

# Word classes in sign languages

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## Abstract

This chapter discusses word classes as applied to signed languages of the world. The chapter provides an overview of various definitions and analyses that have been used to establish word classes in different sign languages. Such definitions are based not only on morphological and syntactic criteria, but also on how the gestural–visual modality affects word classes in terms of iconicity and word formation within and across sign languages. Some of the modality effects on word formation and categorization have in turn also been applied and compared to the gestures of non-signers. Following previous and current work on lexicography and corpus linguistics for sign languages, the chapter also describes some methodological issues and advances in documenting, defining, tagging, and utilizing word classes within these areas of research.

**Keywords:** sign languages, word class, part of speech, word formation, morphology, syntax, modality, gesture, corpus linguistics

## 1. Introduction

Sign languages are full-fledged, natural, human languages, found across the globe, within and around different communities of signing and speaking people. Sign languages are quite often referred to as a group of languages, although they constitute neither a genealogically nor a typologically uniform group (see e.g. de Vos & Pfau 2015; de Vos & Nyst 2018). In fact, what unifies sign languages is the *modality*, being produced and perceived in a gestural–visual form rather than the vocal–auditory form of spoken languages. As such, the relevant contrast is one of modality – that is, between signed and spoken languages.

Nevertheless, in this chapter, we will attempt to summarize some of the key aspects of previous work on word classes (or, *sign* classes) of languages in the signed modality. Our aim is to provide an overview of work done on individual languages without making any assumptions about the universality of any findings as applicable to *all* signed languages. It should also be noted that sign language linguistics is still a relatively young field of research, having emerged only in the 1960s–1970s, which also accounts for the fact that most if not all sign languages should still be considered under-studied (McBurney 2012).

This chapter consists of five parts, moving from considerations pertaining to the visual modality and signed language structure to theoretical definitions and applied methods for identifying and positing word classes in various sign languages, followed by a general summary. Section 2 will first introduce some key considerations concerning language as realized in the gestural–visual modality, indicating

how these may affect the linguistic analysis of language structure. Section 3 will provide an overview of the word classes that have been postulated in individual sign languages, on the basis of both semantic and morphosyntactic criteria. Section 4 looks at the experimental and data-driven approaches used to find and label word classes using elicitation- and corpus-based methods. Section 5 concludes the chapter with a summary.

## 2. Modality and structure

In this section, we discuss how the modality and structure of signed languages give rise to cases that do not always fall into traditionally defined categories of neither words nor word classes. Section 2.1 introduces the general modality effects, focusing on simultaneity and information-stacking due to multiple articulators. Section 2.2 gives examples of expressions that are not always categorized as (lexical) signs and thus often fall outside of word class discussions in the literature. Section 2.3 outlines language contact phenomena that also influence word class categorizations. Finally, section 2.4 gives an interim summary, bridging into section 3, in which the more traditional and easily defined signs and word classes are discussed.

### 2.1 Sign language structure

Although there is no longer any doubt within the linguistics community that sign languages are full-fledged, natural human languages, the fact that they use a different modality has some consequences on their structural properties – part of *modality effects* (Meier 2012). One property of sign language structure that is clearly distinct from that of spoken language structure is, of course, phonology. By using the gestural–visual modality, basic units of linguistic building blocks look fundamentally different: there are no vowels or consonants, and signs are not formed by controlling air flow to produce sound waves. Sign languages are produced using a combination of individuated articulators – hands, torso, head, mouth, and facial gestures – that can move in a synchronized fashion or more or less separately. This allows sign language structure to encode a linguistic signal by stacking rather than sequencing information – that is, being more simultaneous than linear. A spoken signal may obviously express stacked information too, in the sense of adding suprasegmental features such as pitch on top of the phonemes, but signing is unique in the sense of also having paired, identical articulators in the two hands/arms as well as non-manual markers (gaze, eyebrows, posture, etc.), and thus the amount of simultaneity possible. Some features of the simultaneous potential of signed language will prove important in the discussion of word classes. This includes the use of non-manual marking, simultaneous use of a secondary hand, and the definition of morphological processes and syntactic structure in terms of sequential vs. simultaneous modification.

### 2.2 What is (not) a sign?

An often debated topic in sign language linguistics involves the definition of a *sign*. This is mostly based on a debate around the definitions of signs vs. gestures, but also whether there are some meaningful depicting constructions that should not be considered fixed sign forms but rather productive types of enactment (e.g. Liddell 2003; Hodge & Johnston 2014a,b; Ferrara & Hodge 2018; Hodge & Cormier 2019). In this section, we summarize the main types of signs and expressions that have been discussed in the literature as potentially falling *outside* the core definition of (lexical) signs, which in turn complicates their categorization with regard to word classes. Here, we briefly describe

gestures and pointing, depiction and enactment, and discourse-type elements researched within the field, along with discussions on how these relate to word classes.

When it comes to gestures, there are signs that are likely direct incorporations of *emblems* – that is, fixed, conventionalized, culture-dependent gestures that replace whole words, such as thumbs-up for ‘good’ – into sign languages (see Figure 1). This is because sign languages are often used as a minority language surrounded by a larger hearing non-signing community with its own gestural conventions and semiotic repertoire (cf. Kendon 2008). Since emblems can replace entire words or sentences, they can be difficult to categorize into word classes.



Figure 1: A sign variant meaning ‘good’ in Swedish Sign Language (Swedish Sign Language Dictionary online 2020: #12077).

This is a problem that pertains to their use in sign languages too, with the additional complication that they are linearly sequenced in the same modality and production stream/channel as other signs. Although easier for cases such as thumbs-up in Figure 1, it becomes far more complicated with forms such as the so-called “palm(s)-up gesture” (Figure 2). The palm-up gesture has been found to express a wide range of pragmatic discourse functions across both gesture and sign language communities, often associated with interrogative, epistemic, or turn-regulating functions (Cooperrider et al. 2018). In fact, this specific gesture has been found to occur across many sign languages, and with high lexical frequency at that (Börstell et al. 2016).

