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Back and Forth between Theory and Application: Shared Phonological Coding Between ASL Signbank and ASL-LEX

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Abstract

The development of signed language lexical databases, digital organizations that describe different phonological features of and attempt to establish relationships between signs has resulted in a renewed interest in the phonological descriptions used to uniquely identify and organize the lexicons of respective sign languages (van der Kooij, 2002; Fenlon et al., 2016; Brentari et al., 2018). Throughout the mutually shared coding process involved in organizing two lexical databases, ASL Signbank (Hochgesang, Crasborn and Lillo-Martin, 2020) and ASL-LEX (Caselli et al., 2016), issues have arisen that require revisiting how phonological features and categories are to be applied and even decided upon, and which would adequately distinguish lexical contrast for respective sign languages. The paper concludes by exploring the inverse of the theory-to-database relationship. Examples are given of theoretical implications and research questions that arise from consequences of language resource building. These are presented as evidence not only that theory impacts organization of databases but that the process of database creation can also inform our theories.

Keywords: lexical database, phonological coding, signed languages, ASL, experiences in building sign language corpora, annotation and visualization tools

1. Introduction

The development of signed language lexical databases, digital organizations that describe different phonological features of and attempt to establish relationships between signs has resulted in a renewed interest in the phonological descriptions used to uniquely identify and organize the lexicons of respective sign languages (van der Kooij, 2002; Fenlon et al., 2016; Brentari et al., 2018). Throughout the mutually shared coding process involved in organizing two lexical databases, ASL Signbank (Hochgesang, Crasborn and Lillo-Martin, 2020) and ASL-LEX (Caselli et al., 2016), issues have arisen that require revisiting how phonological features and categories are to be applied and even decided upon, and which would adequately distinguish lexical contrast for respective sign languages.

One way in which issues arise in applying phonological descriptions is how we should go about making explicit categories that subsume several "descriptors" or features: movement paths include *arc/curved, straight, circular,* and *other*. This 'other' category includes multiple path types, such as repeated straight path movements, back and forth (bidirectional) movement, or a circular or curved path followed by a straight path movement combination. Furthermore, determining the nature of the type of multiple paths for a given sign is necessary in distinguishing this from holistic views of path movements: e.g. the difference between the ASL signs for DUTYtap[1] and COMMUTE[2] (both are currently identified as [BackAndForth], but we recognize that DUTYtap actually repeats [Straight] path movements, while COMMUTE is a true example of [BackAndForth]).

For a lexical database this kind of information needs to be explicit in order for the function/purpose of distinguishing signs, as well as for comparing how signs are similar. For the ASL Signbank, where the phonological coding of each lexical entry is carried out in collaboration with ASL-LEX lexical database, the fact that there are numerous false homonyms is one such issue that this project aims to address.

2. Background

2.1 Lexical databases and phonological neighborhoods

Lexical databases are developed for myriad purposes, including lexicography and as resources for investigating the phonological structure of a given language. To the end of the latter purpose, which is the focus of this paper, lexical databases have traditionally been organized in such a way as to visualize phonological neighborhoods, or to show how lexical units are similar (or different) according to phonological properties. Phonological neighbors have traditionally been recognized as having a single phoneme difference between two words/signs (Marian and Blumenfeld, 2006). Both ASL Signbank and ASL-LEX currently utilize an abbreviated version of the Prosodic Model (Brentari, 1998), henceforth abbreviated as PM, a feature-based phonological descriptive system, and in turn recognize that this contributes to (and even affects) the overall organization and how lexical relationships are indicated.

As Hochgesang (2014: 490) explains, "systems of measurement should be thoroughly and consistently vetted before they are adopted for widespread use". Because both the ASL Signbank and ASL-LEX databases are still being expanded, the development process is crucial for working out any apparent issues that could undermine the intended benefits of each resource. Caselli et al. (2016: 790) assert that the phonological coding scheme as applied "has substantial discriminatory power;" they indicated that "52% of signs were uniquely identified, and 32% shared a phonological transcription with fewer than three other signs." Signs are identified as related (shared phonological properties) in ASL-LEX in three ways: those that have the same major location, selected fingers, flexion, and movement (parameter-based neighborhood density), those that share four of five phonological features, which adds in consideration of a sign's minor location along with the previously mentioned properties (maximal neighborhood density); and those that share at least one phonological

[1] Sign ID numbers that link to the ASL Signbank will be given for examples. To find the linked sign, registered users can visit https://aslsignbank.haskins.yale.edu/dictionary/gloss/# replace # with the ID number provided in the footnote. DUTYtap is 1283.

