Structural iconicity in silent gesture (For poster presentation)

Background & Goals: Iconicity is pervasive in language and extends beyond motivated connections between form and encyclopedic content (e.g., ASL TREE resembles a tree) to semantic domains, like telicity. Further, forms can also be *structurally iconic*, where meaning and structure have a motivated connection. For instance, the principles of *iconicity of quantity/complexity* state that greater quantities of meaning/more complex meanings correlate with greater quantities of form/more complex forms (Croft, 2003, Haiman, 2008). For example, transitive verbs are cross-linguistically more likely to be marked than intransitive verbs, and transitives are more likely derived from intransitives than *vice versa* (Haspelmath, 2015; düş-Ø-mek 'fall' cf. düş-**ür**-mek 'make fall'/'drop'; Ex. 1). This mirrors the modeling of transitives as being more syntactically complex in Generative Grammar (Newmeyer, 1992), extending to the treatment of classifier constructions in sign languages (Benedicto & Brentari, 2004; Ex. 2).

(1)   a.   [Y BECOME/DO Z]]
      b.   [**X CAUSE** [Y BECOME/DO Z]]

(2) $[_{f_1P} < agent > [_{f_2P} < theme > [\text{ VP }]]$
      where f_2P = intransitive, and $f_1P + f_2P$ = transitive

Previous work on silent gesture has shown how principles of structural iconicity can shape communication among non-signers w.r.t. constituent ordering (e.g., Christensen et al., 2016), but none have discussed complexity. However, previous work on transitivity coding in silent gestures and classifier constructions (CCs) has indirectly found that the former adhere to structural iconicity while the latter do not: Transitive silent gestures exhibit more finger- and joint-complexity, while transitive CCs exhibit more joint-complexity and intransitive CCs exhibit more finger-complexity (Brentari et al., 2012, 2017). We discuss their findings from perspective of structural iconicity. Further, we contribute new data from silent gesture production, with expanded sets of manual features (6) and event types (72), confirming that principals of structural iconicity are present in silent gesture production more generally. Finally, it is unknown whether non-signers use principles of structural iconicity in *comprehension*. To this end, we conducted a silent gesture labeling experiment, hypothesizing that perceivers will also assume that more complexity in visual representation correlates with more underlying structure.

Method: We produced vignettes of 72 unique events that involved the manipulation (transitive) or movement (intransitive) of a variety of objects. Using these action vignettes, we elicited silent gestures from 6 non-signing participants (6 * 72 = 432 silent gestures). Gestures representing transitive events were considered transitive, otherwise intransitive, which we refer to as a gesture's *inherent transitivity*. In turn, we elicited 20 one-sentence descriptions of what each gestureintended to convey using Amazon Mechanical Turk. We then labeled each sentence for transitivity (1 = 'transitive'). For each gesturewe then calculated the proportion of transitive sentences it received (its *perceived transitivity*, range 0–1). Finally, we annotated the verb(-like) element from each gesture for 6 handshape parameters, including finger- and joint-complexity, and flexion of the selected and unselected fingers (see Fig. 1b). We used two linear models to correlate handshape parameters (independent variables) with the gestures' inherent transitivity and perceived transitivity (dependent variables).

Results & interpretation: Our hypotheses were confirmed. We observed that most features across both production and perception analyses characterize transitive silent gestures (**Production**: Flexion $\beta = 0.29$, Finger complexity $\beta = 0.42$, Two-handed $\beta = 1.12$; **Perception:** Flexion $\beta = 0.04$, Two-handed, $\beta = 0.19$, Aperture change $\beta = -0.17$; all $p < 0.05$, all other features n.s.; *transitive* is the positive class). That is, gestures representing transitive events were characterized increased markedness, and were perceived as such. (To note, *Aperture change* applied to less than 13% of the dataset and may not be a general transitivity-marking strategy). This result suggests that these iconicity principles hold beyond language. Further, that both producers and perceivers should default to this more-form-more-structure may initially bootstrap communication before the more sign language-like pattern (i.e., both transitives and intransitives are distinctly marked) emerges.

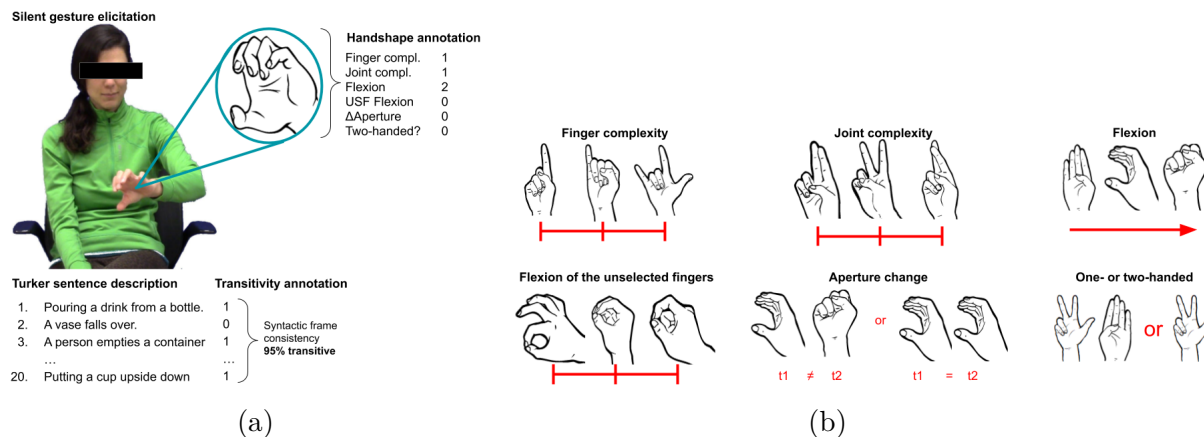(a)   (b)

Figure 1: (a) **Experimental design:** An inherently transitive gesture, depicting *Someone put a book on its side*, with Turker response sentences and annotated for transitivity. Gesture was perceived to be transitive. Handshape was annotated for features in (b); (b) **Handshape parameters:** 'Finger complexity' & 'Joint complexity' = measures of ease of articulation w.r.t. fingers and joints (each scored 1 to 3); 'Flexion' = degree of curvature of the profiled fingers (1 to 6); 'Flexion of unselected fingers (USF flexion)' = degree of curvature of the backgrounded fingers (-1 to 1); 'Aperture change' = whether the hand opens/closes (categorical); 'One- or two-handed' = whether the production involved one or two hands (categorical).

References

Benedicto, E., & Brentari, D. (2004). Where did all the arguments go? *NLLT*, 22(4), 743–810. • Brentari, D., Coppola, M., Cho, P. W., & Senghas, A. (2017). Handshape complexity as a precursor to phonology. *Language Acquisition*, 24(4), 283–306. • Brentari, D., Coppola, M., Mazzoni, L., & Goldin-Meadow, S. (2012). When does a system become phonological? *NLLT*, 30(1), 1–31. • Christensen, P., Fusaroli, R., & Tylén, K. (2016). Environmental constraints shaping constituent order in emerging communication systems. *Cognition*, 146, 67–80. • Croft, William (2003). *Typology and universals.* 2nd edition. Cambridge University Press • Haiman, J. (2008). In defence of iconicity. *Cog. Ling.*, 19(1), 35–48. • Haspelmath, M. (2015). Transitivity prominence. In: Malchukov, Andrej, & Comrie, Bernard (eds.), *Valency classes in the world's languages*, Vol. 1, 131–147. De Gruyter. • Newmeyer, F. J. (1992). Iconicity and generative grammar. *Language*, 756–796.