Nonmanual clash of the lower face nonmanuals in American Sign Language

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Abstract

Nonmanuals in American Sign Language (ASL) provide syntactic, lexical, prosodic, and affective information. While, in general, nonmanuals with different functions are expressed through different articulatory channels, allowing them to be layered and produced simultaneously, there are nonmanuals with different functions that involve the same articulator. Since a given articulator cannot be used in two ways at once, we have the potential for what I am calling, in this context, a “clash”. The simultaneous articulation of certain nonmanuals of the lower face, those that are modifiers or obligatory parts of lexical items, has the potential to result in a clash. I present the theoretical potential for this particular clash, detailing the forms in which it can theoretically appear. This clash and its resolution are then examined in a pilot study, conducted with a native signer. In the pilot study, the signer used four methods to avoid or resolve a clash: a verb-sandwich construction, displacement of the lexical nonmanual, dropping of the lexical nonmanual and paraphrase of the elicited sentence. These methods are examined within the framework of autosegmental phonology, while compared to similar processes in tone languages.
1 Introduction

Nonmanuals are the parts of sign languages that are not expressed with the manual articulators, which comprise the upper limbs. The nonmanuals, instead, are articulated with the torso, head, and parts of the face (Pfau & Quer 2010). While nonmanuals of different types are largely separated into different articulatory channels, allowing them to be layered and produced simultaneously, there are nonmanuals involving the same articulator that, if articulated simultaneously, result in clash. This thesis will address this clash in the nonmanuals articulated in the lower face in American Sign Language (ASL).

Nonmanual clash is a little-studied aspect of sign languages and has only been touched upon briefly (Aarons 1994: Bickford & Fraychineaud 2006). Clash within the nonmanuals of the lower face can occur between nonmanuals that are included as obligatory parts of lexical items and morphological nonmanuals that modify signs. This is an area in which little work has been done and a topic that has never been addressed explicitly for ASL. In this thesis I address the theoretical background for this clash and report on an original pilot study I conducted with a native signer of ASL.

In §2, I provide an overview of the articulation and range of types of nonmanuals in ASL. §3 describes feature clash, introducing the term and its previous uses, its application to ASL, and previous work done on the topic. In §4, I detail the methods used in the pilot study and the results of the study. The pilot study reveals four methods that are potentially used to avoid clash: verb-sandwich constructions, displacement of the lexical nonmanual, dropping of the lexical nonmanual, and paraphrasing of the elicited sentence. In §5, I present an analysis of these results. Two of the methods used to avoid clash, the dropping of the obligatory nonmanual and the displacement of the lexical nonmanual, are similar to processes used in tone languages. In these
languages, floating tones can dock onto adjacent segments, displacing lexical tones. These processes, in both ASL and these tone languages, can be analyzed through the framework of autosegmental phonology. Concluding remarks and further avenues for research are discussed in §6.

2 Background
While manual signs make up most of the lexicon of sign languages, nonmanuals of a wide range of types form an integral part of the grammar in ASL. Nonmanuals are articulated through a number of articulatory channels that group together. Due to the modality of sign languages, layered constructions involving nonmanuals are often employed, where nonmanuals are layered with both manual and nonmanual markers. Layering, in this context, applies to the simultaneous use of different articulators to provide different information (Wilbur 2000). An extensive discussion of layering can be found in §2.2. Within these, I focus on the nonmanuals articulated in the lower face, examining two types of nonmanuals articulated with the lower face articulators.

2.1 The phonological construction of signs
In sign languages, signs are made up of multiple parameters that distinguish signs from one another. These are the location, movement, handshape, orientation, and nonmanual parameters (Valli & Lucas 2000). The signs FATHER and MOTHER, as seen in (1.) and (2.) demonstrate how a difference in a parameter can result in two different signs. MOTHER and FATHER have the same handshape, orientation, and movement parameters, differing only in their location. The location of the sign FATHER is on the forehead, while the location of MOTHER is on the chin.
Handshape, movement, and orientation are similarly distinctive. The nonmanual parameter can also distinguish signs from one another. This can be seen in the minimal pair LATE (3.) and NOT-YET (4.), both of which involve the same manual parameters, but one of which, NOT-YET, also requires a nonmanual. This nonmanual is articulated with a slack tongue, with the blade of the tongue visible (Neidle et al. 2000).

The line above NOT-YET (4.) indicates the scope of the nonmanual articulation, which spreads over the entire manual movement, and which will be referred to here as slack tongue (“st”).
2.2 The articulation and different types of nonmanuals

Nonmanuals are articulated with the head, torso, and parts of the face (Pfau and Quer 2010). In ASL, nonmanuals can be loan elements from the surrounding spoken language, or grammaticalized gestures that play a part in the grammatical system of the sign language (Herrmann & Steinbach 2013). The nonmanual ‘fish’, which accompanies the sign FINISH, is an example of a loan element from English into ASL (5.), while a grammaticalized gesture can be seen in the head shaking that accompanies negation.
While this paper involves only the analysis of linguistic nonmanuals, the same articulators are used for affective purposes, such as the furrowed eyebrows (6.) associated with anger (de Vos, van der Kooij, & Crasborn 2009). Affective uses of these articulators can include facial expressions and movements of the head, which convey emotions such as surprise or disgust (Pfau & Quer 2010).

(6.)

Affective furrowed brows made with anger (de Vos, van der Kooij, & Crasborn 2009:317)

While linguistic and affective nonmanuals use the same articulators, they can be differentiated in a number of ways. Linguistic nonmanuals have clear onsets and offsets, occurring consistently in parallel with syntactic constituents, while affective nonmanuals do neither (Herrmann & Steinbach 2013). For example, the raised eyebrows that indicate a yes/no question in ASL are articulated over the entire question. The scope of the yes/no question can be seen in (7.), where the line above the utterance indicates the scope of the raised eyebrows nonmanual ("re"). Raised eyebrows, as an affective nonmanual, can optionally accompany the sign SURPRISE, but are not required.

