IS THERE AN ICONIC MOTIVATION FOR THE MORPHOPHONOLOGICAL DISTINCTION BETWEEN NOUN-VERB PAIRS IN ASL?

KAREN EMMOREY[*1] and JENNIE PYERS[2]

[*]Corresponding Author: kemmorey@sdsu.edu
[1]Speech, Language and Hearing Sciences, San Diego State University, San Diego, USA
[2]Psychology Department, Wellesley College, Wellesley, USA

A match-to-sample, forced-choice paradigm was used in four experiments to test whether nonsigners are sensitive to the patterns of noun-verb derivation observed in many different sign languages. Nouns are often derived from verbs by (1) movement reduplication and size reduction or (2) size reduction alone (if the verb has reduplicated movement). Nonsigners (MTurk workers) were asked to match drawings of actions and objects with videos of noun and verb pairs in American Sign Language. Contrary to our predictions, nonsigners either were not sensitive to these rules (performing at chance) or they exhibited a bias that was the opposite of the one found in sign languages, preferring to match small reduplicated movements with actions, rather than with objects. Whether or not the noun-verb pairs exhibited pantomimic iconicity ("handling" signs or signs that resembled conventional pantomimes) did not affect the results. We speculate that internal linguistic pressures (a large lexicon, directional verbs) might override this weak, initial bias to map "more movement" (reduplication) to depict actions.

1. Introduction

Iconicity, typically defined as the resemblance of a symbol to its referent, is an essential tool in the creation of language, spoken or signed. Humans readily generate novel iconic symbols in the laboratory, and modern day languages bear traces of iconic origins. Some iconic mappings reflect associations between the linguistic form and common human cognitive construals of meaning (e.g. event telicity and sign movement; Strickland et al., 2015). However, the perception of iconicity can also be modulated by sign language knowledge (Occhino et al., 2017; Sehyr & Emmorey, 2019). We ask whether the morphophonological distinctions between nouns and verbs in American Sign Language (ASL) are iconically driven by cognitive construals of objects and actions. ASL nouns can be derived from verbs through two general principles: (1) movement

reduplication + change in movement size (e.g., OPEN-BOOK vs. BOOK), or (2) change in movement size only if reduplication is already presented in the verb (e.g. PEDAL-BIKE vs. BIKE) (see Fig. 1; Supalla & Newport, 1978). One or both of these derivational strategies appear across many different sign languages (e.g., Italian Sign Language: Pizutto & Corazza, 1996; Russian Sign Language: Kimmelman, 2009; AUSLAN: Johnston, 2001; Israeli Sign Language: Tkachman & Sandler, 2013).

Across a set of four experiments, we tested non-signers' sensitivity to the two ways that nouns are derived from verbs. We hypothesized that these derivational strategies originated in universal human cognitive construals of actions and objects that can be iconically mapped to elements of the morphophonological structure of the sign (Wilcox, 2004). The clearest indicator of this construal would be the observation that nonsigners systematically associate large movements in signs with actions and small reduplicated movements with objects. We additionally hypothesized that pantomimic iconicity in a sign (see Fig. 1B) might affect non-signers assignment of noun-verb signs to objects and actions respectively.
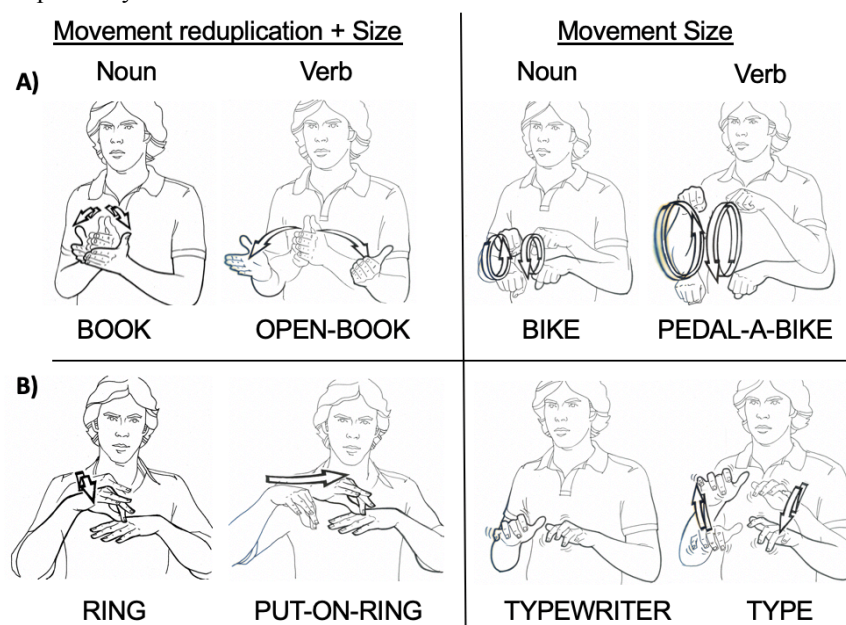

Figure 1. Examples of ASL noun-verb pairs derived by two morphophonological rules. **A)** Examples of non-pantomimic signs used in Experiments 1-3. **B)** Examples of pantomimic signs used in Experiment 4.