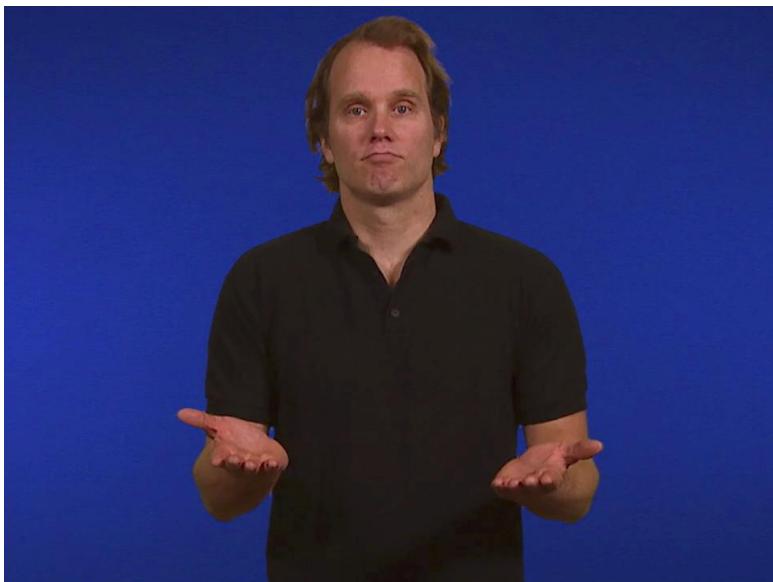


Figure 2: The palm(s)-up gesture/sign (Swedish Sign Language Dictionary online 2020: #18717).

Another obvious overlap in form across sign languages and gesture is the use of pointing signs. Pointing is prevalent across many cultures – although the form-specifics may differ (as in which body-part or configuration thereof is used for indication) – and also ubiquitous in sign languages, constituting the highest frequency signs in all corpus-based lexical frequency studies to date (Börstell et al. 2016; Fenlon et al. 2019). Fenlon and colleagues (2019) show that what appears to be obvious similarities in the use of pointing across sign and gesture exhibit form and distributional differences at closer inspection. This includes sign language pointing being more consistent in the use of some form parameters (one-handed pointing, and contact with the chest for self-points), suggesting that although pointing as a communicative strategy across sign languages and gesture have similar origin and function, the specifics get more detailed when adapted into a sign language as it becomes more entrenched in the linguistic system. Furthermore, pointing is used with equivalent functions to pronouns and demonstratives in sign languages, but especially the pronoun status has been questioned since pointing forms are context-dependent and theoretically infinite in number – that is, not listable, specified forms (see e.g. Lillo-Martin & Klima 1990; Cormier et al. 2013; Johnston 2013; Hou & Meier 2018, for discussions).

Regarding depicting constructions, most, if not all, sign languages seem to use complex enactments – either embodied as taking on a character’s physical being (called *character perspective*), or by mapping referents to different articulators of the body (called *observer perspective*). For many action-depicting signs, this is the iconic motivation behind the sign: showing how the action is being performed (e.g. ‘to hammer, a hammer’; Figure 3). However, such constructions may also be much more elaborate, including several different referents mapped onto separate articulators (Dudis 2004), including adverbial/emotional information and complex manner descriptions (e.g. ‘person angrily hammering a round object flat’). Some have argued that these types of *depicting* or *enacting* (Liddell 2003; Hodge & Johnston 2014a,b; Ferrara & Hodge 2018; Hodge & Cormier 2019) would be outside the regular “lexicon” in the sense that lexical sign forms, themselves initially formed on the basis of action depiction, revert back to a productive and modifiable iconic depiction in a sort of “de-lexicalization” (Cormier et al. 2012, but see also Lepic & Occhino 2018 and Lepic 2019 for an alternative view). Bergman & Dahl (1994) argued that certain depicting constructions may better be described as a type of ideophones, with a visual sensory depiction. Analogously, Mesch and colleagues (2015) describe signing of sensory depictions with touch among signers using tactile

signing – i.e. the tactile form of signing used primarily by deafblind signers. Although most linguists would probably agree on depicting constructions being closest to verb-like structures, there is clearly overlap with other word classes in the – often simultaneously layered – expression of property (adjective-like), manner (adverb-like), and “sensory imagery” (ideophone-like; Dingemanse 2012:655).

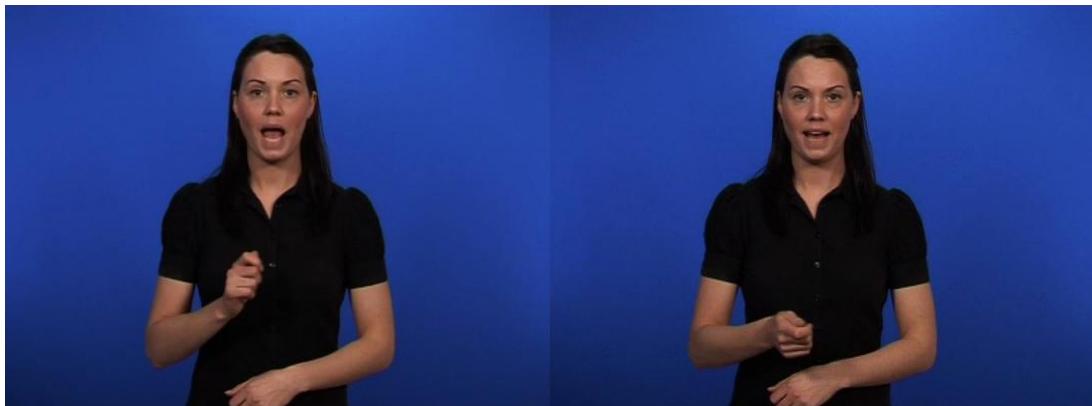


Figure 3: The sign HAMMER in Swedish Sign Language (Swedish Sign Language Dictionary online 2020: #03829)

Another category of simultaneous construction is the so-called *buoys* used across many sign languages. These are mainly discourse-regulating signs often articulated on the non-dominant hand simultaneously with the “main” signing on the dominant hand. These signs are used for tracking individual referents or discourse topics, item-listing (Figure 4), or anchoring reference points in time and space (Liddell et al. 2007; Gabarró-López 2019). To the best of our knowledge, no one has attempted to classify buoys as falling into any traditionally defined word class, nor are they regularly listed in dictionaries. Nonetheless, they are similar in form to (demonstrative) pointing signs (topic- or referent-tracking) or numerals (item-listing), and may occur frequently in discourse.