(7.)

re
WOMAN FORGET PURSE
'Did the woman forget the purse?'
(Pfau & Quer 2010:389)
Affective nonmanuals can vary in their scope. In the sentence \textit{I HIM DISLIKE}, \textit{`I don't like him'}, the use of wrinkled nose (``\text{wn}''), accompanying the emotion of disgust or dislike, is optional. If articulated, it can be included over the entire sentence, over DISLIKE, or over HIM DISLIKE (8a-c.).

\begin{enumerate}
\item a. \text{wn} \\
\item b. \text{wn} \\
\item c. \text{wn} \\
\end{enumerate}

``\text{I don't like him}''

In addition, there are differences in the facial muscles used between the two and they are processed in different hemispheres of the brain, with linguistic nonmanuals processed in the left hemisphere and affective nonmanual articulations processed in the right hemisphere (Neidle, Kegl, MacLaughlin, Bahan, & Lee 2000).

Each nonmanual articulator has multiple movements and configurations available to it. The size of these movements can differ within each articulator. The torso can be used in leans, either forward and backward or side-to-side. For example, the sign for \textit{AVOID} includes a slight backward lean and the sign \textit{ENCOURAGE} often involves a forward lean (Pfau and Quer 2010). Leans to the side are involved in role shifting, when a signer shifts between perspectives. The head can articulate head tilts and thrusts, which involve fixed positions of the head, as well as nods and shakes of the head.

\begin{enumerate}
\item a.
\item b.
\item c.
\end{enumerate}

\textit{SLEEP in Italian Sign Language (LIS)}

(\textit{Spreadthesign 2012})
This can be seen in a number of sign languages, where a head tilt accompanies the sign for SLEEP (9.), as one or both hands are brought to the side of the head. Headshakes and nods are associated with negation and affirmation respectively (Pfau & Quer 2010).

Within the range of the face, the nose, eyes, and mouth can be employed in a variety of configurations. Within the eyes, gaze can shift and eyes blink, while the brows can raise, lower, and remain in a neutral position. Shifts in eye gaze can be used in ASL to indicate verb agreement with the object of the verb. Eye blinks are used to mark the edges of Intonational Phrases, often providing information about constituent structures (Wilbur 2000). The mouth has a wide range of movements available to it, as several dozen configurations of the mouth, involving the lips, teeth, tongue, and cheeks, have been identified, each with a number of possibilities for articulation. For example, puffed-cheeks (10.) can indicate something described as puffed or fat. To indicate that something is close or near, in addition to tensing the shoulders and raising the dominant shoulder, there is an obligatory mouth configuration. The mouth configuration involves the lips spread and tensed, with the jaw closed (11.).

(10) ‘fat legs walking’ (Bickford & Fraychineaud 2006:35)  
(11) NEXT-TO (Bickford & Fraychineaud 2006:42)
The 'lalala' nonmanual (12.), articulated with the tongue wagging up and down, is used as an intensifier with a small set of lexical items, including LOOK, HELLO, and LATER (Struxness 1996).

(12.)

'la-la-la' nonmanual
(Struxness & Marable 2013:124)

The modifier 'oo', articulated with the mouth slightly open and the corners of the lips in, indicates that something is small or skinny, as seen on the string classifier in (13.). Although the nose has been largely overlooked in research on sign languages, nose crinkling and wrinkling have been shown to have functions within discourse, indicating specificity when making reference to a known, specific object at a specific place and time (Wilbur 2000).

(13.)

STRING_{CL}
Nonmanuals play prosodic, syntactic, lexical, and morphological roles in ASL. Within the syntax of ASL, nonmanuals act as domain markers, marking questions, negation, topics, conditional clauses, and relative clauses (Aarons 1994). Negation is sensitive to scope, as, in negative constructions, the nonmanual marking can spread over the negated domain. When an overt manual sign is not used to mark negation, the nonmanual, articulated with a headshake ("hs") and furrowed eyebrows ("fb"), must spread over the entire domain of the negated constituent (14.).

\[
\begin{array}{c}
\text{fb} \\
\text{hs} \\
\text{J-O-H-N BUY HOUSE}
\end{array}
\]

'John is not buying a house'

(Neidle et al. 2000:45)

Nonmanuals can mark agreement and play a role in marking prosodic structures. This is shown by the use of eye gaze to mark object agreement and head tilt to mark subject agreement (Wilbur 2000). Eye blinks, as mentioned above, are claimed to have a role in marking prosodic structures, such as Intonational Phrases. In addition, within the realm of morphology, nonmanuals function as modifiers, a discussion of which can be seen in §2.4. Lastly, nonmanuals play a small role in the lexicon, as an intrinsic part of certain lexical items (Liddell 2003).

2.3 Layering

Sign languages and spoken languages, in addition to differing in modality, differ in their use of simultaneous and sequential transmission strategies. In spoken languages, information is transmitted largely sequentially. Sign languages heavily employ the use of simultaneous constructions, which, according to one theory, is a way of saving time; the need to save time is due to the use of larger muscles, which have a slower rate of production than spoken languages.
(Wilbur 2009). It should be noted that, in the context of this paper, when layering is discussed, it applies to when different articulators are used to express different information. The term layering can also be used to discuss the simultaneous presence of the phonological aspects of each sign (Vermeerbergen et al, 2007). The handshape, orientation, location, and movement of a sign all occur simultaneously and differentiate signs from one another, but, as these individual parts do not themselves convey any information on their own, this will not be considered layering here.

In ASL, layered constructions are frequently used. As noted by Wilbur, “with respect to layering, we noted that in ASL, each productive phonological element has the potential to contribute meaning to a larger grammatical unit (word, phrase, sentence) in a layered construction in such a way that co-occurring elements do not obscure or interfere with each other” (Wilbur 2000:216). Wilbur speaks of the nonmanuals as being articulated through a number of channels, which are independent of each other. This is what allows for the layering of nonmanuals without nonmanuals interfering with one another, as these channels are also largely separated in their uses within prosody, morphology, and syntax. These channels are: “head position, body position, eyebrow and forehead position, eye gaze, nose position, and mouth, tongue, and cheek” (Wilbur 2000:223).

