 10a, 11a, and 14a–16a).

Besides pointing signs, other light elements such as pu, palm forward and person occurred phrase finally, following the adjectival predicates. An example of
the phrase final light element person is given in (9a). In seven of the 113 sentences combinations of light elements occur, such as person+pt and pt+palm forward. An example of such a combination of final light elements is in (9b), which represents another articulation of the same signer of the same sentence as in (9a). The lexical movement of the sign shy consists of a rotation of the forearm while the selected index finger touches the cheek.

(9) a. boy look know pt man pt shy person (S093_2b)
   b. boy look know pt man pt shy person pt (S093_2a)

‘That boy knows that the man is shy.’

After the second recording of the full set of 21 sentences, we asked the signers to try and refrain from pointing. For some phrase final adjectival predicate signs this appeared to be harder than for others. For instance, the sign dirty could easily be articulated as a final element of the sentence. Impressionistically, in comparison with the versions of dirty that were followed by a final light element (pt or palm forward), the affective facial expression appeared to be stronger in these ‘bare’ cases.

4.3.2.2 Manual modifications. With respect to the manual properties of the final signs, in the avoid pointing context we find modifications of the final adjectival predicates that increase the duration of the sign. The increased duration can be manifested as holding the final position of the sign, illustrated in (10), or as a repetition of the lexical movement of the sign, illustrated in (11).

The following pair of sentences illustrate that the absence of the final pointing sign may result in holding the final bare predicate. Compared to the articulation by the same signer of the same predicate followed by a pointing sign, the duration of the adjectival predicate is twice as long in the bare articulation (650 msec. and 1300 msec., respectively). The sign strange consists of an outward straight movement in neutral space.

(10) a. woman pt know colleague strange pt (S075_3c: strange takes 650 msec.)
   b. woman know colleague strange (hold) (S075_3b: strange takes 1300 msec.)

‘That woman know that this colleague is weird.’

The increased duration may also result in repeating the lexical movement as illustrated in (11). The two instances of repeated hand-internal movement of the adjectival predicate wet lasted two to three times longer than the same predicate in the context of a final pointing sign (630 msec. and 950 msec. vs. 230 msec.)
(11) a. **pt girl pt person pt know sweater pt wet pt**  
(S095_9b: WET takes 230 msec.)  
b. **girl person pt knows sweater wet (repeated)**  
(S095_9c: WET takes 630 msec.)  
‘That girl knows that the sweater is wet.’

A third variant of increased weight that occurred in our data did not add sequential weight but added to the simultaneous complexity of the final sign. In the following example, a path movement is added to and merged with the lexical movement of the sign. The lexical rotation of the forearm in **shy** is enhanced by a path movement from the cheek to the space in front of the lower body.

(12) **boy know man palm-up intensive shy (+path movement)**  
(S093_2c)  
‘This boy knows the man is shy.’

The various ways of expressing prosodic weight in terms of timing units were nicely illustrated by three versions of the sentence ‘That girl knows that the sweater is wet’ by one and the same signer. The three realizations form minimal pairs with respect to the manifestations of the added weight. The first two realizations were illustrated in (11a) and (11b). A third realisation includes a final hold, as shown in (13).

(13) **pt girl pt know sweater pt wet (hold)**  
(S095_9a: WET takes 950 ms)  
‘That girl knows that the sweater is wet.’

4.3.2.3 *Use of non-manuals*. In addition to the increased duration of the manual articulation in the form of holds, repeated lexical movements and added light elements such as pointing signs, we also annotated non-manual signals such as facial expression and head and body position, keeping our eyes open to the possibility that not only increased duration but also increased intensity of the articulation could add to the impression of weight. The adjectival predicates **shy, difficult** and **strange** showed variation in the presence of a final pointing sign for all three signers. A comparison of different versions of the following sentences shows that in the versions without the final pointing sign the adjectives are articulated with more or stronger non-manuals, such as eye squint, a frown, a shoulder raise, or head shake. Examples are given in (14)–(16). **difficult** consists of a forearm rotation, while **innocent** is an end contact movement on the chest.