[2] ASL Signbank ID 1109

feature (minimal neighborhood density) (Caselli et al., 2016: 792).

As for the ASL Signbank, shared phonological descriptions appears to be a much more pervasive issue (e.g. entering in [Hand], [imrp], [1 (fully open)], [Straight] path movement within the sign search function leads to a result of 36 signs sharing a phonological transcription, many of which would be considered "false homonyms"). Applying a feature-based system to lexical databases might seem counterintuitive if phonological relationships are determined based on a phonemic descriptive approach, but as Corina (1990: 27) explains, "[i]n describing distinctive feature systems, one attempts to characterize the underlying perceptual and/or gestural components of phonemes in a [sign] language." For example, "a handshape representation consists of features for finger(s) involved in articulating the handshape and features describing the configuration [or flexion] of these fingers" (Corina, 1990: 28).

2.2 ASL-LEX

ASL-LEX[3] (Caselli et al., 2016) is a publicly-available database which includes subjective frequency and iconicity judgments as well as phonological information for 1,000 ASL signs (and more to come in version 2.0).

2.3 ASL Signbank

The ASL Signbank[4], further described in Hochgesang, Crasborn and Lillo-Martin (2018), is an online database that organizes ID glosses for ASL annotation. It is built off the NGT Signbank, which in turn is based on the Auslan Signbank software (Cassidy et al., 2018). At the time of writing, there are over 3300 entries. ASL Signbank is a language resource that can be directly linked to ELAN (Crasborn et al., 2016).

2.4 Phonological coding used by ASL Signbank

Our collaboration between ASL Signbank and ASL-LEX involves sharing ID glosses, so that signs that are common across the databases can be easily accessed, as well as phonological information, with the goal that signs have consistent coding, whenever applicable, across the two databases (discrepancies in coding between the two databases helped to illuminate some of the issues discussed in section 3 below). The phonological coding scheme used for both the ASL Signbank and ASL-LEX are based on the PM which is essentially a compilation of the collective analyses that have been carried out on ASL phonology over the past few decades (Brentari, 1998). In compound signs, codes refer to the properties of the initial free morpheme (or component derived from what was originally the initial free morpheme). Note that the phonological coding in ASL Signbank does not provide a complete phonological description of signs; there are contrastive elements that are not included for entries, e.g. direction of movement. This leads to situations in which signs that are distinct in form and meaning are identically coded for phonology in ASL Signbank (e.g. ACT[5] and AGGRESSIVE[6], which differ only in direction of movement, a characteristic which is not coded here). In this subsection, we describe some of the fields in which we apply the shared phonological coding scheme for both the ASL Signbank and ASL-LEX in the Phonology section of the ASL Signbank. Not all phonological aspects included in ASL Signbank will be described here (e.g. not describing *weak drop/prop* since this is still in development) – we'll describe handedness, major location and dominant hand – selected fingers and flexion.

2.4.1 Handedness

ASL signs can be one or two-handed. When two-handed, they tend to conform to constraints referred to as the Symmetry and Dominance Conditions (Battison, 1978). According to the Symmetry Condition, signs for which both hands move must have the same or mirror image location and orientation, same handshape, and same (simultaneous or alternating) movement specifications. This type of sign is listed in ASL Signbank as [SymmetricalOrAlternating] (e.g. ACCEPT[7] has symmetrical specifications and BICYCLE[8] has alternating movement). Signs in which only one hand moves are referred to as [asymmetrical]. When the two handshapes are the same in an asymmetrical sign, these signs are coded in ASL Signbank as [AsymmetricalSameHandshape] (e.g. BELIEVEb[9]). According to the Dominance Condition, when a two-handed sign has different specifications for the two handshapes, the sign must be asymmetrical (that is, only one hand can move), and the stationary hand is restricted to one of seven unmarked handshapes, coded in the Nondominant handshape field as 1, 5, A, B, C, O, and S. These signs are coded in ASL Signbank as [AsymmetricalDifferent Handshape] (e.g. COUNT[10]). Finally, two-handed signs may be coded in ASL Signbank as [Other] when they violate either the Symmetry or Dominance Condition. Signs that violate the Symmetry Condition are those for which both hands move but have different handshapes (e.g. SIM-COM[11]). Signs that violate the Dominance Condition are those for which the stationary hand has a handshape other than the seven unmarked handshapes (e.g. CHERRY[12]). The possible values for handedness in ASL Signbank are listed below:

AsymmetricalDifferentHandshape
AsymmetricalSameHandshape
OneHanded
Other (violates sym/dom conditions)
SymmetricalOrAlternating

2.4.2 Location – Major

Each sign is specified for only one major location. The possible locations are listed below, along with examples. Note that there does not need to be contact between the hand and location, either in phonological specification or in actual production. For each pair of examples, the first makes contact with the major location and the second does not (excluding neutral, for which there can never be contact with the body). The possible values are listed here:

arm (including wrist): e.g. TRASH[13]
body (signer's torso): e.g. FANCY[14]

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[3] http://asl-lex.org/
[4] https://aslsignbank.haskins.yale.edu/
[5] ASLSignbank Sign ID 5
[6] ASLSignbank Sign ID 2379
[7] ASLSignbank Sign ID 2045
[8] ASLSignbank Sign ID 379
[9] ASLSignbank Sign ID 576
[10] ASLSignbank Sign ID 609
[11] ASLSignbank Sign ID 3289
[12] ASLSignbank Sign ID 1982
[13] ASLSignbank Sign ID 2107
[14] ASLSignbank Sign ID 1382

hand: e.g. BEACHwig[15], BASIC[16]
head (including face): ALASKA[17]
neutral (signing space in front of the signer's body): e.g. INSULT[18]
other NA

2.4.3 Dominant hand – Selected Fingers and Flexion

ASL signs adhere to "the Finger Position Constraint" (Mandel, 1981) which limits the number of categories a handshape can specify for finger configurations to two. One group of fingers – called the selected fingers – can be specified for any configuration possible in ASL. The other group – the non-selected fingers – must be either fully extended or fully flexed/closed. This means, for example, that a handshape in which some fingers are specified as fully extended, some as partially extended, and some as fully flexed is impossible in ASL. Since Mandel (1981), various models have formalized this constraint in slightly different ways; all capture the notion that signs specify one category of phonologically salient fingers. ASL Signbank follows ASL-LEX's and PM's criteria for coding selected fingers. In signs with a handshape change or handshape-internal movement, the fingers that move are selected (e.g. index in QM[19]). For signs without a handshape change or handshape-internal movement, if one set of fingers is partially flexed or partially extended (e.g. index in NEED[20]), these fingers are considered selected and the set of fully flexed or fully extended fingers are considered non-selected. If neither of these criteria can be applied to distinguish between selected and non-selected fingers, the decision is made based on which fingers "appear foregrounded" (Caselli et al., 2016). For example, in the sign ALONE[21] there is no handshape change or internal movement, one category of fingers (index) is fully extended, and the other category (middle, ring, and pinky) is fully flexed. Since neither group is partially extended/flexed, stacked, or crossed, applying these criteria does not differentiate selected from non-selected fingers in ALONE. However, the index finger appears foregrounded and is therefore coded as the selected finger.

The PM model states that "in the majority of cases the thumb behaves like the other selected fingers...yet in some signs it operates as a semi-independent articulator" (Brentari, 1998, p. 113). In ASL-LEX and ASL Signbank, the thumb is coded as selected only when it is the only selected finger. For example, in MOON[22], both index and thumb are partially extended and middle, ring, and pinky are fully flexed. In this case, only the index is coded as the selected finger. In the sign TEXT-PAGER[23], on the other hand, since the thumb is the only moving/salient finger while the others are fully flexed and non-moving, the thumb is coded as the selected finger. In asymmetrical two-handed signs, selected fingers are coded only for the dominant hand (e.g. middle is selected for ADVANTAGE[24]). The full word [thumb] labels the thumb as the selected finger. The codes for the remaining fingers are each one letter: i = index, m = middle, r = ring, and p = pinky. All possible combinations of the four fingers, including each finger individually, are possible in this field with the exception of ir (index and ring), mp (middle and pinky), and rp (ring and pinky), which are unattested in ASL.

Following ASL-LEX and PM, flexion codes in ASL Signbank are categorical. That is, rather than providing a phonetic description of the flexion of individual joints, flexion codes describe nine categories of hand configurations that arise from combinations of flexion values of selected finger joints and configuration of the thumb in relation to the selected fingers. Selected finger joints may be "flat", "bent", or "curved." In "flat" configurations, selected fingers are flexed at the metacarpal joints only. In "bent" configurations, the distal and proximal joints are flexed. "Curved" configurations are those in which the selected finger joints are partially flexed. The thumb can be either "closed", in which case it contacts the fingers, or "open", in which case it does not. These finger and thumb configurations combine to produce seven contrastive categories. Two additional joint configurations – crossing and stacking – provide the last two possible values in the Flexion field.