In terms of function, nonmanuals are generally grouped into two groups, divided into the lower and upper face. According to Wilbur (2000), the lower part of the face is primarily used for modifiers, while the upper part of the face is used to mark higher syntactic constituents. The upper face, head, and body have syntactic and prosodic functions, and can be layered with one another. An example of layering can be seen in (15.).
(15.)

\[ \text{q} \quad \text{mmm} \]

\[
\text{MAN FISH}[\text{I: continuous}]
\]

‘Is the man fishing with relaxation and enjoyment?’

(Wilbur 2000:226)

In (15.), “q” stands for the yes/no question articulation, which involves the raising of the eyebrows. The line indicates the scope of the articulation, in this case extending over MAN and FISH. The ‘mmm’, articulated with the lips closed and protruding (unrounded), is articulated over FISH. The simultaneous use of different articulators, each providing additional information, is a common feature of sign languages.

2.4 Lower face nonmanuals in ASL

Two kinds of lower face nonmanuals are specifically addressed here, lexical nonmanuals and nonmanual modifiers. The lower face, in this context, applies to the mouth, cheeks, and nose, although the nose is not addressed in this analysis.

Lexical nonmanuals, also known as phonological nonmanuals, are obligatory parts of lexical items, without which they would be incomplete (Pfau & Quer 2010). Signs with obligatory nonmanuals make up a small portion of the ASL lexicon (Liddell 2003). An example can be seen in (16.), where the sign SUCCESS includes a nonmanual in its lexical entry. The sign SUCCESS includes the obligatory nonmanual ‘pah’ ([pa]) (Bickford & Fraychineaud 2006).
These nonmanuals are included in every context – including questions, negation, exclamations, and topics. While Liddell recognizes these nonmanuals as obligatory parts of certain lexical items, he cites an older study that gives “evidence for a historical shift away from the use of nonmanual activities in the citation form of ASL signs toward a concentration of lexical information in the hands” (1980:17). While this may be the case, there are still lexical items recognized as having an obligatory nonmanual (Liddell 2003). A list of lexical items that include an obligatory nonmanual can be found in the appendix (§7.1). Following are two additional examples of signs with lexical nonmanuals.

The sign TORMENT is articulated with squared lips (“sl”).
Another set of nonmanuals articulated in the lower face are modifiers. These are termed “mouth morphemes” by Bickford & Fraychineaud (2006), who define them as the “use of the mouth as an independent morpheme which combines with a variety of manual signs” (33). While, in the literature, these are referred to as adjectival and adverbial morphemes, here they will be referred to as nonmanual modifiers. Nonmanual modifiers are articulated with movements of the mouth, tongue, and cheeks. These appear as independent nonmanuals that co-occur with a manual (Neidle et al. 2006). An example of a nonmanual modifier is the “th” ([θ]) nonmanual, which indicates that an action is done carelessly (19.). It is articulated with the mouth slightly open, with the tongue protruding slightly through the teeth, often with the head tilted to one side (Lifeprint 1997). This is also known to be articulated with the tongue off to one side. Considering that the tongue is a part of the head, this articulation of the sign is comparable to distalization, as discussed in Napoli, Sanders, and Wright (2014), as moving the tongue to the side is a smaller movement than articulating a head tilt, thus requiring less total effort to articulate.
Some of these modifiers are limited to only modifying certain items, while others can be used more freely, modifying all items within certain syntactic or semantic contexts. An example of this is the ‘sta-sta’ nonmanual, which can only accompany signs with cyclical movement (Bickford & Fraychineaud 2006). In spoken languages, the prosodic structure of a word can influence what morphemes can modify it. An example of this is the –er comparative morpheme in English, which can only apply to words that have one or two moras (O’Grady, Archibald, Aronoff, & Rees-Miller 1996). In the same way, some nonmanuals, like ‘sta-sta’, can only modify signs with a certain prosodic structure. This ties into a phenomenon in sign languages called Echo Phonology. Echo phonology applies to signs and nonmanuals which both involve movement, wherein the non-manual movement is executed in parallel with the path movement of the sign (Pfau & Quer 2010).

3 Potential for clash

Potential clash occurs when two nonmanual parameters compete for the same articulator. The two types of nonmanuals outlined in the previous section have the potential to result in a clash if
articulated simultaneously, as the mouth is required to articulate two different configurations at one time. Nonmanuals of the lower face were chosen due to their potential to produce clashing constructions and their possibility for elicitation, in a way that constructions involving body-leans and gaze-shifts could not.

3.1 Terminology

Phonological clash is recognized as a phenomenon that occurs in spoken languages. The term ‘clash’ was first used in phonology to indicate a stress clash in speech. It is used largely in metrical phonology. A ‘stress clash’ occurs when two stressed syllables are too close to one another. A stress shift, typically a retraction in English, results through the application of rules such as the Rhythm Rule of English (Hayes 1984). This term has not been used when discussing phonological clashes in sign languages nor have I seen this term applied to the phenomenon I examine in this thesis.

The term ‘conflict’ has been used when discussing the simultaneous articulation of nonmanuals involving the same articulator and has appeared in the literature on sign languages. It can be seen in the context of conflict between affective and linguistic uses of the eyebrows in Sign Language of the Netherlands, where this referred to as “anatomically conflicting” (de Vos, van der Kooij, & Crasborn 2009). As this is a little-studied phenomenon, neither ‘conflict’ nor ‘clash’ has been used a great amount in the literature on sign languages. In the context of this analysis, the term ‘clash’ will be used because of its history of use in previous discussions of phonology and its wider applicability to the field.
3.2 Previous work on clashing constructions in ASL

Two authors have discussed constructions in ASL involving co-occurring linguistic nonmanuals that use the same articulator. In a discussion of +Wh questions and topic marking, Aarons (1994) notes the potential for +Wh words in a sentence initial position to bear topic marking. While typically, +Wh questions are marked with eyebrow lowering and topics marked with eyebrow raising, they co-occur “by a raising of the brow, at the same time as a narrowing of the eyes and the tilt of the head that is normally associated with wh- marking” (Aarons 1994:125). This shows an instance in which nonmanuals that usually use the same articulators overlap and combine. This can be found in the sentence given in (20).