Figure 4: A list buoy in Swedish Sign Language: three items listed on left hand; right hand points to each in turn before signing a comment about the associated listed referent (Swedish Sign Language Dictionary online 2020: #00074, phrase 2)

## 2.3 Language contact and borrowing

In many national sign languages, there is a manual alphabet in use. Manual alphabets encode written words by representing letter-by-letter strings of handshapes, each representing a written letter of the

alphabet.<sup>1</sup> Although, in theory, any written word can be fingerspelled and thus borrowed into a sign language, one study on American Sign Language (ASL) showed that 70% of fingerspelled signs in discourse are nouns (evenly distributed between common and proper), followed by adjectives (10%) and verbs (6%) (Padden & Gunsauls 2003). Fingerspellings can also be part of word formation processes, such as part of a compound together with a non-fingerspelled item (Padden & Gunsauls 2003), or by adding a borrowed derivational morpheme to a lexical sign, such as the H-E-T for Swedish *-het* ('-ity'), which can be added to verbs and adjectives to form nouns in Swedish Sign Language (see Figure 5).



ACCESSIBLE

H(-E-T) ‘-ity’

Figure 5: The sign ACCESSIBLE<sup>^</sup>H-E-T ('accessible'+'-ity' = 'accessibility') in Swedish Sign Language (Swedish Sign Language Dictionary online 2020: #08617)

Besides borrowing from a spoken language (in a written form), sign languages also borrow signs from other sign languages, for instance as a contact phenomenon between neighboring languages (Quinto-Pozos 2008). Borrowing also happens through globalization and contact with geographically distant sign languages, for example often replacing exonymic toponyms with borrowed endonymic ones from the referenced region. However, the borrowing may lead to changes in meaning or function, such that it also affects the word class. One example is the sign WHAT'S.UP in ASL which is used as a question phrase 'what's up?', but has been borrowed into Swedish Sign Language with the meaning 'WhatsApp' (the messaging app) on the basis of mapping onto the (written/spoken/mouthed) *name* rather than the original *function* of the sign (Figure 6).<sup>2</sup>

<sup>1</sup> Such manual alphabets may encode different writing systems, such as Latin script in most European-derived sign languages, Cyrillic for e.g. Russian Sign Language, and kana-based characters for Japanese Sign Language.

<sup>2</sup> The use of WHAT'S.UP for the messaging app seems to be found among some signers of ASL too, albeit not very widespread (Lynn Hou, p.c.).



Figure 6: The sign WHATSAPP in Swedish Sign Language, borrowed from the ASL phrase ‘what’s up?’ (Swedish Sign Language Dictionary online 2020: #04672)

## 2.4 Interim summary

As shown in the subsections above, sign languages contain several types of signs and expressions not easily categorized into traditional word classes, many of which are rarely even discussed in relation to word classes at all. In some cases, modality is part of the difficulty in categorizing signs – e.g. with buoys and other (partly) simultaneously articulated elements. In other cases, language contact situations – both signed-to-signed and spoken-to-signed languages – give rise to borrowings in which the source is altered in a way that changes the word class assignment (e.g. WHATSAPP, Figure 6), or fingerspelling as a strategy for borrowing not only the form but also derivational patterns from another language (e.g. derivational suffixation, Figure 5). Although there are many types of signs across signed languages that have not yet been investigated with regard to word classes, others, such as nouns and verbs, have in fact been discussed extensively across relatively many languages: the categories and criteria established for word classes across sign languages are discussed in Section 3.

# 3. Categories and criteria

## 3.1 Categories

For most sign languages, a basic distinction between nouns and verbs (at least for a part of the lexicon, see below) has been proposed. Such claims have been made for ASL (Supalla & Newport 1978; Brentari et al. 2013; Abner 2017), Auslan (Australian Sign Language) (Johnston 2001), Austrian Sign Language (Hunger 2006), Catalan Sign Language (Ribera-Llonc et al. 2019), Israeli Sign Language (Tkachman & Sandler 2013), Russian Sign Language (Kimmelman 2009), Turkish Sign Language (Kubus 2008), and many others. A recent comparative handbook of sign languages of the world (Bakken Jepsen et al. 2015) contains short chapters on 33 sign languages, and although the issue of the distinction between nouns and verbs is not addressed explicitly in every chapter, the existence of these two word classes is acknowledged, at least in passing, for Argentine Sign Language, Austrian Sign Language, Danish Sign Language, Finnish Sign Language, Greek Sign Language, Malaysian Sign Language, and Spanish Sign Language. For French Sign Language and Norwegian Sign Language, it is claimed that this distinction does not apply (but note that these

chapters do not offer detailed discussions of this issue). In other chapters, even when the difference between nouns and verbs is not mentioned, it is often implied by the inclusion of separate sections on nominal and/or verbal morphology (e.g. for Libras [Brazilian Sign Language], Chinese Sign Language, Hausa Sign Language, and others).

Adjectives is another word class that is often mentioned in sign language literature (see Loos 2014 for an overview). However, researchers quite often question whether adjectives form a separate word class, or whether they should instead be analyzed as instances of nominal and verbal signs (e.g. Takkinen et al. 2015 for Finnish Sign Language).

Adverbs are even less studied than adjectives, and sometimes occur as part of more expressive depicting constructions as discussed above, and sometimes exclusively as non-manual features (e.g. Liddell 2003; Dudis 2004). Nevertheless, the label is still often used, even without a detailed motivation for the existence of this class.

Pronouns (which in sign languages are usually indexical/pointing signs) are usually discussed as a separate word class in most sign languages (e.g. in most chapters in Bakken Jepsen et al. 2015), as well as in the corpus-based studies discussed below. However, as discussed in Section 2.2, they are not always considered to be fully lexical signs. This non-lexicalized or gestural view of pointing signs has often been motivated in terms of listability: the potentially infinite number of variations in context-dependent pointing would render these signs impossible to list in a “lexicon”, which would mean that they cannot be a part of a fixed, pronominal paradigm as assumed in the structuralist tradition. However, there are pointing signs with other pronominal-like functions across sign languages, such as possessive markers, which may use a different handshape than index points but are directed towards the location of the associated referent in the same manner (see Figures 7 and 8).