(14) a. **boy know man shy pt**  
(S075_2d)  
b. **boy know man shy + shoulder raise, eye squint**  
(S075_2c)  
‘This boy knows the man is shy.’

(15) a. **girl know book difficult pt**  
(S075_4d)  
b. **girl know book pt difficult + shoulder raise, frown**  
(S075_4a)  
‘The girl knows that book is difficult.’
(16) a. pt judge person pt know boy pt INNOCENT pt  (S075_6c)
    b. judge person know boy INNOCENT + headshake  (S075_6d)
      ‘That judge knows that the boy is innocent.’

The headshake in (16b) is not an obligatory element of the sign INNOCENT and it
does not negate the adjectival predicate or the adjective, but it is merely a rein-
forcement of the negative meaning inherent in innocent. It is thus semantically
redundant, and in that sense equally ‘light’ as the function word PT that is added
in the alternative realisation of the sentence.

4.2.3 Summary
We found that embedded sentences that contained a final verbal predicate (read,
walk) typically consisted of multiple movement cycles and were never followed
by a phrase final light element, regardless of whether they were spatially modi-
fyed for person or adverbially modified for movement quality. The predicate visit,
which consists of a simple path movement, was spatially modified by a first, sec-
ond or third person goal argument. Only in the second person goal argument a
pronominal pointing sign was added after the verbal predicate by one participant.
However, this pointing sign was not prosodically light: it was repeated or held.
Variation in occurrence of phrase-final light elements was found for sentences
with adjectival predicates (DIRTY, SHY, STRANGE, DIFFICULT, INNOCENT, CONFU-
sing, IMPOSSIBLE, WET, DIFFERENT). A comparison of four instances of these
adjectival predicates showed that in some instances the adjectival predicates were
followed by a light element (pointing, PERSON, PU, or a combination thereof). In
the bare cases without final pointing, there was some other additional phonetic
event: the (affective) facial expression of the adjectival predicate appeared to be
stronger than in non-final position (e.g. eye squint), the movement of the adjec-
tival predicate was repeated, the final position was held, or a simultaneous move-
ment component was added.

5. Discussion

5.1 Variation in the expression of prosodic weight

We found evidence in the elicitation study for the final position of the phrase in-
deed being prosodically prominent. Content words in final position never appear
to be prosodically light in the sense of only containing a single path movement
(or hand-internal movement) without any modification. Either the movement is
modified so that it comes out lengthened, or function words such as pronouns
(PT) or discourse markers (PU) are added. Various realisations of the ‘bare’ final
adjectival predicates show that non-manual articulations may also contribute to prosodic weight, cf. suggestions in the literature for other sign languages. An overview of phrase-final appearances in NGT is given in (17). In fact, we found instances of nearly all of the types of enhancement that we started out annotating. A type of enhanced articulation that we did not find in our data was a two-handed realisation of a normally one-handed sign. We would predict that this too could be used to increase the weight of a sign, just as Miller (2000, 2004) makes explicit by using two moras in the surface form representation of two-handed signs.

(17) Types of enhancement in phrase-final position

Sequential
- Temporal enhancement of a sign: hold or repetition of the lexical movement
- Adding a light sign: PT, PU, PERSON

Simultaneous
- Adding a simultaneous path movement to a hand-internal movement
- Non-manual expressions: squinted eyes, shoulder raise, headshake, frown

Taken together, these phenomena could potentially strengthen Perlmutter’s (1992) claim that final lengthening appears to be different in sign languages than in spoken languages. Where Perlmutter argued for ASL that it is not the case that final syllables tend to be articulated longer irrespective of their phonotactics, our findings for NGT suggest that final holds are in alternation with other articulations that can jointly be analysed as ‘adding weight’. This does not exclude the possibility that there is also a more general final phonetic lengthening process in NGT that lengthens the overall duration of movements in the final syllable, but this has not yet been investigated for NGT.