(20)

\[ \text{WHO} \quad \text{MARY LOVE} \quad \text{WHO} \]

(Aarons 1994:123)

The name Mary, in the example provided by Aarons (1994) is fingerspelled (usually indicated in glosses with M-A-R-Y). While the topicalized WHO is articulated with nonmanuals corresponding to both topic marking and +Wh questions, the nonmanual marking for WHO at the end of the sentence is articulated with the nonmanuals typically associated with +Wh questions, with lowered brows and a tilted head.

Another instance of co-occurring nonmanuals that involve the same articulator can be seen in Bickford and Fraychineaud’s (2006) investigation into mouth morphemes, which claims that certain mouth morphemes can be combined. The examples given include the combination of modifiers, as well as the combination of a modifier and a lexical nonmanual. One of the combinations given combines ‘mm’ (as expected) with puffed-cheeks, (large), resulting in “large, but as expected” (Bickford & Fraychineaud 2006:36). Another combination, one which
involves a lexical nonmanual and a modifier, has the modifier infixed within the lexical nonmanual. In this case, the ‘fsh’ nonmanual of FINISH is combined with what is termed ‘la-la-la’, involving the tongue moving up and down repeatedly. The ‘la-la-la’ nonmanual is an intensifier that accompanies a number of signs including LOOK, HELLO, and FAR-AWAY. The combination is formed with the [f] and [l] articulated surrounding the ‘la-la-la’ nonmanual. This combination means ‘finish finally after a long time’ (Struxness 1996). It should be noted that the ‘la-la-la’ nonmanual is not used for this purpose by all signers, but is used, at least, in some regions of the United States (Gene Mirus, personal communication, October 2015).

In describing mouth morphemes, Bickford and Fraychineaud (2006) also note that some, but not all, of these can be combined. This could be seen in the impossible combination of puffed-cheeks and squared lips. This combination is impossible to articulate because, with the lips spread open, the air kept in the cheeks would escape. Thus, the articulators limit what kinds of combinations are allowed. An extensive analysis of these combinations can be found in §5.5.

### 3.3 Clashing constructions

A clash can occur in constructions in which a lexical nonmanual is produced simultaneously with a nonmanual modifier, as a result of the mouth being unable to articulate two different configurations at one time. To exemplify this, I detail two combinations in which this might occur.

The simultaneous articulation of CARELESSLY, as seen in (21.) over DRIVE, and TORMENT (22.) has the potential to result in clash. The combination would require the signer to protrude the tongue through the teeth, for the modifier CARELESSLY, and to articulate the squared lips and bared teeth required as part of TORMENT. Because, to articulate TORMENT, the jaw is
closed, it would appear impossible to also protrude the tongue for CARELESSLY without altering the lexical nonmanual.

(21.)

DRIVE
'drive carelessly'

(22.)

TORMENT

The combination of the signs BIG and BALLOON also has the potential to result in clash. If the large size is indicated through the use of the nonmanual 'cha' (23.), it requires the jaw to begin closed with the teeth visible, then to quickly open. This, in theory, would be signed simultaneously with BALLOON (24.). BALLOON requires the lips to be closed and the cheeks puffed. The cheeks cannot keep air in them, as required for the puffed-cheeks nonmanual, if they are spread open, as required for 'cha', These combinations appear impossible and, thus, I expected that signers would use some method to avoid the clash.

(23.)

cha
BOX
'big box'
Given the examples above, I postulated that signers would, instead of signing clashing constructions simultaneously, produce the nonmanuals sequentially to avoid the clash. Given the constructions seen in Bickford & Fraychineaud (2006) and Aarons (1994), combining the two nonmanuals also appeared to be a possible way to accommodate these constructions.

4 Pilot study

To discern what signers do to avoid this clash, I conducted a pilot study that involved eliciting clashing constructions from a native signer. Following this, I then discussed these constructions, and possible avoidance methods, with my consultant. The results reveal four methods that are used to include all of the information elicited, while avoiding clash.

4.1 Methodology

To participate in the pilot study, the signer was required to be a native signer who either acquired ASL before the age of five or a deaf signer who uses ASL as their primary and preferred mode of communication. The study was designed to have two parts. In the first, the signer was asked to sign a list of sentences provided. In the second part of the consultation session, after eliciting constructions from the signer, they were debriefed as to the purpose of the study and asked if
they could provide their insights into the constructions used. Before elicitation, the signer was not informed of the focus of the study, to avoid potentially biasing responses.

The first part of the consultation session involved elicitation. Constructions that included the nonmanual clash were elicited by asking the participant to sign sentences provided in written English. Data elicited in this manner, using written English, has the potential to influence the structure of the data produced (Perniss 2015). This was a necessary risk, due to the difficulty in eliciting these constructions, which are attached to specific lexical items. Each item targeted was also elicited in a sentence without other nonmanuals, to check if the signer used the form that I was targeting.

The sentences that included a potential clash were interspersed with distractor sentences, which included none of the nonmanuals that were the target of the study. The two first sentences were also distractors, as the first couple sentences are generally not considered for analysis, in an effort to get data that is as natural as possible. A total of thirty sentences were elicited, thirteen of which involved clashing constructions. The sta-sta nonmanual could only be included once in this set of clashing constructions, because it could only modify TORMENT, the only sign with cyclical movement included in the pilot study. These sentences were randomized. This randomized list was tweaked to ensure no two sentences eliciting a conflict followed one another. A full list of the sentences used in the pilot study can be found in the appendix (§7.3).