Figure 7: The sign POSS<sub>1</sub> ('my') in Swedish Sign Language (Swedish Sign Language Dictionary online 2020: #00187)



Figure 8: The sign POSS<sub>2</sub> ('your') in Swedish Sign Language (Swedish Sign Language Dictionary online 2020: #00275)

In some sign languages, mainly across the Nordic countries but also in the unrelated Israeli Sign Language, there are dedicated object pronouns in use. These appear to be cases of differential object marking and also exhibit some common features of a pronominal paradigm, such as making formal distinctions in both person and number. For example, in Swedish Sign Language, the object pronoun can be used with 2<sup>nd</sup> person plural but never 3<sup>rd</sup> person plural, which goes against this language only making a first- vs. non-first person distinction (Börstell 2019).

Another interesting category of signs across sign languages is proper nouns. Proper nouns can often be fingerspelled or initialized (using the first letter of the name as the handshape – see Padden & Gunsauls 2003), but may also be given a regular sign, most often referred to as a *name sign* (or *sign name*). Name sign conventions differ in form and motivation across sign languages (see Lutzenberger 2018 for an overview). Whereas some sign languages prefer arbitrary signs with initialization (common naming convention in the ASL community – see Supalla 1990), others prefer motivated signs based on property- or action-descriptive signs for individuals (common in the Swedish Sign Language community – see Börstell 2017). In Swedish Sign Language – and other sign languages – such descriptive signs can be chosen from various other word classes, such as adjectives (e.g. HAPPY), verbs denoting general actions (e.g. HORSE.RIDING, for a person who likes going horseback riding), or verbs depicting an action that the individual is known to perform habitually (e.g. SCRATCH.HAIR). Thus, signs that are motivated and formed into one word class can be transferred to a name sign (i.e. noun) function through this naming process.

Studies focused on creating and analyzing sign language corpora and databases often use a larger number of word classes for annotation. For instance, in a corpus-based study of lexical frequency in Auslan, Johnston (2012) uses the following classes for “lexical signs”: nouns, verbs, adjectives, adverbs, auxiliaries, prepositions, wh-signs, conjunctions, interjections, discourse markers. At the same time, he notes that the classes are mostly defined based on the ID gloss (the unique English word label for each sign) (Johnston 2012:178), and that a real analysis of word classes in Auslan would require further corpus-based research.

## 3.2 Semantics

In the literature on sign languages, it is commonly accepted that many of the same semantic categories and features are relevant across modalities. Therefore, major word classes are often defined using

terms familiar from spoken language descriptions. Typically, nouns are associated with objects/entities, verbs with actions/events, and adjectives with properties.

One of the most detailed descriptions of the semantic basis of word classes in sign languages is provided in Schwager & Zeshan (2008), and applied to German Sign Language (DGS) and Kata Kolok. The authors argue that word classes should be defined in terms of semantic features, and assume these features to be universal. They define three major semantic classes (entity, event, and property), and further subdivide them into a large number of small categories defined by binary features (e.g. [ $\pm$ proper], [ $\pm$ concrete], [ $\pm$ count] for nouns; [ $\pm$ dynamic], [ $\pm$ agentive], [ $\pm$ telic] for verbs). They demonstrate that, for the semantic categories defined this way, they can find signs in both DGS and Kata Kolok. However, they do not discuss in any detail how they ascertained that the signs indeed have the ascribed semantic features.

In other studies, the common associations between word class and semantics is often assumed without detailed investigation.<sup>3</sup> In the majority of experimental studies, which we discuss below, the semantic basis for word classes is presupposed in the experimental design: stimuli depicting objects are expected to elicit nouns, and stimuli depicting actions/events are expected to elicit verbs.

### 3.3 Formal criteria of word classes

#### 3.3.1 Phonology of related noun–verb pairs

Many sign languages investigated to date show a curiously similar pattern: there are some semantically related noun–verb pairs for which the nominal and the verbal signs are similar in form, but different in some phonological component (typically movement). This pattern, first described for ASL by Supalla & Newport (1978), is not only attested in the majority of sign languages for which this issue has been investigated, but also in so-called homesign systems (Abner et al. 2019).<sup>4</sup>

Consider the following example from Kimmelman (2009: 172–173). In Russian Sign Language (RSL), the signs LIGHTER and LIGHT.LIGHTER are very similar in form (Figure 9); however, they differ in a number of features. The nominal sign contains repeated movement (vs. single movement in the verbal sign), the amplitude of the movement is smaller (more restrained) in the noun, and the more distal joints (e.g. finger joints instead of the elbow) are used in the nominal sign. Other RSL noun–verb pairs that show the same pattern include COMB ~ TO.COMB, HAMMER ~ TO.HAMMER, and BOOK ~ OPEN.BOOK. In addition, the nominal signs in RSL are more frequently accompanied by a mouthing (the silent miming of [part of] a spoken word on the mouth) than verbal signs, which often are accompanied by mouth gestures (mouth movements not related to spoken words). Other formal differences between related nouns and verbs in other sign languages include absence vs. presence of movement, and the use of the non-dominant hand in verbs as reported for ASL, Nicaraguan Sign Language, and homesign by Abner et al. (2019). For some languages, including ASL and Italian Sign Language (LIS), it has been shown that there is a systematic handshape difference between related

<sup>3</sup> While the reliance on semantics is acceptable for purposes of cross-linguistic comparison (Haspelmath 2010), it is clearly not adequate for descriptions of word classes in specific languages, where word classes should be defined morphosyntactically.

<sup>4</sup> Isolated signed communication (e.g. within a single family) without an existing language model is sometimes referred to as “homesign” – cf. Kusters & Hou (2020) for a critical discussion on labels for different ecologies of signing.

nouns and verbs, the nouns preferring the so-called object handshapes (related to the shape of the physical object/entity) and the verbs preferring the handling handshapes (related to the shape of the hand manipulating an object/entity) (Brentari et al. 2015; Goldin-Meadow et al. 2015; Padden et al. 2015).