2. Methods

We selected a total of 61 noun-verb pairs in ASL that followed one of the rules shown in Fig. 1 and created line drawings that depicted the object and actions in each pair. For each experiment, we recruited 40 "master" MTurk workers who were non-signers. Participants viewed videos of the noun and verb signs and were asked to match an object and an action picture to each video (forced-choice matching task). We also coded whether signs were pantomimic and operationalized pantomimic signs as being handling signs (Fig. 1B) or conventional pantomimes that involve manipulating objects (e.g., holding a Y handshape for TELEPHONE/TO CALL).

3. Results

Exp. 1 assessed nonsigners' sensitivity to the *movement reduplication + size* rule for non-pantomimic signs ($n = 20$ noun/verb pairs). Participants' performance was significantly <u>below</u> chance ($M=.223$, $SD=.196$, $t(39)=-8.935$, $p<.001$). Nonsigners systematically associated movement reduplication with actions not objects, a pattern that is the opposite of what we see across sign languages.

Using the same forced-choice matching task, **Exp. 2** investigated whether non-signers show sensitivity to differences between ASL nouns and verbs that vary only in the *size of movement* ($n = 9$ pairs). Nonsigners exhibited some sensitivity to the expected pattern, mapping large movements to actions and smaller movements to nouns ($M=.603$, $SD=.283$, $t(39)=2.305$, $p=.027$).

Because these two derivational strategies co-exist in a sign language, **Exp. 3** presented nonsigners with a mix of 18 non-pantomimic noun-verb pairs (9 pairs following each rule). Non-signers were significantly below chance in making correct matches in both conditions, preferring to match small reduplicated movements to actions instead of objects (*Movement reduplication + size*: $M=.291$, $SD=.258$, $t(39)=-5.123$, $p<.0001$; *Movement size*: $M=.391$, $SD=.247$, $t(39)=-2.80$, $p=0.008$).

Exp. 4 tested whether these patterns held for pantomimic noun-verb pairs. For the *movement reduplication + size* rule (18 pairs), nonsigners again performed significantly below chance ($M=.258$, $SD=.301$, $t(40)=-5.137$, $p<.001$, systematically mapping small, reduplicated movements with actions. For the *movement size only* rule (15 pairs), nonsigners performed at chance, in contrast to Exp. 2 which included fewer noun-verb pairs ($M=.455$, $SD=.341$, $t(34)=-.777$, $p=.443$). When presented with a mix of rules (15 pantomimic noun-verb pairs following each rule), non-signers were at chance in making correct matches in

both conditions (*Movement reduplication + size*: M=.416, SD=.328, *t*(38)=-1.569, p=.125; *Movement size only*: M=.522, SD=.264, *t*(38)=0.519, p=.607). However, non-signers were significantly more likely to attribute reduplication to actions over objects than to attribute a reduction in movement size to actions (*t*(38)=2.888, p=.006, 5%CI[0.031- 0.178]), even if they did so at a rate that was not greater than chance.

Finally, we conducted an exploratory analysis, using mixed effects logistic regression to understand the relative contributions of the type of rule and type of iconicity and the interaction between these two variables on mapping of the rule to the lexical class. Only rule type significantly predicted mapping changes in movement to changes in meaning (*B* =-0.75, *S.E.*= 0.28, *z*=-2.48, p=0.01). Participants exhibited more consistent mappings when the noun-verb contrast involved *movement reduplication + size* than with *movement size* alone. Although this consistent mapping was the inverse of the pattern observed in sign languages. Iconicity type and the interaction between rule type and iconicity type did not significantly predict accuracy (Iconicity type: *B* =-0.17, *S.E.*= 0.34, *z*=-0.49, p=0.63; Rule type x iconicity type: *B* =-0.00, *S.E.*= 0.39, *z*=-0,00, p=1.0).

3. Discussion

Across a set of four experiments we investigated whether morphophonological distinctions between nouns and verbs in ASL are iconically driven by the way humans construe objects and actions. We hypothesized that non-signers would be able to map ASL verbs to actions and nouns to objects, iconically mapping large and/or single movements to actions and small, reduplicated movements to objects. However, we found no evidence that non-signers followed the movement reduplication + size rule that is used cross-linguistically in sign languages to distinguish nouns and verbs. In addition, we found only modest evidence that non-signers followed the movement size only rule. Thus, nonsigners did not systematically associate large movements in signs with actions and small reduplicated movements with objects.