Following elicitation, the signer was debriefed as to the exact focus of the study. She was then asked if she consciously noticed the clash and, if so, asked if there was a method she used to avoid it. This is adapted from a method of gathering data called Think Aloud Protocol, which was originally used to study how people solve problems by having them think aloud (van Someren et al. 1994). For a discussion of the uses of this protocol in studies on sign languages
see Napoli, Fisher, & Mirus (2013). This method is helpful because it potentially provides additional insights into the processes the signers went through when encountering the clash and how they got around it. The signer was also asked if she could think of any additional lexical items with an obligatory nonmanual, due to their limited number, and give any opinions on the structure of the study itself for possible use in future investigations. The signer in the pilot study is both a teacher of ASL and a sociologist of language, which promised fruitful insights.

The video data was tagged using a computer program called ELAN, which is commonly used in research on sign languages. ELAN can be used to view videos and recordings frame by frame, and annotate these in tiers, facilitating the annotation of layered constructions in sign languages (Pemiss 2015). For the purposes of this study, each utterance was tagged and each targeted item was marked. Each relevant nonmanual as well as any other co-occurring nonmanuals were noted, as well as any variations in their articulation. The absence of targeted nonmanuals was also recorded.

4.2 Results

The following results are from a consultation session with a single signer, who is a native signer from the Philadelphia area. The signer employed four methods to express all of the information elicited, while avoiding clash. The methods used are a sandwich construction, the displacement of the lexical nonmanual to accommodate the modifier, the dropping of the lexical nonmanual to accommodate the modifier, and paraphrase.

4.2.1 Verb sandwiches

One method employed was the sequential articulation of the nonmanuals through the use of a sandwich construction. In this construction, the lexical item retained its obligatory nonmanual,
but the modifying nonmanual was articulated with both of the verbs surrounding the lexical nonmanual. Verb sandwiches are constructions in ASL where the verb appears in two places, first in its sentence internal position, then in a sentence final position. For an extensive discussion of this construction, see Sandler and Lillo-Martin (2006). This occurred in the construction resulting from the elicited sentence, “The woman worked and worked all afternoon. She was wound up – stressed. So she finished intensely, not in a relaxed way.”

In this case, as can be seen in (27.) and (28.), the lexical nonmanual ‘fsh’ was articulated simultaneously with the manual movement of FINISH. Both before and after FINISH, the signer used the sign WORK, which was articulated simultaneously with the ‘oo’ nonmanual. The signer used the ‘oo’ nonmanual, which, in addition to its use denoting small size, can be used to indicate that something is done intensely, though to a lesser degree than the nonmanual included with INTENSELY at the end of this document. (Bickford & Fraychineaud 2006). In this case, it is impossible to tell whether the signer used this construction to avoid the clash, or as an alternate interpretation of the elicited sentence.

(27.)

\[
\begin{align*}
\text{oo} & \quad \text{fsh} & \quad \text{oo} \\
\text{WORK} & \quad \text{FINISH} & \quad \text{WORK}
\end{align*}
\]

‘Intensely finished working’

(28.)
This being said, the signer mentioned that, in the moments when she consciously realized she could not produce the nonmanuals at the same time, she intentionally included them sequentially. It is important to note that the signer in the pilot study is not a naïve signer, as she works at a university and teaches languages courses on ASL. This may contribute to an increased level of awareness of the processes being elicited.

4.2.2 Lexical nonmanual movement

In one case, the nonmanual associated with the lexical item appeared on a neighboring manual item, while the modifying nonmanual was articulated simultaneously with the lexical item being modified (29.). In this construction, in addition to BALLOON, the signer used two classifiers, one tracing the string of the balloon, and the other encompassing the entire balloon as it floated between children. The manual parameters of BALLOON were articulated along with the modifying ‘00’ nonmanual, indicating the small size of the balloon. The puffed-cheeks of BALLOON were then articulated with the STRING classifier. In this construction, the modifying nonmanual, ‘00’, appeared twice, on either side of the lexical nonmanual, modifying both BALLOON and the floating balloon classifier.

(29.)
\[
\text{oo} \quad \text{puff} \quad \text{oo} \quad \text{FLOAT} \\
\text{BALLOON}_{ct} \\
\text{BALLOON STRING}_{ct}
\]

‘small balloon moves [between children]’

From the elicited sentence “The group of children played with a small balloon”
4.2.3 Nonmanual drop

Another method employed dropped the lexical nonmanual to accommodate the modifier. In (30.) SUCCESS is signed along with the ‘mm’ modifier and the head is tilted back and to the side (‘ht’). While the signer did not use the target modifier ‘oo’, instead using one similar to ‘mm’, the ‘pah’ nonmanual included with SUCCESS was left out. When SUCCESS was elicited without another nonmanual present, the ‘pah’ nonmanual was included along with the manual component.

(30.)

ht    mm
MONEY RAISE SUCCESS
‘The fundraiser was a moderate success’
From the elicited sentence “The fundraiser was a small success”
4.2.4 Paraphrase

The signer used a method that here will be termed paraphrase, using different lexical items, modifiers, or both, from the forms targeted. This can be seen in the construction resulting from the elicited sentence: “The girl’s father wanted to give her a present. He blew up a big balloon for her” (25.). In this case, the large size of the balloon was indicated by the increased size of the movement parameter of the sign. The obligatory nonmanual for the lexical item BALLOON, puffed-cheeks, remained. When ‘big’ was elicited before, ‘cha’ was used, indicating perhaps that this method of showing the size of the balloon by increasing the size of the movement parameter instead was used intentionally to avoid clash. The same method was used in another potentially clashing construction, trying to elicit BIG and SUCCESS. In this instance, the movement produced by the signer was larger than that used without the modifier and the nonmanual, ‘pah’, was also exaggerated, with the mouth opening to a larger degree.

(25.)

puff-cheeks
BALLOON
‘big balloon’
In a number of the other sentences meant to elicit a clash, the signer phrased the utterance using lexical items or modifiers that were not those targeted in the elicitation, or phrased it in such a way so as to avoid using one or both of the targeted items. For example, the modifier WITH-PLEASURE was always articulated including a manual (26.), as well as a nonmanual, thus avoiding clash each time it was used in an utterance. This was the most common method used in the potentially clashing constructions elicited.