Figure 9: LIGHTER (2 frames) vs. LIGHT.LIGHTER (2 frames) in RSL (from Kimmelman 2009: 172–173).

The pattern of formally related noun–verb pairs has been described for ASL (Supalla & Newport 1978), Auslan (Johnston 2001), Turkish Sign Language (Kubus 2008), Italian Sign Language (LIS) (Pizzuto & Corazza 1996), Austrian Sign Language (Hunger 2006), Israeli Sign Language, (Tkachman & Sandler 2013), Nicaraguan Sign Language (Abner et al. 2019), and homesign

(Hunsicker & Goldin-Meadow 2013, Abner et al. 2019). In the comparative handbook (Bakken Jepsen et al. 2015), this phenomenon is also mentioned for Danish Sign Language, Greek Sign Language, and Malaysian Sign Language. Note that the formal differences between nouns and verbs are not the same across different languages (see Abner 2019: 232–233 for a comparison), and also within one language there is variation for different noun–verb pairs in terms of which of the features specifically distinguish between nouns and verbs (see e.g. Johnston 2001; Kimmelman 2009).

Two points are worth mentioning concerning these noun–verb pairs. First, no study has shown that all or even a majority of verbs in any sign language form such pairs. Most studies are focused only on nouns referring to concrete objects ('hammer', 'comb', 'door', etc.) and verbs describing activities involving these objects as instruments or themes ('to hammer', 'to comb', 'to open a door'). However, all studies also report that, for some concepts, the same sign can be used nominally or verbally without modification, and that for others verbal and nominal signs are unrelated. An exception is Abner (2017) who demonstrates that the systematic formal relation between nouns and verbs in ASL also applies to abstract verbs (e.g. ACCEPT, JOIN, SUPPORT), but no comparable findings are reported for any other sign language. Even for ASL, there is no large-scale lexical study showing what percentage of noun–verb pairs are indeed related but distinct in form.

Second, it is striking that formally similar and semantically related noun–verb pairs are found across a majority of sign languages for which this specific issue has been investigated, but even more striking that such pairs are also found in the first generation of an emerging sign language (Nicaraguan Sign Language), as well as in homesign – that is, in the absence of an accessible full-fledged language or even a language community (Hunsicker & Goldin-Meadow 2013; Abner et al. 2019). This has led various researchers to argue that the entity–event distinction is universal and cognitively important, which means that distinguishing the two semantic categories by grammatical means is indispensable in communication, and, in addition, that there is an iconic basis for such a distinction in sign languages. For instance, Kimmelman (2009) argues that verbs in such pairs are iconic depictions of the events, while nouns are less iconic (being reduced in size and details of articulation due to economic considerations). Abner et al. (2019) argue that the use of repetition for nouns (in comparison to verbs) is iconically linked to iterability of the event associated with the object. Recent experiments with non-signers categorizing gestures with handshape and/or movement distinctions as referring to either objects or actions have shown that the handshape distinction (instrument-depiction = noun; handling-depiction = verb) is stronger than movement distinctions (Lepic & Verhoef 2020; Emmorey & Pyers 2020). Although there may be language-specific preferences for encoding objects (nouns) and actions (verbs) systematically with e.g. handshape distinctions, some patterns seem to extend also to the gestures of non-signers.<sup>5</sup> However, research on more sign languages and homesign systems is required to support this conjecture.

### 3.3.2 Morphological modifications

As discussed above, major word classes in sign languages have some morphological and syntactic properties that have been used to formally distinguish them from each other. In this and the following sections we discuss the main properties that have been associated with verbs, nouns, and adjectives in different sign languages.

<sup>5</sup> Recent work has also shown that handshape choices for action signs are driven by agent-(de)focusing (Rissman et al. 2020) – thus, this type of distinction may be more gradient as it is variable even within a proposed semantic category (i.e. actions).

However, two notes of caution are in order. First, as in the case in spoken languages, morphology and syntax vary between sign languages, so it is very likely that there is no single morphological or syntactic feature that would in all sign languages distinguish e.g. nouns from verbs. For instance, Schwager & Zeshan (2008: 538) demonstrate that DGS and RSL have a large number of verbal morphological categories, but that Kata Kolok lacks most of these. Second, at least for morphological categories, they very often target only subclasses of the major word classes in sign languages. For instance, subject–object agreement (see below) is clearly a verbal category, but only a subclass of verbs (namely, agreeing verbs) shows such agreement. In sign languages, as in spoken languages, the intensive modification (morphological or syntactic) of adjectives only applies to gradable adjectives (Loos 2014).

The most frequent verbal categories in sign languages are verbal agreement (Lillo-Martin & Meier 2011, but see also Schembri et al. 2018) and verbal aspect. Some verbs in most sign languages (but not all: Schwager & Zeshan 2008) can be modified in movement and/or orientation to indicate the subject and object referents. Referents can be associated with locations in the signing space, so the movement and/or orientation in agreeing verbs can use these locations to assign the subject/object syntactic functions to the referent. This is illustrated for the RSL verb HELP in Figure 10 for the 1<sup>st</sup> and 2<sup>nd</sup> person referents, but the same mechanism also applies to 3<sup>rd</sup> person referents.



Figure 10. The RSL signs  $_1\text{HELP}_2$  'I help you' and  $_2\text{HELP}_1$  'You help me'.

This type of movement and/or orientation modification involving two locations is not found in nominal signs, not even in relational nouns that would have arguments with which they could potentially agree. However, as we discussed above, sign languages also have non-agreeing verbs (which cannot be modified) and spatial verbs (which are modified to describe movement of a referent), which do not show this double location type of agreement modification either.

