Grammatical and affective layering in ASL: A preliminary study

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

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

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

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

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

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

This preliminary study observes how signers' can monitor their expressions while prioritizing communicative practices to ensure message clarity. Signers can separate affective features from grammatical NMS (e.g., jaw drop Figures 1d, 2d, & 3a), use one articulator competing for multiple

functions (e.g., Figures 1c-d & 3c-d), or supplement the grammatical NMS with additional markers (e.g., darting eyes in Figures 1 & 3). Noting this study's smaller scale of data, a larger sample of elicited and holistic data is needed to confirm these patterns. Nevertheless, this analysis of layering further introduces sign language linguists to the metastrategies driven by real-time brokering of shared facial articulators, utlizing affective expressions' flexibility of scope and timing and maintaining clarity for higher grammatical functions.

Figure 1

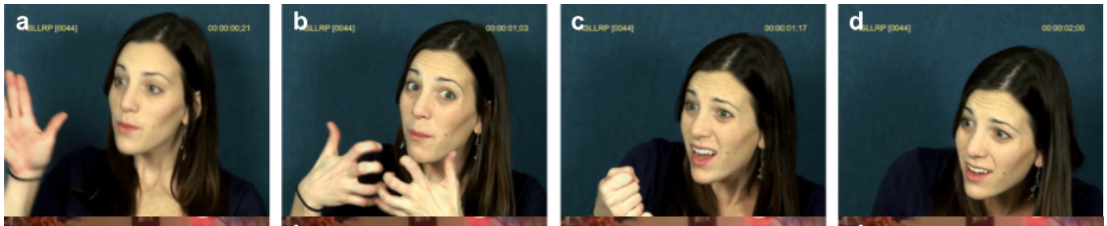


Figure 2

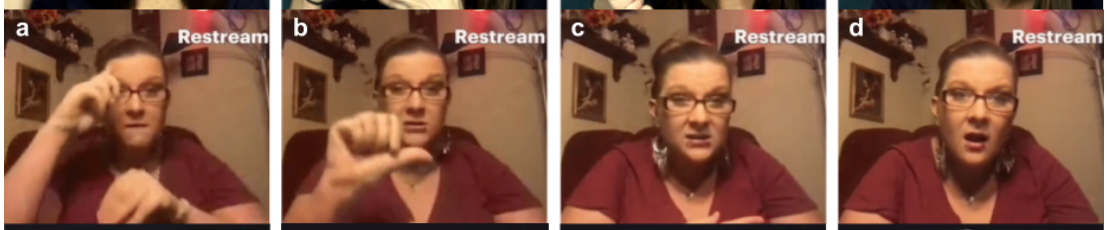
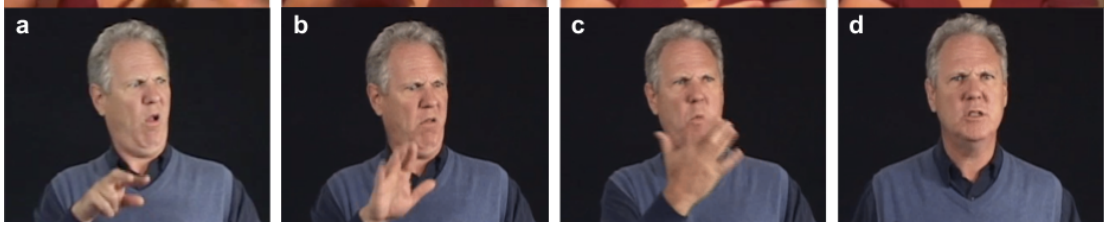


Figure 3



References

Baker-Shenk, C. L. (1985). The facial behavior of deaf signers: Evidence of a complex language. *American Annals of the Deaf*, *130*(4), 297-304.

Du, S., Tao, Y., & Martinez, A. M. (2014). Compound facial expressions of emotion. *Proceedings of the national academy of sciences*, *111*(15), E1454-E1462.

Ekman, P., & Heider, K. G. (1988). The universality of a contempt expression: A replication. *Motivation and emotion*, *12*(3), 303-308.

i3xCx (2021, January 9). *Saturday Chat! #Deaf #ASL*. [Video file]. YouTube. https://youtu.be/zDeSJeKH94w

Kimmelman, V., Imashev, A., Mukushev, M., & Sandygulova, A. (2020). Eyebrow position in grammatical and emotional expressions in Kazakh-Russian Sign Language: A quantitative study. *PloS one*, *15*(6), e0233731.

Liddell, S. K. (1980). American sign language syntax (Vol. 52). *Mouton De Gruyter*.

Neidle, C., Opoku, A., & Metaxas, D. (2022). ASL Video Corpora & Sign Bank: Resources Available through the American Sign Language Linguistic Research Project (ASLLRP). *arXiv:2201.07899*. https://arxiv.org/abs/2201.07899

Reilly, J. S., & Bellugi, U. (1996). Competition on the face: affect and language in ASL motherese. *Journal of Child Language, 23(1)*, 219-239. https://doi.org/10.1017/S0305000900010163

Schnepp, J., Wolfe, R., McDonald, J., & Toro, J. (2013). Generating co-occurring facial nonmanual signals in synthesized American sign language.

Weast, T. (2011). American Sign Language tone and intonation: A phonetic analysis of eyebrow properties. *Formational units in sign languages*, 203-228.

Wilbur, R. B. (2013). Phonological and prosodic layering of nonmanuals in American Sign Language. In *The signs of language revisited* (pp. 196-220). Psychology Press.