(26.)

5 Analysis
Some of these methods used to avoid clash can be explained as phonological processes similar to those seen in tone languages, while others are less clear, due to the amount of data collected and the data collection method employed. The example that most clearly draws a parallel to processes seen in other languages, which have been analyzed through the use of autosegmental phonology, appears in the construction where an obligatory lexical nonmanual is displaced. The exclusion of lexical nonmanuals may also have parallels to some lexical tone languages, which exhibit a similar pattern. The paraphrasing of certain constructions assists in confirming that these clashing constructions are problematic for signers.
5.1 Verb Sandwiches

Verb sandwiches are one construction that result from the impossibility of articulating two configurations of the mouth at the same time. As each lexical item cannot hold more than one nonmanual, the other nonmanual has to be articulated elsewhere, if the lexical nonmanual is not moved. The adjacent manual segments, if they do not already host a nonmanual, are a place where this nonmanual can be articulated. In the pilot study, the signer used a verb sandwich construction. It has been suggested that verb sandwich constructions emerge due to a constraint on how much information a single verb can carry. Sandwich constructions often include verbs carrying morphology other than aspect (Sandler and Lillo-Martin, 2006). Typically, the first verb in this construction is uninflected, while the second carries additional morphological information (Brentari 2002). The verb sandwich produced in the pilot study can be seen in (32.).

(32.)
\[
\text{00 fsh 00}
\]
\[
\text{WORK FINISH WORK}
\]

*Intensely finished working*

In the elicited construction from the pilot study, however, both verbs were inflected, as a nonmanual modified WORK each time it was used in the sandwich construction. The consultant in the pilot study suggested that, since the clashing nonmanuals could not be articulated simultaneously, they could be articulated sequentially, and the verb carrying one of the modifiers could be articulated twice to indicate temporal simultaneity. This was explained as, in generalized terms: X is happening, Y happens, X is still happening. The verb sandwich, with both of the verbs surrounding the lexical item modified, appears to be a potential way that the signer avoided clash, while retaining the meaning of the elicited sentence.
5.2 Tone docking

Within autosegmental phonology, features can be detached from a segment, then can float and dock onto the nearest available host segment. Goldsmith (1976) introduced autosegmental phonology as a framework that can model tonal segments acting separately from vowel and consonant segments. This framework has commonly been used in analyzing the movement of tones in tone languages and accounts for the spreading of phonological features at a distance. The framework also proves useful in analyzing nonmanuals, revealing parallels to the behavior of tones in lexical tone languages. Nonmanuals will then, like tones, be treated as autosegmental parameters in this analysis. In this framework, linear segments are represented through different tiers, which are separate, but linked to one another with association lines.

The nonmanual floating and docking process that occurs in ASL is compared to a similar process in the tone language Ga’anda. This process is first explained in Ga’anda, then in ASL, through the construction produced in the pilot study. The two are then compared side by side.

5.2.1 Tone Docking in Ga’anda

Ga’anda, a Chadic language, has a process that closely parallels that seen in ASL. Ga’anda, like many of the Bantu languages, has lexical tone. Ga’anda has three tones and a downstep, though the downstep is not used in distinguishing words from one another. These are the high tone (H), low tone (L), mid tone (M), and the downstep, also called reduce-high (!H) (Comrie 1989).

Ga’anda has an underlying floating tone that marks associative constructions. This tone has no phonetic mooring until it docks onto a right-adjacent vowel segment. If the segment to the right of this tone already has a lexical tone, the floating tone displaces the lexical tone. The displaced tone then docks onto the segment to its right, spreading its features. This can be seen
in (34.). The high floating tone docks onto the first vowel of *puno*, displacing the lexical mid tone. The displaced mid tone docks onto the following vowel, which already has a high tone. This tone is then realized in the surface representation as a downstep high tone (Chen 2004).

| (33.) a. bar  | M  | M H | M H M H |
|             | ‘bark’ | ‘maize’ | ‘husk of maize’ |

(Chen 2004:37)

Tone morphemes are attested in many of the world’s languages. These are often analyzed through autosegmental phonology as floating morphemes, although they do not always result in displacement. Floating tones and lexical tone displacement, acting in processes similar to the one presented here, are both seen in a number of the Bantu languages (Chen 2004).

5.2.2 Nonmanual docking in ASL

A similar, although not completely parallel, analysis involving the floating and docking of autosegmental parameters can be applied to the ASL data collected. These processes differ in that, while the displacement of the nonmanual is driven by clash, the tone displacement is driven by a floating tone. In both, the dissociation of nonmanuals and tones from one segment is followed by their association with another. In (35.), the lexical nonmanual is displaced by the modifying nonmanual. The sandwich construction given in §5.1 shows that the modifying nonmanual does not have to displace the lexical nonmanual, but (35.), below, indicates that this is a possibility.
In an autosegmental analysis, the nonmanual parameters will be treated as segments in their own tier, above that of the manual segments. The ‘oo’ nonmanual is a parameter, much like the associative floating high tone of Ga’anda, which has to dock onto an adjacent host. When the ‘oo’ nonmanual docks onto BALLOON, the puffed-cheeks nonmanual is displaced onto the following segment, the string classifier. The ‘oo’ nonmanual modifier typically articulated with the string classifier (see (13.)) is then displaced onto the following segment. This is shown in (36.).

It appears that this is one of the ways in which the signer avoids clash, with the lexical nonmanual being displaced from the associated manual segment by the modifying nonmanual and docking onto the nearest manual segment.
4.2.3 A comparison of Ga’anda and ASL

When this process is seen side by side with that in Ga’anda, ((37.) and (38.)), it appears a similar process, driven by a morphological modifier, occurs. Although similar, these processes are not exactly the same, as manual segments in ASL cannot, even underlyingly, like Ga’anda, have two nonmanuals over one of them. This forces the ‘oo’ nonmanual underlyingly associated with the string classifier to dock onto the following segment. In contrast, in Ga’anda, the mid and high tones, which are both over the o of puno, are realized as a downstep.