In many sign languages, verbs can also be modified for aspect (e.g. iterative, habitual, inceptive, etc.) by altering movement and/or location in various ways, and/or by adding the second hand (Schwager & Zeshan 2008; Wilbur 2009). The simplest case is that iterative aspect is often marked by simple reduplication. Sometimes, however, formally identical modifications may also be applied to nominal signs to express collective or distributive plurality (Pfau & Steinbach 2006, 2016; Wilbur 2009; Kuhn 2019).<sup>6</sup> Therefore, the purely formal criterion of whether a certain type of reduplication is applicable

<sup>6</sup> The same is true for distributive marking, which is typically associated with verbal signs, but can often apply to nouns and numerals as well (Kimmelman 2017).

to a sign does not distinguish word classes; one needs to consider the interpretation of the marker, which depends on the word class.

Some other morphological modifications that are word class-specific are negative affixes and clitics, which only attach to verbal signs mentioned by Schwager & Zeshan (2008)<sup>7</sup>, intensive modification, restricted to scalar adjectives (Padden 1988), and – in between morphology and syntax – nominal classifiers that can accompany nouns (e.g. Pizzuto & Corazza 1996 for Italian Sign Language [LIS]; Tkachman & Sandler 2013 for Israeli Sign Language and Al-Sayyid Bedouin Sign Language; Safar & Petatillo Chen 2020 for Yucatec Maya Sign Languages). As for the latter, nouns in some sign languages can be accompanied by a Size-and-Shape Specifier (SASS) referring to the shape of the denoted entity – see examples (1) and (2). Figure 11 illustrates the RSL SASS for rectangular.

- (1) LIPSTICK SMALL.OBJECT.SASS [Israeli Sign Language]  
‘A lipstick.’ (Tkachman & Sandler 2013: 270)
- (2) BOX RECTANGULAR.SASS [RSL]  
‘A rectangular box.’ (RSL corpus: <http://rsl.nstu.ru/data/view/id/342/t/6370/d/7500>)



Figure 11. The RSL sign RECTANGULAR.SASS

Similarly to SASSes, some sign languages have noun classifiers that are compound-like structures of a sign (of a lexical word class) and a free morpheme that functions as a derivational morpheme. Perhaps the most famous derivational morpheme is what has been referred to as an “agentive marker” in ASL (e.g. Padden 1988) and a “noun classifier” in Swedish Sign Language (Bergman & Wallin 2001, 2003). Although the forms differ between the two languages, the origin and use of the signs are similar, since both stem from a sign meaning ‘person’ and being added to nominalize and agentivize some meaning. For example, ASL TEACH^AGENTIVE = ‘teacher’, and Swedish Sign Language TO.TRAIN^PERSON = ‘trainer, coach’ (see Figure 12). In Swedish Sign Language, this sign is used to nominalize signs from various word classes, including agentivizing/individuating other nouns, such as its use with name signs for countries (i.e. toponyms) as a demonym (e.g. AMERICA^PERSON = ‘an American’). In addition, it may have certain discourse functions, e.g. introducing referents (Bergman & Wallin 2001, 2003), and in several sign languages – e.g. DGS and Swedish Sign Language – it can be used to pluralize nouns with reduplicated and/or sideward movement (Pfau & Steinbach 2006).

<sup>7</sup> Negative affixes can only attach to verbs in the languages discussed by Schwager & Zeshan (2008); in other languages they can also attach to adjectives (Tomaszewski 2015), so this is a language-specific criterion – also, see Wilkinson (2016) for a discussion on negation collocations, frequency, and chunking in ASL.



Figure 12: The sign TO.TRAIN^PERSON ('trainer, coach') in Swedish Sign Language (Swedish Sign Language Dictionary online 2020: #13035)

### 3.3.3 Syntactic properties

The major word classes in sign languages are commonly associated with the major syntactic roles: nouns are typically subjects and objects, verbs are used as heads of clauses, and adjectives are nominal modifiers (Padden 1988; Schwager & Zeshan 2008; Loos 2014). Naturally, the order of the major constituents differs across different languages (cf. Leeson & Saeed 2012; Napoli & Sutton-Spence 2014), so the tests have to be language-specific.

Padden (1988) was probably the first to discuss syntactic tests for word classes in ASL. She argued that nouns can be modified by quantifiers, such as FOUR, while verbs and adjectives cannot, and that verbs cannot be pre-posed modifiers of other signs (\*RUN SHOE), while nouns and adjectives can. Schwager & Zeshan (2008) use similar criteria for word classes in DGS and Kata Kolok. Pizzuto & Corazza (1996) argue that only nouns in LIS can be modified by possessives and adjectives. Johnston & Schembri (1999) argue that adjectives in Auslan can be distinguished as a separate class because only they can be preceded by modifiers like MOST and VERY. Abner et al. (2019) in an experimental study demonstrate that verbal signs in ASL and Nicaraguan Sign Language are more likely to be clause-final than nominal signs.

An important point discussed by Schwager & Zeshan (2008), as well as many others (e.g. Johnston & Schembri 1999; Johnston 2001; Loos 2014) is that many signs in different sign language appear to be flexible and can, for instance, appear in both argument and predicate positions, as illustrated in (3)–(4) for RSL. This would mean that word order alone is not enough to distinguish word classes.

- (3) DEAF ENTER [RSL]  
‘A deaf person enters.’
- (4) INDEX<sub>1</sub> EXIST DEAF FRIEND [RSL]  
‘I have a deaf friend.’

Interestingly, Schwager & Zeshan (2008) show that, in Kata Kolok, most signs are not flexible, and can only serve one syntactic function; for instance the sign DEAF can be used as a noun but not as an adjective (5)–(6). This may be related to the fact that, as mentioned above, Kata Kolok lacks most of the morphological categories that other languages use to distinguish between word classes.

- (5) DEAF COME [Kata Kolok]  
‘A deaf person came.’ (Schwager & Zeshan 2008: 532)
- (6) \*FEMALE DEAF COME [Kata Kolok]  
Intended meaning: ‘A deaf woman came.’ (Schwager & Zeshan 2008: 532)

For Swedish Sign Language, Bergman (1983) argued that many signs that could be thought of as adjectives, based on the fact that they describe properties, would form a class in-between “true” adjectives and verbs. Bergman labeled these signs “stative verbs”, since they express a property but can only occur have a predicative function, and are never used as attributive modifiers within the noun phrase – e.g. the sign PREGNANT. However, these signs differ from prototypical verbs when negated, in that they would always follow the manual negator NOT (a property of adjective) rather than precede it (as one would expect for verbal signs): e.g. INDEX NOT PREGNANT ~ \*INDEX PREGNANT NOT = ‘she is not pregnant’.