When viewing signs, nonsigners nevertheless did exhibit a set of iconic biases that differed from what is seen in sign languages. When forced to match the noun and verb variants to pictures of actions and objects, non-signers systematically interpreted movement reduplication and size reduction as more action-like and single path movements as more object-like at rates that differed significantly from chance. We speculate that nonsigners interpret reduplicated forms as having "more movement" and therefore mapped this form to actions. Goldin-Meadow et al. (1994) reported a similar pattern in a homesigner – David

– who systematically produced verb gestures with reduplication and noun gestures with a single movement (or fewer repetitions). Interestingly, the newest signers (Cohort 3) of Nicaraguan Sign Language were more likely to use movement reduplication to distinguish nouns from verbs compared to older NSL signers, suggesting that this noun-verb pattern is emergent (Abner et al., 2019). All NSL signers used movement size to distinguish nouns from verbs.

Given the robust evidence that nonsigners treat pantomimic iconicity as more action-like (e.g., Ortega & Özyürek, 2019), we speculated that we would see improved rule mapping with these signs. Pantomimic iconicity, however, did little to shift the biases we observed with signs that had no pantomimic iconicity. Indeed our exploratory regression analysis showed no effect of pantomimic iconicity when considering all of the data across the four experiments. Important to note, however, is that in our study handshape was not a contrastive feature for meaning and as such may have played little role in non-signers' attribution of meaning to the presented signs.

Taken together, we did not find systematic support for the idea that large articulated movements in a manual signal emphasizes the process oriented nature of actions (Wilcox, 2004) in a way that allows for nonsigners' systematic interpretation of large movements as actions and small movements as objects. Nor did we find that nonsigners interpret small reduplicated manual movement as de-emphasizing the action which in turn should favor an object interpretation of such movement (Lepic & Padden, 2017).

If nonsigners (and possibly homesigners) exhibit a bias to interpret "more movement" (i.e., reduplication) as iconically mapping to actions over objects, then why do sign languages systematically exhibit the opposite pattern? We speculate that this relatively weak cognitive construal effect could be over-ridden by internal linguistic pressures as a sign language develops. For example, with a large lexicon, small movements may be used to focus attention on the hands (which map to objects), and such small movements may need to be reduplicated for saliency. Supporting this speculation, recent work indicates that the movement of nouns is smaller than verbs across the ASL lexicon (Sehyr, Edinger, & Emmorey, 2019). In addition, path movements for verbs can be articulated directionally to specify changes in location or grammatical roles. Future research is needed to investigate whether such linguistic pressures override an initial iconic bias for construing reduplicated movement as associated with actions over objects.

Acknowledgements

References

Abner, N., Flaherty, M., Stangl, K., Coppola, M., Brentari, D., & Goldin-Meadow, S. (2019). The noun-verb distinction in established and emergent sign systems. *Language*, *95*(2), 230-267.

Goldin-Meadow, S., Butcher, C., Mylander, C., & Dodge, M. (1994). Nouns and verbs in a self-styled gesture system. What's in a name? *Cognitive Psychology, 27,* 259-319.

Johnston, T. (2001). The lexical database of AUSLAN (Australian Sign Language). *Sign Language & Linguistics*, *4*(1), 145-169.

Kimmelman, V. (2009). Parts of speech in Russian Sign Language: The role of iconicity and economy. *Sign Language & Linguistics*, *12*(2), 161-186.

Lepic, R., & Padden, C. (2017). A-morphous iconicity. In C. Bowern, L., Horn, & R. Zanuttini (Eds.), *On looking into words (and beyond): Structures, relations, analyses* (pp. 489-516), Berlin, Germany: Language Sciences Press.

Occhino, C., Anible, B., Wilkinson, E., & Morford, J. P. (2017). Iconicity is in the eye of the beholder. *Gesture*, *16*(1), 100-126.

Ortega, G., & Özyürek, A. (2019). Systematic mappings between semantic categories and types of iconic representations in the manual modality: a normed database of silent gesture. *Behavior and Research Methods*.

Pizzuto, E., & Corazza, S. (1996). Noun morphology in Italian Sign language (LIS). *Lingua*, *98*(1-3), 169-196.

Sehyr, Z., S., Edinger, R., & Emmorey, K. (2019). Quantifying differences in spatial and temporal patterns between nouns and verbs in American Sign Language. Poster presented at the Theoretical Issues in Sign Language Research meeting, September, Hamburg, Germany.

Sehyr, Z. S., & Emmorey, K. (2019). The perceived mapping between form and meaning in American Sign Language depends on linguistic knowledge and task: evidence from iconicity and transparency judgments. *Language and Cognition*, *11*(2), 208-234.

Supalla, T, & Newport, E. (1978). How many seats in a chair? In P. Siple (Ed.), *Understanding language through sign language research* (pp. 158-181). New York: Academic Press.

Strickland, B., Geraci, C., Chemla, E., Schlenker, P., Kelepir, M., & Pfau, R. (2015). Event representations constrain the structure of language: Sign language as a window into universally accessible linguistic biases. *Proceedings of the National Academy of Sciences*, *112*(19), 5968-5973.

Tkachman, O., & Sandler, W. (2013). The noun–verb distinction in two young sign languages. *Gesture*, *13*(3), 253-286.

Wilcox, S. (2004). Cognitive iconicity: Conceptual spaces, meaning, and gesture in signed language. *Cognitive linguistics*, *15*(2), 119-148.