When flexion changes due to handshape change or handshape-internal movement, only the initial state is coded. For asymmetrical two-handed signs, the values given in this field reflect the dominant hand configuration only. Below, each contrastive category resulting from the finger and thumb configurations just presented, is described, and an example is given. The first seven are coded in ASL Signbank by a numerical label, and the last two are simply named [Crossed] and [Stacked]. The possible values are listed below with examples:

1: fully open – finger joints fully extended and thumb unopposed, not contacting fingers (e.g. ABHOR[25])
2: bent or closed – (e.g. BATTERY[26])
3: flat open – metacarpal joints flexed, thumb not contacting fingers (e.g. GROWN-UP[27])
4: flat closed – metacarpal joints fully flexed, thumb contacting selected or non-selected fingers (e.g. BUY[28])
5: curved open – finger joints partially flexed, thumb not contacting fingers (e.g. HOT[29])
6: curved closed – finger joints partially flexed, thumb contacting fingers (e.g. EIGHT[30])
7: fully closed – finger joints fully flexed, thumb may or may not be contacting fingers (e.g. SHOES[31])
Crossed (e.g. DONUTneut[32]) – selected fingers crossed over one another (e.g. ROPE[33])

[15] ASLSignbank Sign ID 583
[16] ASLSignbank Sign ID 2092
[17] ASLSignbank Sign ID 707
[18] ASLSignbank Sign ID 2970
[19] ASLSignbank Sign ID 529
[20] ASLSignbank Sign ID 194
[21] ASLSignbank Sign ID 2065
[22] ASLSignbank Sign ID 1594
[23] ASLSignbank Sign ID 1519
[24] ASLSignbank Sign ID 2052
[25] ASLSignbank Sign ID 2040
[26] ASLSignbank Sign ID 345
[27] ASLSignbank Sign ID 2442
[28] ASLSignbank Sign ID 424
[29] ASLSignbank Sign ID 485
[30] ASLSignbank Sign ID 635
[31] ASLSignbank Sign ID 393
[32] ASLSignbank Sign ID 2419
[33] ASLSignbank Sign ID 663

Stacked (e.g. WORSE[34]) – different flexion value for each selected finger (e.g. ALLOWp[35])

3. Some specific issues with current phonological coding system

Through assessment of the application of phonological properties to both databases several discrepancies arose. As examples, we will focus here on two: one pertaining to finger flexion and one related to distinguishing path movement types. An example of when a flexion coding discrepancy becomes apparent is determining whether a sign should be considered [3] "flat open" versus [4] "flat closed". The other coding discrepancy discussed here relates to how movement types are distinguished, such as signs with repeated straight path movements as opposed to a back and forth movement, or signs with a repeated arc path movement as opposed to a circular one.

3.1 Distinguishing flexions

When considering the feature specifications for the thumb and index finger (note, this is currently not a possible selected finger combination in ASL Signbank, although it is actually a very common occurrence in signs, because the thumb is only considered selected when it is the only selected finger in our coding scheme), the options [ti] "flat closed", [ti] "curved closed" do not serve a distinctive function (likewise for any thumb and other single finger selection). For both of these the "secondary finger selections" can be either extended or closed, which would seem to result in four possible finger selection-flexion combinations, or handshapes; in reality, there are two: 'F' handshape  or a so-called 'baby-O' handshape  (with thumb and index contacting). What seems to be the issue for signs within the [ti] and either flexion specification (123 in total) is that the flexion feature is not contrastive (there are 198 signs in the ASL Signbank with the thumb and any other single finger selection and either flexion specification). One possible explanation for this could be that for signs that incorporate an unmarked handshape, flexion serves a more distinctive role, while in signs with marked handshapes, flexion is less pronounced. Or, when signs select for primary and secondary fingers, the primary finger contrast simply lies with closed or open features, while in signs that select for primary fingers only (no secondary selection), the features flat and curved provide additional needed contrast. Interestingly, when describing each flexion feature in the PM, each sign referenced involves all of the fingers ([timrp]), with the flexion categories examined here represented through KNOW-NOTHINGf[36] (curved closed) and KISS-MOUTHstr[37] (flat closed) (Brentari, 1998: 108).