### 3.4 Interim summary

In this section, we have discussed how a number of word classes have been suggested in several sign languages investigated. The visual modality has an effect on some (potential) categories, such as pointing signs being similar to pointing gestures but often functioning like pronouns (see also Section 2.2), and adverbial functions often being expressed non-manually, by facial expressions. However, the most common word classes discussed for sign languages are nouns and verbs, unsurprisingly, suggesting a cognitively salient distinction between objects and actions/events. This distinction has been observed in several formal differences, such as changes in articulation (e.g. handshape and movement). Morphosyntactically, the basic noun–verb distinction also influences which type of modification is possible (e.g. spatial and repeated), available derivational elements (e.g. agentive or specifying classifiers), as well as the word order and syntactic function of the signs. In the next section (Section 4), we will give an overview of how the categorization of signs into word classes has been applied – either in terms of experimental design in order to identify them, or in terms of practically labeling them in sign language databases (e.g. dictionaries and corpora).

## 4. Methods for categorization

### 4.1 Experimental approaches

Methodologically, word classes in sign languages have been investigated using several techniques. First, traditional descriptive approaches relying on elicitation of crucial (isolated) examples and acceptability judgments have been used (e.g. Abner 2017). Secondly, some relatively small-scale corpus-based investigations of word classes have been conducted (Voghel 2005).

Thirdly, and most prominently for the studies focused on the phonological differences between nouns and verbs, a quasi-experimental approach has been applied in various studies (Johnston 2001; Kimmelman 2009; Tkachman & Sandler 2013; Abner et al. 2019, among others). Most such studies focus on production of nouns and verbs, while in some studies (Johnston 2001; Kimmelman 2009), perception is also investigated.

The basic method of production studies is to use visual stimuli (pictures and/or videos) of objects to elicit nouns, and visual stimuli of events when the same objects are manipulated to elicit formally related verbs. The nominal and verbal signs involving the same object are then compared to each other in order to establish the differences between formally similar signs. Using this method has the advantage that one can study whether all noun–verb pairs show the same differences, and also whether different signers of the same language are consistent. The method also has, however, some challenges: the concepts have to be predetermined and only signs for concrete objects can be elicited; in addition, some studies have shown that in natural discourse the differences found in the experimental condition disappear or become much weaker (Johnston 2001).

Perception studies typically involve native signers assigning the labels of nouns and verbs (or objects and events) to signs elicited in a production study, a methodology used in similar gesture experiments with hearing non-signers (e.g. Emmorey & Pyers 2020; Lepic & Verhoef 2020). In Kimmelman's (2009) study, for instance, the number of repetitions and the amplitude were useful for identifying both verbs and nouns, but the involvement of joints (e.g. the use of fingers vs. the use of the elbow) was only useful for identifying nouns.

One of the most recent and the most advanced in terms of experimental design is the study reported in Abner et al. (2019). The authors used short video clips of objects manipulated in a typical way to elicit verbs (e.g. a man taking a picture with a camera) and in an atypical way to elicit nouns (e.g. a man dropping a camera into a trash can). They asked ASL signers, homesigners from Nicaragua, and signers from 3 different cohorts of Nicaraguan Sign Language to describe these clips. They statistically analyzed the data and found that word order, the use of different joints, movement repetition, and the use of the non-dominant hand are all used to distinguish nouns from verbs in at least some of the groups. This study can be used as a template for future experimental studies of noun–verb distinction in sign languages.

## 4.2 Lexicography

Although sign language dictionaries have been around for a long time, longer than the field of sign language linguistics, many of them have assumed a close tie between a majority spoken/written language – and its word classes – and the sign language in question. Such assumptions may lead to inferring the categories and definitions of word classes of the spoken language. However, as more linguistically-informed, sometimes corpus-based, lexical databases and dictionaries have been established, many questions have arisen as to how signs should be defined, categorized, and linked together. One main question in this domain is how to define sign lexemes and lemmas for use in lexicography and corpus work (Johnston & Schembri 1999; Johnston 2010, 2014b; Schembri & Crasborn 2010). Different lexicography projects have taken different routes in this matter, some opting for overarching, lemmatized forms being recorded (e.g. several of the Signbank projects: Johnston 2014a,b; Fenlon et al. 2014, Crasborn et al. 2020), whereas others would separate slight form variations and derived/related signs into distinct sign entries (e.g. the Swedish Sign Language Dictionary online 2020). In many sign languages, the mouthing of a spoken language word may be used to distinguish manually identical forms, or specify related concepts or synonyms. This can be found in signs that are clearly based on a shared semantic motivation. An example of this is the Swedish Sign Language sign FLOOR in Figure 13, for which the manual part can similarly mean ‘table’, ‘carpet’, ‘shelf’, ‘stage’ if accompanied with the mouthing of the equivalent spoken word in Swedish, although all stemming from a depiction of a flat extended surface. In such cases, it is unclear

which of these forms could be seen as a lemma form for all related meanings. Because of this, several Signbank projects have opted to conflate similar examples into a single sign entry, without mouthing specified, with a listing of possible translation equivalents in the spoken (written) language.