The prosodic weight and the resulting perceptual prominence in terms of which we would like to analyse our findings thus transcends a single phonological feature, and cannot be measured simply in duration, movement repetition, or holds. Perlmutter’s (1992) rule of final mora insertion, to which we will come back below, was argued to count as evidence for his analysis of lexical sign structure in terms of movement and position segments, as it accounted for his observation that final holds in ASL looked differently in signs with repeated internal movement. It is clear from our findings above that we do not find such a neat pattern of final holds at all for NGT. While a final hold appears to be one of the type of modifications we see phrase-finally, our crucial finding is that these alternate with different types of manual modification, with addition of phonologically light function words, and with non-manual articulations. An analysis of these findings cannot simply consist of the addition of a (temporal) weight unit like a mora or a ‘*’ (Brentari 1998) to a prosodic domain like the phonological phrase or the
intonational phrase, as such a unit would only have the effect of lengthening or strengthening the phonological material that is already present. We found that in addition to such enhancements, it also happens that new material is inserted. In the next section, we sketch an alternative analysis.

5.2 An analysis in terms of prosodic domains

If an elegant analysis in terms of simply adding a mora or some other weight unit to the end of a phrase cannot account for the appearance of phrase-final positions, what could be an alternative? Is ‘weight’ a relevant concept at all in accounting for these phenomena?

What we would like to suggest is the need for an analysis in terms of a prosodic template, which could be quite similar to what Miller (2004) proposed. He looked at metrical phonology for spoken languages, where stress patterns in languages like English are analysed in terms of ‘metrical grids’ (Hayes 1995). Alternations between stressed and unstressed syllables are central (as in sequences of iambs or trochees), two or three moras or syllables together forming a foot.

In our model for the lexical representation of NGT signs, there is no need for an explicit weight unit such as the mora as weight can be (partially) deduced from segmental complexity (Crasborn 2001; van der Kooij 2002). However, it is well possible that when surface forms are generated in a specific prosodic context, moras are projected to some surface movements but not to others. In Miller’s proposal for LSQ, full circles would be represented by two moras, while an arc or a circle that is reduced to an arc counts only one mora. In our model a lexical path movement is represented by two segmental features associated to the temporal skeleton. More generally, each associated skeletal slot appears to generate a mora post-lexically, leading to bimoraic syllables for lexical movements such as path movements and handshape or orientation changes. The configuration features of a light sign such as a pointing are associated to a single (final) skeletal slot. This representation would then characterize pointing signs as monomoraic.

(18) Post-lexical representations of lexical path movements vs. light signs such as \( \text{pt} \) and \( \text{pu} \)

a.Lexical path movements
   \[
   \sigma \quad \omega_{\mu\mu} \quad \sigma
   \]
   \[
   \begin{array}{c}
   [x \ x] \\
   \mid \\
   a \\
   \end{array}
   \]

b. Light signs
   \[
   \sigma \quad \omega_{\mu} \quad \sigma
   \]
   \[
   \begin{array}{c}
   [x \ x] \\
   \mid \\
   b
   \end{array}
   \]
Our proposal would then be that final prosodic words need to be minimally trimoraic, either branching into two syllables or counting one ‘heavy’ syllable consisting of three moras in case of final holds or repetitions of the lexical movement. Our data suggest that signs with straight path movements contain two moras, as these too need to receive extra material in final position (cf. ex. (10)). If a prosodic word (that is, the surface form of a lexical word in a prosodic context) consists of a ‘defective prosodic word’, counting only a single bimoraic syllable, it somehow needs to be extended to form a full trimoraic (or disyllabic) prosodic word. This could be done by enhancing the phonetic material of the lexical word, adding a final hold or lengthening the movement, but adding another defective (monomoraic or bimoraic) prosodic word would similarly achieve the requirement for a trimoraic prosodic word. The cliticised light pointing signs in our study consist of one mora. Being semantically void and referentially redundant, they are the ideal material to supplement the defective final prosodic words. The various options are represented in (19).

