The effect of iconicity on weak hand drop in American Sign Language

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A signed language phonology may specify features for the dominant hand only or for both hands. Weak hand drop (WHD) is a post-lexical phonological process in which only the dominant hand of an underlyingly two-handed sign surfaces. This process is phonologically constrained (Brentari, 1998), but whether or not iconicity (resemblance to a referent) affects WHD is unknown. Van der Kooij (2001) suggests that for Sign Language of the Netherlands, a pressure to preserve iconic associations between form and meaning may limit or block this process for some iconic signs while making it more acceptable if the weak hand iconically represents a surface. These claims are based upon limited observations, however, and have not been evaluated for American Sign Language (ASL). To determine whether iconicity affects the acceptability of WHD, the present study controlled for phonological similarity in two-handed ASL signs in experimentally collected acceptability judgments from native ASL signers. Iconic signs were more amenable to WHD than non-iconic signs: participants rated stimuli containing one-handed (1H) versions of two-handed (2H) iconic signs significantly higher than those containing 1H versions of phonologically similar non-iconic 2H signs. The present study is part of a larger research project investigating iconicity's role in phonetic and phonological processes. The overarching goal is to address the question of whether the iconic associations that motivate a sign's form remain relevant to the grammar after a sign has become conventionalized. The discussion argues that these associations must be accessible during the application of synchronic processes in order to account for the significant effect of iconicity on WHD.

An acceptability judgment experiment was created in PsychoPy (Peirce, 2019; Peirce & MacAskill, 2018) and run on Pavlovia.org. Stimuli were developed in consultation with two native ASL signers and produced by one of these signers. They consisted of 12 pairs of 2H target signs and 24 distractor signs. All target signs were asymmetrical, meaning the dominant hand moves while the weak hand acts as place of articulation. Each target pair consisted of one sign with clear iconic mapping and a phonologically similar non-iconic sign of the same grammatical category (noun or verb). Distractor signs were underlyingly 1H. Signs were defined as iconic or non-iconic based upon ratings from hearing non-signers in the ASL-Lex database (Caselli, 2016). Although some of the non-iconic signs may be considered abstractly iconic via metaphorical extension of a concrete image, each iconic sign had a higher iconicity rating than its phonologically similar non-iconic counterpart, and native signer consultants confirmed these ratings. An example of an iconic target sign GET-OFF and its phonologically similar non-iconic counterpart RESIGN is given in Figure 1.

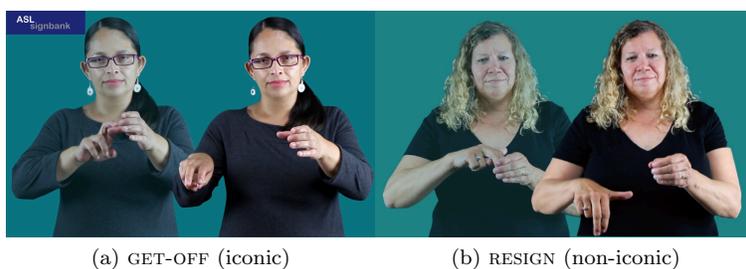(a) GET-OFF (iconic)   (b) RESIGN (non-iconic)

Figure 1: Iconic/Non-Iconic Sign Pair (images from Hochgesang et al., 2020)

Each target and distractor sign occurred in sentence-final position in a carrier sentence. Nouns followed the determiner sign THAT and verbs followed the first person pronoun IX$_{\text{self}}$. For example, the carrier sentence for RESIGN was THAT JOB IX$_{\text{self}}$ RESIGN. The carrier for each target sign was filmed with the target sign in 2H form and again with the target sign in 1H form.

Stimuli were divided into four blocks. After a practice round, each block showed 36 sentences: 24 with target signs and 12 with distractor signs. Each target sign occurred in only one sentence/block, and both

pair members appeared in the same form in a given block (as 1H or 2H). Sentences were randomized within each block. After rating each sentence in a block, participants rated every target sign in isolation, first in 1H form, then in 2H form. Participants were asked to rate each sentence or isolated sign they saw as a whole-number from 1 ("very strange ASL") to 5 ("perfectly natural ASL"). Instructions were given in both ASL and written English. Participants were 40 self-identified Deaf ASL signers, 23-50 years old, living in the US, all of whom began acquiring ASL by age 4 (one reported "4 or 5").

To account for different uses of the rating scale, participant judgments were Z-transformed. A linear mixed effects regression revealed a significant interaction between iconicity and handedness: 1H versions of sentences containing iconic target signs were rated significantly higher than 1H versions of sentences containing non-iconic target signs ($Estimate$ = -0.29, CI = -0.47 – -0.11, p = 0.002). Thus iconicity was shown to facilitate, rather than inhibit, phonological variation in the form of WHD for asymmetrical signs.

The broader question motivating this study was whether iconic form-meaning mappings are accessible during application of synchronic grammatical processes. The nature and direction of the results suggest the answer is yes. An alternative explanation is that iconicity is relevant only in its diachronic creation of sign classes. This theory predicts categorical results. However, the present results did not show ceiling effects for WHD forms of one group or the other, but, rather, gradiently more acceptability of iconic over non-iconic WHD forms. Regarding the direction of the result, iconic signs were more amenable to WHD, suggesting that it is the semantic information encoded in the dominant hand of an iconic 2H sign that mitigates the loss of phonological information caused by this reduction. Because this information is encoded by way of iconic form-meaning associations, these associations must be accessible during application of WHD. This interpretation has implications for our characterization of iconicity. Because iconic signs can undergo diachronic reduction that obscures iconic motivation (Frishberg, 1975), iconicity has been understood by some as a grammar-external process relevant only to a sign's initial formation. More recent research by Eccarius (2008) likens iconicity to other language-external pressures like ease of production. Eccarius's work, however, addresses lexical strata created by constraints that enforce faithfulness to iconically motivated forms. These constraints need not refer to iconic form-meaning associations themselves; they simply motivate faithfulness to forms that happen to have historically iconic motivation. In contrast, in its role in WHD, iconicity acts as a resource allowing for phonological variation. The results here are aligned with Emmorey's structure mapping framework, in which iconic form-meaning associations link "two mental representations [rather] than...linguistic form and human experience" (2014, p. 8). These mappings are apparently accessible to the synchronic grammar, pointing to iconicity as a property of the linguistic system itself rather than only as a language-external pressure.

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