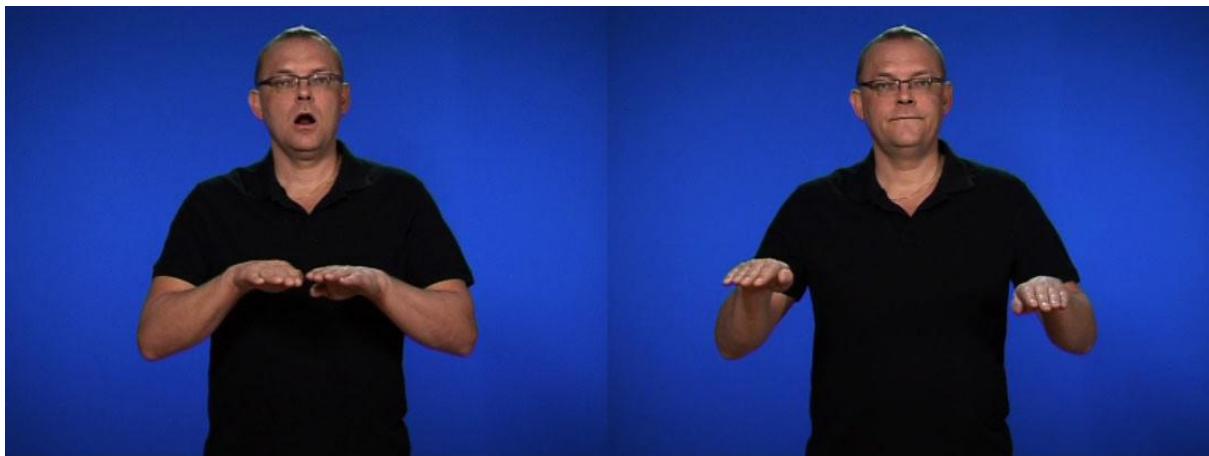


Figure 13: The sign FLOOR in Swedish Sign Language (Swedish Sign Language Dictionary online 2020: #12253)

However, there are cases for which it is unclear whether manually identical sign forms constitute polysemous or otherwise related forms with a similar derivation, or are accidental homonyms. One such example is found in Figure 14 illustrating the Swedish Sign Language sign DO, which can also (with appropriate mouthing) be used to mean ‘verb’, clearly related to ‘doing, action’ although used as a noun rather than verb, but also the question word ‘why’, in which case it is not obvious whether or not there is an association between the sign forms.



Figure 14: The sign DO in Swedish Sign Language (Swedish Sign Language Dictionary online 2020: #00563)

Thus, a constant conundrum for sign language lexicographers is whether to regard each *function* of manual sign forms as individual signs, or rather lump them together under a more abstract lemma, assuming that context will disambiguate. With the former approach, phonological detail (e.g. mouthing) and word class status (e.g. noun or verb) would call for splitting into different entries, whereas the latter approach would favor an abstract conflation, later taking context into account for function or specified meaning and categorization of individual tokens.

### 4.3 Computational approaches

With the relatively recent emergence of true, machine-readable, large-scale sign language corpora, the question of what can be done automatically or semi-automatically with the help of big data has become relevant. Within the domain of natural language processing (NLP), automatic part of speech (word class) tagging is a large field with plenty of highly accurate taggers being applied to spoken/written languages. However, for sign languages this is not yet the case. An exception is Östling et al. (2015) who attempted to use an automatic word class tagging of the Swedish translations of the Swedish Sign Language Corpus, later inferred and transferred to the Swedish Sign Language glosses by word alignment between words and sign glosses. This method proved to reach 77% accuracy in the automatic tagging compared to gold standard manual annotations of the same data, which shows that there is considerable overlap in word classes in Swedish and Swedish Sign Language that can be inferred from glosses (certainly aided by the fact that the Swedish Sign Language Corpus does not primarily lemmatize their gloss categories), but also that language-specific definitions and modeling are required. Furthermore, the manual annotation in Östling et al. (2015) was done on the type-level, which results in some sign glosses used for polysemous/homophonous signs potentially not being accurately tagged for each individual token (as context is ignored).

With sign language corpora growing ever larger, the prospects of building (semi-)automatic taggers – for word classes and other properties – increase. Through the advent of automatic recognition of sign forms – through tools like motion capture, 3D cameras, or post-production video recognition software – there is also a potential to recognize phonological cues such as repeated or larger movements, which could be useful for automatically recognizing such features argued to be associated with word classes (e.g. noun–verb distinction) in several sign languages.

### 4.4 Interim summary

In experimental approaches to identifying and establishing word classes for sign languages, the design has frequently been to use stimuli to elicit production based on the semantics of a viewed picture/event, later analyzed for any observable formal differences in those elicited signs. In some cases, a reverse method has been used to investigate the perceptive side of word class categorization. When developing lexical databases (e.g. dictionaries) and corpora of sign languages, word class categorization is sometimes included in the process. Here, the categorization can be done partly based on form and meaning, such as taking distinguishing mouthings of manually identical forms into account (or not), and partly on function in context, such as the distribution and position in a corpus. As sign language corpora are still relatively small in size, few attempts have been made to categorize/induce word classes through automated methods.

## 5. Summary

As mentioned in the beginning of this chapter, sign languages constitute a diverse set of languages defined by a shared modality. As such, it is ill-advised to assume cross-linguistic similarities in terms of categories or structure across different signed languages. Some of the methods applied in order to identify and describe word classes have been shared across sign languages, but the results differ between languages. Across many sign languages, a general distinction between nouns and verbs has

been suggested – sometimes on the basis of semantics alone, but often based on formal differences in both basic and modified forms of signs. Other word classes (e.g. adjectives and pronouns) have been suggested for some sign languages, but not nearly to the extent of nouns and verbs. Furthermore, several additional types of categories deserve dedicated investigations, as the modality uniting sign(ed) languages may in fact give rise to forms and functions possibly unattested for any spoken language. This includes simultaneous articulation of a second hand (e.g. buoys) or non-manuals (e.g. facial adverbials), spatially dependent signs (e.g. pointing), and the re-encoding of borrowed material (e.g. fingerspelling and mouthing).

Much of the work that has been done on the structure of sign languages to date – be it word classes or any other linguistic phenomenon – is based on elicited data. Because of this, it is hard to judge whether findings and suggested features will be observable and relevant when looking at more natural, spontaneous, and contextualized language. However, as naturalistic data of sign languages are becoming increasingly more available – and in ever larger size – investigating word classes and their potential formal differences can eventually be done based on language use. In such cases, it has been suggested that proposed formal differences observed in more isolated contexts are much reduced and gradient. Furthermore, the development of large-scale lexical databases and corpora require extensive decision processes in terms of labeling and categorizing the data, but will hopefully also result in a more data-driven approach to categories and patterns of language in use.

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