(19) Minimal sentence-final prosodic word with two different instantiations

<table>
<thead>
<tr>
<th></th>
<th>a. Minimal prosodic form</th>
<th>b. Realisation with two syllables</th>
<th>c. Realisation with one syllable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\omega_{\mu\mu})</td>
<td>(\omega_{\mu\mu})</td>
<td>(\omega_{\mu\mu})</td>
</tr>
<tr>
<td></td>
<td>(\sigma)</td>
<td>(\sigma)</td>
<td>(\sigma)</td>
</tr>
</tbody>
</table>

For example: 

<table>
<thead>
<tr>
<th></th>
<th>shy pt</th>
<th>shy + shoulder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>raise &amp; squint</td>
<td>(as in 14a)</td>
</tr>
<tr>
<td></td>
<td>(as in 14b)</td>
<td></td>
</tr>
</tbody>
</table>

The advantage of the prosodic word over the syllable as the domain over which the minimal domain specification is formulated is that the variety of enhancements we have found in our study could be accounted for, including both sign-internal (repetition, hold) and sign-external (light elements, non-manual) material. For instance, facial expressions would be hard to see as realisations of the movement unit ‘syllable’, but there would appear to be no reason to exclude them from generating a more abstract moraic unit to the post-lexical representation.

We therefore suggest that NGT has a phrase-final weight requirement that states that some domain above the syllable should be minimally trimoraic. In case of the enhancement of the lexical phonological material of a sign, this minimal domain could potentially be a trimoraic foot, but in cases where multiple lexical words are combined into a single phonological domain, the minimal domain has to be the prosodic word by its very definition: it is a lexical word plus any appended material from other (function) words. There is thus a need for a weight
unit ‘mora’, but it is only used in the creation of surface forms, and does not have a contrastive function in the lexicon.

This leaves open many questions that we are not able to answer at this moment, based on our data. First of all in our data we found not only alternations between pointing signs and enhanced realisations of the final lexical sign, but also cases where the lexical sign was followed by two light elements. In these ‘triple forms’ (such as shy PERSON PT in (9b) above) both light elements (PERSON and PT) cliticize to the final (monosyllabic) adjectival predicate (SHY). One possibility is that these ‘triple forms’ reflect a maximum weight of four moras. In principle the two light elements in the ‘triple forms’ (PERSON and PT in this case) could form a disyllabic foot if the final pronoun would be emphasised receiving an extra mora. However, this would leave the preceding bimoraic adjectival predicate defective again. How the prosodic structure of the final prosodic word fits in with the prosodic structure of the rest of the utterance can only be determined by a full prosodic analysis.

How the prosodic structure interacts with requirements of the syntactic or discourse structure is a second issue that future research will have to shed light on.

A third issue that will clearly need to be addressed is to which domain the minimal final prosodic word requirement actually applies. Throughout this paper we have followed Perlmutter’s wording of ‘phrase-final position’, but the prosodic hierarchy that forms the broader context for our work suggests at least two or three potential domains. Anything from the phonological phrase up to the utterance could be the relevant domain, in fact. As we have elicited isolated (complex) sentences, by looking at the sentence-final position we automatically look at the location where the right boundary of the utterance, the intonational phrase, and the phonological phrase overlap with the right edge of the final prosodic word. In the work of Wilbur, Sandler, and others, evidence for each of these domains has been found — although not all arguments have yet been applied to NGT. As the sentences we have looked at contained many prosodic words (i.e. lexical words plus any cliticized material on either side, cf. Sandler (1999)), it is unlikely that it is merely the right edge of prosodic words where the alternations take place. It may be the right alignment of the prosodic word to the higher-level prosodic domain that demands the minimal size requirement, which would most naturally be its parent domain, the phonological phrase. This would allow for an elegant analysis in terms of alignment constraints (e.g. Selkirk 2008).
6. Conclusions: Phrase-final position and prosodic weight in sign language

We have presented new empirical data on NGT on alternations of forms in phrase-final position that were interpreted as evidence for the role of prosodic weight in sign languages, cf. earlier studies on weight by Perlmutter (1992), Brentari (1998), and Miller (2000). The alternations show that in NGT there is no simple final lengthening process that can be formulated in terms of duration or even sequences of elements: both sequential and simultaneous properties of sign production contribute to weight. Moreover, the fact that this strengthening does not occur across the board for every sentence but is restricted to situations where there is a light element in final position. For this reason, we consider the processes to reflect the need for a prosodic word of a minimally trimoraic size. We conclude that our expectation that pointing signs are sometimes used as ‘fillers’ to arrive at a full prosodic form is confirmed, even though we have not yet arrived at a definite representation for the minimal weight requirement. Such an analysis should contain the specific prosodic domain involved, as well as the representation of weight for specific surface forms. We suggested that a more detailed metrical analysis of surface forms in the spirit of Miller (2004) will turn out be productive.