3.2 Path movement discrepancies

The other phonological coding issue examined here relates to path movement discrepancies, and how path movement codes are (inconsistently) applied. The PM identifies movement types (*straight, arc,* and *circle*) and movement sequences (Brentari, 1998: 132). This latter category is where many issues arise in determining whether a sign's path movement should be considered to be repeated straight paths or a bidirectional path. For example, DUTYtap should be a repeated [Straight] path movement rather than bidirectional (i.e., [BackAndForth]; e.g. COMMUTE). Also, for signs like SEARCH[38], should this be a repeated upward [curved] path movement rather than circular (e.g. YEARs[39])? Furthermore, the PM does not discuss the movement sequence type described for signs such as SEARCH, or those that have repeated arc path movements.

Issues with the path movement coding scheme seem in part due to the application of features based on either a perceptual approach (more "global", or path movements taken altogether) versus how they are characterized and sometimes referenced with sign examples in the PM (Brentari 1998). As our coding scheme now stands, identifying DUTYtap as [Straight] seems "off", but this could easily be resolved by adding a [Repeat] feature of sorts. Explicating the distinction between movement sequences is necessary in order to uniquely characterize signs, and, in turn, will affect sign relation results, which is a primary focus of lexical databases.

3.3. General discussion of issues

The implications we can take away from these issues in using specific theories when applying to lexical database organization just outlined in 3.1 and 3.2 are that we need to consider pursuing a recursive/symbiotic relationship between theory and database-building. Issues that arise in database building can inform revision of theory – i.e. when the data contradict the theory. Database building can also support/confirm predictions made by theory.

Assessing both the ASL Signbank and ASL-LEX is particularly significant and necessary for further research based on lexical databases because the phonological coding system applied is, in some respects, a shorthand version of the PM. Even through comprehensive application of the PM, the issue of determining phonological distinctions is still unresolved, and so additional, thorough examination of data (evidence of contrastive units) would be beneficial for both theory and application (Eccarius & Brentari, 2008; Fenlon, Cormier, & Brentari, 2017). This has been acknowledged in other studies on sign language lexicons, such as BSL. In a study outlining the phonological structure of BSL through a usage-based lexical database, Fenlon et al. (2016: 39), concluded that "[o]ther issues to explore in more detail involve searching for evidence of lexical contrast". Furthermore, as explained by Fenlon, Cormier, and Brentari (2017), "[m]ore evidence is needed about lexical contrast in ASL and BSL before claims about particular contrastive units can be confirmed," and so the discussion of issues and discrepancies in this study is an initial step in that direction.

4. Implications for Theory

The examples we have seen so far might be considered conflicts or problems arising from application of a

[34] ASLSignbank Sign ID 1462
[35] ASLSignbank Sign ID 12
[36] ASLSignbank Sign ID 1693
[37] ASLSignbank Sign ID 165
[38] ASLSignbank Sign ID 537
[39] ASLSignbank Sign ID 656

particular theory or coding scheme. However, theory and resource building can, and ideally do, exist in a recursive, symbiotic relationship. Theory provides a foundation for the coding that makes a resource searchable and quantifiable; the act of coding then serves as a test of a theory's predictions, informing revisions where issues arise and confirming those predictions where application is successful. Importantly, whether a coding scheme is theoretically grounded or simply anticipates how a user may want to search a database, cases where its application is less than straightforward often lead to interesting research questions that can be addressed empirically. The remainder of this paper discusses a few examples of this complementary relationship between theory and database coding. The purpose of this section is not necessarily to provide specific solutions to the issues raised in the foregoing discussion but, rather, to present examples of ways in which insights from database building can reveal paths for theoretical research.

One area of ASL Signbank that poses a challenge is categorization of the handshape for the nondominant hand in asymmetrical two-handed signs (those in which the nondominant hand remains stationary). When the two handshapes differ, the coding scheme inherited from ASL-LEX, following Battison's (1978) typology of two-handed signs, restricts the nondominant hand handshape to one of seven possibilities: 1 (e.g. AVOIDix[40]), 5 (e.g. POLICY[41]), A (e.g. TECH[42]), B (e.g. DOLLAR[43]), C (e.g. GET-IN[44]), O (e.g. QUIT[45]), or S (e.g. APPOINTMENT[46]). When the nondominant hand of an asymmetrical two-handed sign cannot be categorized as one of these seven options, the sign is considered to violate Battison's Dominance Condition and is labelled as "Other" in ASL Signbank. Applying this catchall category will allow us, once enough data are collected, to ask questions about what leads to violations of the Dominance Condition and in what ways it can be violated. For example, in the ASL Signbank production of CHAIR[47], the dominant hand has index and middle finger partially extended (curved), while the nondominant handshape has index and middle fully extended.