(37.) ‘oo’ Puffed-cheeks oo

(38.) M H M H

This comparison, in addition to revealing parallel processes in spoken and sign languages, supports the treatment of nonmanuals as auto-segments on their own tier.

5.3 Nonmanual dropping

The dropping of a nonmanual (39.) was perhaps the most unexpected method used to avoid clash, as it implies that the nonmanual is not required in all situations. This may indicate solely that, at least for the signer, this nonmanual is not an obligatory part of this sign and is instead optional, perhaps used for emphatic purposes or redundancy. As this only happened once in the data, it remains unclear.

(39.)

MONEY RAISE SUCCESS
'The fundraiser was a moderate success'
While this may be the case, the replacement of a lexical nonmanual does appear similar to a process in tone languages, if the nonmanual included with SUCCESS is obligatory for the signer consulted in the pilot study. In a number of tone languages that have lexical tone, the lexical tone can be replaced by another tone due to a morphological process. This is attested in the language Hausa, another Chadic, lexical tone language (Inkelas 2014). In Hausa, the imperative requires a low-high tone pattern, regardless of the original, lexical tones (40.).

\[
\begin{align*}
\text{kårmå:} & \rightarrow \text{kårmå:} \quad \text{‘catch (!)’} \\
\text{binciké:} & \rightarrow \text{binciké:} \quad \text{‘investigate (!)’}
\end{align*}
\]

(Inkelas 2014:202)

In this case, the lexical tones are simply replaced by others to form the imperative. The dropping of a nonmanual is then not unreasonable when compared to the replacement of lexical tone, which is attested in a number of languages (Inkelas 2014).

5.4 Instances of Paraphrase

In the case that a modifier was articulated with only one of the nonmanual items targeted, or simply that a sentence used different lexical items and modifiers entirely, it is unclear whether this was done to avoid the clashing nonmanuals or if it was simply how the signer decided to interpret the sentence elicited. Two of these paraphrases of clashing constructions did employ a similar method. These were BIG SUCCESS and BIG BALLOON. In both cases, ‘cha’ was not used to indicate the large size of the modified item. Instead, the signer exaggerated the size of both the manual movement parameter and the size of the nonmanual. The consultant in the pilot study indicated that it would be strange to indicate the size of the balloon with ‘cha,’ when changing
the size of the sign can show its large size. Given the limited set of data collected, it is difficult to
draw any solid conclusions from any instances of paraphrasing.

5.5 Combination

Although the signer in the pilot study did not combine nonmanuals, this has been seen to occur in
analyses done by Bickford and Fraychineaud (2006). This analysis was through the native signer
intuitions of one of the authors, a deaf signer from New Orleans, and an instructional video on
mouth morphemes (Struxness 1996). The reported combinations that could occur appear to be
limited by the articulators. The signs that require the lips to be open cannot be combined with
signs that require the lips to be closed. These combinations were ‘mm’ and puffed-cheeks, and
‘th’ with puffed-blows (which involves puffed-cheeks and a small amount of air escaping through
the mouth). ‘th’ can be combined with puffed-cheeks even though the jaw is not completely
closed because this can be done without all of the air escaping from the cheeks.

The most unexpected combination involved the infixation of a morphological nonmanual
into a lexical nonmanual. The two nonmanuals combined are the ‘la-la-la’ nonmanual and the
‘fsh’ nonmanual. This combination is articulated with manual parameters of FINISH and means
‘finish finally after a long time’. The ‘la-la-la’ modifier is infixed within ‘fsh’, as ‘f-la-la-la-sh’.
This method of combination is surprising because it indicates the use of concatenative
morphology.

Concatenative morphology, which is employed through the sequential combination of
morphemes, is argued to be rare, if present at all in ASL. This is due to the slower rate of
production, resulting from the use of larger muscles. Non-concatenative morphology is more
common in ASL and involves the modification of the different parameters that make up signs
and morphemes (Fernald & Napoli 2000). One explanation for the infixation seen in ‘f-la-la-la-sh’ is that, as it is articulated with the mouth, it does not have the same restrictions as the larger muscles used in signing that are present during many of the other morphological processes employed in sign languages.

6 Conclusion and further directions for research

This thesis provides one of the first analyses of feature clash of nonmanuals of the lower face in sign language. The analysis presented here has theoretical implications that connect the structures of sign languages and spoken languages. In the parallels made with tone languages, I suggest that nonmanuals may behave, at least in some ways, similarly to tone in lexical tone languages. This then situates the analysis of nonmanuals within autosegmental phonology. With this in mind, nonmanual clash in ASL needs to be examined further for any strong conclusions to be made.

An expansion of the current study would serve to confirm and expand upon the conclusions made. In future research, the pilot study conducted here should be expanded both to include a wider range of modifiers and lexical items, as well as to include more signers. The inclusion of a greater number of signers could reveal additional ways in which signers avoid clash between nonmanuals, as well as discern whether there are any wider patterns in the methods employed to do this across nonmanuals. In addition, an expanded study would include an increased number of modifiers and lexical items with an obligatory nonmanual. The modifiers included in the present pilot study encompass only a small portion of those used in ASL. For additional nonmanual morphemes that modify lexical items, see Bickford & Fraychineaud (2006) and Struxness (1996).
While the results and analysis presented were limited to ASL, the concept driving it, that of clashing nonmanuals, as well as the theoretical implications suggested by its resolution, has potential applicability to other sign languages. Certain aspects of nonmanuals behave in similar ways across various sign languages. It would be fascinating to discover whether any of the strategies used by signers to avoid clash, and the resulting theoretical implications, can be applied more widely to other sign languages.