The resulting prosodic analysis of many pointing signs can help explain why pointing signs are so frequent sentence-finally, as our analysis of the Corpus NGT revealed, but it does not exclude the possibility that there are also syntactic motivations for (these or other) sentence-final pointing signs. However, once syntactic categories are phonologically realised, their syntactic properties are no longer ‘visible’ to the prosodic phonology. For this reason, our prosodic analysis holds for all types of final pointing signs in the specific prosodic context that we described, irrespective of their morphosyntactic nature or referential content.

In earlier work we found that the palm up sign is a light element in NGT that always occurs in phrase final position, and, if it is not a turn taking signal, is typically accompanied by non-manual signals for either modal meaning, other aspects of mood and modality, or some affective comment on the preceding sentence content. We therefore analysed palm up as pointer to the non-manual information (e.g. questions, modal meanings) in phrase-final position (van der Kooij, Crasborn & Ros 2006). Based on our finding that facial expression alternates with other light elements to jointly form a heavy final prosodic constituent of some type, we hypothesise that the palm up sign could well fill such a heavy position on its own, provided that there is sufficient non-manual activity to accompany it. This is a promising area for further research as well. Together with a metrical analysis targeted at answering the open questions (about domain size, metrical grids, the role of the foot, and alignment), this should deepen our general understanding of sign language prosody. Although the visual modality allows for the combination
of very different articulators such as the hands and the face in the articulation of a prosodically well-formed utterance, an analysis in terms of prosodic domains and weight shows how structurally similar sign and speech really are.

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References


On the weight of phrase-final prosodic words in a sign language


Appendix: Elicitation materials

1. Dit meisje weet dat die sinaasappels vies zijn.
   This girl knows that oranges are disgusting.
2. Deze jongen weet dat die man verlegen is.
   This boy knows that the man is shy.
3. Die vrouw weet dat deze collega vreemd is.
   That woman knows that this colleague is weird.
4. Dat meisje weet dat het boek moeilijk is.
   That girl knows that the book is difficult.
5. Deze leraar weet dat die jongen vreemd is.
   That teacher knows that the boy is weird.
6. Die rechter weet dat de jongen onschuldig is.
   That judge knows that the boy is innocent.
7. Die collega weet dat de lezing verwarrend is.
   That colleague knows that the lecture is confusing.
8. Die man weet dat winnen onmogelijk is.
   That man knows that winning is impossible.
9. Dat meisje weet dat de trui nat is.
   That girl knows that the sweater is wet.
10. Die vrouw weet dat alle mannen verschillend zijn.
    That woman knows that all men are different.
11. Die leraar weet dat wat de politicus zegt onzin is.
    That teacher knows that what the politician says is nonsense.
12. Die man weet dat vrouwen anders zijn.
    That man knows that women are different.
13. Die buurvrouw weet dat die man mij bezoekt.
    That neighbour knows that that man visits me.
14. Die postbode weet dat die vrouw jou bezoekt.
    The postman knows that that woman visits you.
15. De kapper weet dat zijn moeder hem bezoekt.
    The hairdresser knows that his mother visits him.
16. Dat meisje ziet de man lopen.
    That girl sees a man walking.
17. Die jongen ziet de vrouw snel lopen.
    That boy sees a woman walking fast.
18. Die vrouw ziet haar collega op zijn gemak lopen.
    That woman sees her colleague walking at ease.
19. Die professor ziet de student snel een boek lezen.
    That professor sees the student read a book fast.
20. Die postbode ziet de kapper aandachtig lezen.
    The postman sees the hairdresser read carefully.
    That man sees the girl read [a text].

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