In another example of a Dominance Condition violation, HELICOPTERthree[48], the nondominant hand handshape has thumb, index, and ring finger fully extended (), while the dominant hand has a 5 handshape.

Both of these examples are still closely related to depictive origins. Furthermore, in CHAIR the two handshapes differ in flexion only and, in HELICOPTERthree, in selected finger combination only. Thus we might ask whether a sign could violate the Dominance Condition by two handshapes that differ in both flexion and selected finger combination and/or whether violations of the Dominance Condition are always in signs closely resembling depictive origin. The potential to understand iconicity and phonology as opposing forces shaping signed languages is a central question in the field which can be probed by cases like these[49].

A second question arises from another issue that is highlighted by categorization of the nondominant hand handshape in ASL Signbank: namely, how to treat signs in which a site on the opposite arm or forearm serves as the location for the dominant hand, but the nondominant hand may or may not be specified for a particular handshape. It is unclear whether it is appropriate to categorize these signs within the handedness typology currently available in ASL Signbank and/or to specify a handshape for the nondominant hand. For example, the sign CRACKER[50] is produced in ASL Signbank with an A handshape on both hands, but it is the elbow location that seems phonologically relevant rather than the nondominant hand handshape.

It can also be difficult to determine the boundary between arm as location, as appears to be the case in CRACKER, and nondominant hand as weak hand if the dominant hand articulates on the wrist or near the base of the hand (e.g. TIME[51]).

Collection and coding of more entries of these types will allow us to address these questions regarding handedness, and it is the application of a set of categories which brings these ambiguous cases into relief.

Of course, not all methods of database organization are based in linguistic theory; some organization applied for purposes of searchability do not necessarily reflect assertions about the grammar but rather how researchers anticipate users may want to search a database. Nevertheless, these methods of organization can lead to questions about lexical categories.

For example, the "Relations to Other Signs" field in ASL Signbank marks connections between signs that users may be interested in but which may or may not reflect relationships in the grammar. Some relations have established definitions, e.g. "Synonym" and "Variant." The catchall category "See Also" links signs in ways that may not yet be clearly understood, which can lead to interesting research questions about lexical organization that can be tested empirically. One such relationship is initialized signs sharing iconic motivation. For example, one paradigm of semantically related signs all share an iconically motivated symmetrical arc movement on each hand produced in neutral space. These signs are differentiated in form only by their handshapes, which correspond to those of the ASL fingerspelling system, reflecting the first letter of a written English translation of each sign's meaning. The signs in ASL Signbank belonging to this group are AGENCY[52],

[40] ASLSignbank Sign ID 2411
[41] ASLSignbank Sign ID 913
[42] ASLSignbank Sign ID 1183
[43] ASLSignbank Sign ID 1268
[44] ASLSignbank Sign ID 778
[45] ASLSignbank Sign ID 786
[46] ASLSignbank Sign ID 2074
[47] ASLSignbank Sign ID 378
[48] ASLSignbank Sign ID 481
[49]We are thankful to an anonymous reviewer for raising this point.
[50] ASLSignbank Sign ID 647
[51] ASLSignbank Sign ID 1233
[52] ASLSignbank Sign ID 2055

CLASS[53], GROUPg[54], FAMILY[55], LEAGUE[56], ORGANIZATION[57], SOCIETY[58], and TEAM[59] (as well as the ASL sign for "union", not currently listed in ASL Signbank) as shown in Figure 1.

Figure 1: Images of signs that share iconically motivated movement (ASL Signbank, 2020)

Although these relationships are marked only for the sake of searchability, we might ask whether their relationship is metalinguistic and diachronic only or whether it holds some synchronic reality in the lexicon. (For discussion of lexical categories based on iconic motivation, see Occhino 2017, and for evidence of synchronic relationship between ASL signs and written English words, see Morford et al. 2011). This question could be explored through experimental means such as lexical priming tasks. Again, it is the imposition of structure on a database that raises this question, and thus an example of how resource building can lead to theoretical linguistic investigation.

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