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7 Appendix

7.1 Lexical items with an obligatory nonmanual

<table>
<thead>
<tr>
<th>Lexical Item</th>
<th>Nonmanual</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. TORMENT</td>
<td>Squared-lips</td>
</tr>
<tr>
<td>II. SUCCESS</td>
<td>[Pa] (“pah”)</td>
</tr>
<tr>
<td>III. FINISH</td>
<td>[f]</td>
</tr>
<tr>
<td>IV. BALLOON</td>
<td>Puffed-cheeks</td>
</tr>
<tr>
<td>V. RELEIVED</td>
<td>Lips must be rounded and pursed, signer releases a small puff of air as hands move down</td>
</tr>
<tr>
<td>VI. NOT-YET</td>
<td>Tongue protrudes slightly</td>
</tr>
<tr>
<td>VII. TAKE-IT-EASY</td>
<td>Lips pushed outwards</td>
</tr>
<tr>
<td>VIII. NEAR</td>
<td>Clenched teeth, open lips</td>
</tr>
</tbody>
</table>

I. TORMENT
(Liddell 2003:13)

II. SUCCESS
III. FINISH

IV. BALLOON

V. RELEIVED
   (Liddell 2003:13)

VI. NOT-YET
VII.

TAKE-IT-EASY

(Bickford & Fraychineaud 2006:34)

VIII.

NEAR

(Bickford & Fraychineaud 2006:34)

7.2 Nonmanuals and signs included in the pilot study:

<table>
<thead>
<tr>
<th>Lexical Item</th>
<th>Nonmanual</th>
</tr>
</thead>
<tbody>
<tr>
<td>TORMENT</td>
<td>Squared-lips</td>
</tr>
<tr>
<td>SUCCESS</td>
<td>[pa] (“pah”)</td>
</tr>
<tr>
<td>FINISH</td>
<td>[f]</td>
</tr>
<tr>
<td>BALLOON</td>
<td>Puffed-cheeks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modifier</th>
<th>Nonmanual</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARELESSLY</td>
<td>[θ] “th”</td>
</tr>
<tr>
<td>WITHOUT-EFFORT (EASILY)</td>
<td>[mm]</td>
</tr>
<tr>
<td>IN-AN-INTENSE-MANNER</td>
<td>[i] (“ee”) - with clenched teeth and open lips</td>
</tr>
<tr>
<td>WITH-EFFORT</td>
<td>“sta-sta”</td>
</tr>
<tr>
<td>LARGE</td>
<td>[l] a “cha”</td>
</tr>
<tr>
<td>SMALL</td>
<td>[u] “oo”</td>
</tr>
<tr>
<td>WITH-PLEASURE</td>
<td>[mmm] “mmm”</td>
</tr>
<tr>
<td>FAT</td>
<td>Puffed-cheeks</td>
</tr>
</tbody>
</table>
7.3 Sentences used in pilot study

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Item in focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>The woman worked and worked all afternoon. She was wound up – stressed. So she finished intensely, not in a relaxed way.</td>
<td>FINISH, INTENSELY</td>
</tr>
<tr>
<td>The person carelessly finished.</td>
<td>FINISH, CARELESSLY</td>
</tr>
<tr>
<td>The girl was taking a hard test, but she finished easily. The man slowly ate a good meal and finished with pleasure.</td>
<td>FINISH, EASILY</td>
</tr>
<tr>
<td>The man, with effort, tormented his friend.</td>
<td>FINISH, WITH-PLEASURE</td>
</tr>
<tr>
<td>The boy intensely tormented the frog. The man wanted revenge, so he tormented his enemy with pleasure.</td>
<td>TORMENT, WITH-PLEASURE</td>
</tr>
<tr>
<td>The child wasn’t mean. He simply wasn’t thinking right. So he carelessly tormented his sister.</td>
<td>TORMENT, CARELESSLY</td>
</tr>
<tr>
<td>The student easily tormented her teacher.</td>
<td>TORMENT, EASILY</td>
</tr>
<tr>
<td>The group of children played with a small balloon. The girl’s father wanted to give her a present. So he blew up a big balloon for her.</td>
<td>BALLOON, SMALL</td>
</tr>
<tr>
<td>The meeting was a big success.</td>
<td>SUCCESS, BIG</td>
</tr>
<tr>
<td>The fundraiser was a small success.</td>
<td>SUCCESS, SMALL</td>
</tr>
<tr>
<td>The woman drove carelessly.</td>
<td>CARELESSLY</td>
</tr>
<tr>
<td>The person ran intensely.</td>
<td>INTENSELY</td>
</tr>
<tr>
<td>The man walked easily.</td>
<td>EASILY</td>
</tr>
<tr>
<td>The student studied with effort.</td>
<td>WITH-EFFORT</td>
</tr>
<tr>
<td>The king torments his subjects.</td>
<td>TORMENT</td>
</tr>
<tr>
<td>The scientist finished his experiment.</td>
<td>FINISH</td>
</tr>
<tr>
<td>There was a small gift on the table.</td>
<td>SMALL</td>
</tr>
<tr>
<td>A big box came in the mail.</td>
<td>BIG</td>
</tr>
<tr>
<td>The clown gave the child a balloon.</td>
<td>BALLOON</td>
</tr>
<tr>
<td>It was a good book, so the man read it with pleasure.</td>
<td>WITH-PLEASURE</td>
</tr>
<tr>
<td>The musician was a success in his first performance.</td>
<td>SUCCESS</td>
</tr>
<tr>
<td>It is fun to run.</td>
<td>distractor</td>
</tr>
<tr>
<td>The child likes to ride his bike.</td>
<td>distractor</td>
</tr>
<tr>
<td>The man sat on the bed.</td>
<td>distractor</td>
</tr>
<tr>
<td>The dog saw the frog.</td>
<td>distractor</td>
</tr>
<tr>
<td>Where is the cat?</td>
<td>distractor</td>
</tr>
<tr>
<td>The girl saw a skinny man.</td>
<td>distractor</td>
</tr>
</tbody>
</table>
8 References


Napoli, Donna Jo, Nathan Sanders, & Rebecca Wright. On the linguistic effects of articulatory ease, with a focus on sign languages. Language 90. 424-456.


