Morphology (2012) 22:545–579
DOI 10.1007/s11525-012-9205-1

ORIGINAL PAPER

A classification of compounds in American Sign Language: an evaluation of the Bisetto and Scalise framework

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Received: 25 October 2011 / Accepted: 20 May 2012 / Published online: 17 July 2012

Abstract Cross-linguistic comparisons of compounds are difficult because of the varied criteria and terms used by different linguists (Scalise and Bisetto 2009). To address this problem, Scalise and Bisetto proposed a universal three-level classification of compound types. Although several researchers have shown that American Sign Language (ASL) has compound signs, a classification of compound types in ASL has not been completed. All of the potential compounds in an ASL dictionary (Costello 1994) were identified, then verified as compounds with the help of a fluent deaf signer by applying standard tests for composition. These compounds were then classified using the Scalise and Bisetto classification. We found that Scalise and Bisetto's three-level hierarchical classification successfully captured cross-category relationships among subtypes of compounds but fails to predict the existence of one type of compound attested in ASL. In our revised classification, a consistent set of criteria is used at each level, resulting in a classification that is both conceptually simpler and empirically more adequate. The second tier category for hierarchical compounds are bifurcated into the categories expressed predicate and unexpressed predicate, according to whether each predicate in a compound's semantic structure is expressed by one of the overt constituents. The revision has the further advantage of allowing us to avoid any reference to word class/grammatical category in applying our taxonomy, a goal that we show to be desirable on both theoretical and empirical grounds.

Keywords Compounding · Composition · Signed languages · ASL · Classification · Taxonomy

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1 Introduction

Numerous attempts have been made to develop classificatory schemes for compounds (Bloomfield 1933; Marchand 1969; Fabb 2001; Bauer 2001, 2009; Booij 2005). Unfortunately, most of these schemes suffer from shortcomings that make them difficult to apply to cross-linguistic research. Some schemes are based on the compounds of a particular language and thus fail to capture the richness of compounds that are found in the world's languages. Others are intended to be general in their application but use criteria that are difficult to apply consistently across languages. The most frequent of these is the use of grammatical category ("part of speech") of constituent lexemes as a criterion. This is problematic in two ways. Many languages display considerable flexibility in the morphosyntactic category of a root or stem, due either to pervasive zero conversion or to roots not being specified for such category information at all. Furthermore, it is clear that some languages have compound types that are relatively insensitive to the lexical category of their constituents. In many Southeast Asian languages, for instance, coordinate compounds display very similar properties whether their constituents are nouns, verbs, or even numerals:

(1) Hmong
(Xiong et al. 1992)
a. ob-peb
two-three
'a few'
b. rig-tsho
pants-shirt
'clothing'
c. noj-haus
eat-drink
'consume'

(2) Tangkhul
(Pettigrew 1918)
a. ʔap^{h}ur-ʔap^{h}am
peritoneum-stomach
'belly'
b. mək^{h}əniŋ-məkəp^{h}a
mischevous-bad
'knavish'

Recently, a classificatory framework has been proposed that addresses these significant challenges. Scalise and Bisetto (2009) provide a three-level taxonomic scheme in which compounds are classified according to the relationship between the constituents (attributive-appositive, subordination, coordination), an additional criterion that is specific to the compound type, and the endo- or exocentricity of the compound. These criteria are ostensibly independent of grammatical category and are designed to facilitate the comparison of compounding across languages. It has already been applied to a variety of languages, with interesting results (Ceccagno and Basciano 2007;

Lieber 2009; Rosenberg 2007). However, data from many of these languages were familiar to the developers of the framework as they were developing it.

A useful test of a framework of this type is to apply it to a set of data that was not considered in the framework's construction. Compounding in American Sign Language (ASL) provides an ideal test-bed for the Scalise and Bisetto framework. Not only is ASL genetically unrelated to the other languages to which the framework has been applied (leaving aside ASL's extensive history of language contact with English), it also uses a completely different language modality than these other languages. If, therefore, the Scalise and Bisetto framework were to provide an insightful scheme for classifying compounds in ASL, this would be a compelling confirmation of its cross-linguistic validity.

Klima and Bellugi (1979) did the earliest and most comprehensive study of ASL compounds by collecting and examining 1000 potential compounds which were submitted by language consultants. They evaluated the signs in terms of lexical unit, specialized meaning, and rhythmic properties (e.g. duration, repetition). An example is GOOD+ENOUGH 'good enough'[1] in which a compound takes less time to sign than the sum of the individual signs in non-compound contexts. Liddell and Johnson (1986) describe the phonological differences between signs as individual lexical items and as constituents in a compound. Sandler and Lillo-Martin (2006) briefly mention typical compounds and coordinate compounds. For Sandler and Lillo-Martin, coordinate compounding only results from a listing of three exemplars of a category to represent its superordinate category, a construction also described in Klima and Bellugi (1979). These three-constituent compounds (e.g. APPLE+ORANGE+BANANA for 'fruit') are not unlike the two-constituent collective co-compounds in spoken languages described by Wälchli (2005). But prior to the current study, no complete survey has been done of the types of compounds in ASL. In addition, ASL researchers seem to have relied on the early work of Klima and Bellugi for their list of compounds, bothering neither to expand this empirical base, nor to verify Klima and Bellugi's claims. Thus, while it has long been expected that ASL compounds have theoretically interesting properties, no comprehensive systematic attempt has been made to study this part of the ASL lexicon or to classify ASL compounds according to well-defined criteria. A valid classification could illuminate patterns within ASL. In addition, a classification of ASL compounds would be an interesting data set to test linguistic universals in compounding and to advance morphological theory.

ASL compounds have been the subject of relatively little research, and our study represents the first systematic attempt to produce a classification of them. In fact, our application of the Scalise and Bisetto framework to ASL revealed a few shortcomings of the taxonomy, but supported its general architecture. The Scalise and Bisetto framework allowed us to categorize compounding data which were superficially very different from the data which originally inspired the framework and to do so in a

[1] Following convention, signs will be denoted with small capitals, and compounds will be denoted by signs connected by a plus sign (+). Where more than one English word is needed to represent the sign, the words will be connected with an underscore (e.g. NEXT_TO+AREA 'neighborhood'), and when the sign represents two English words and it is unclear which is in the compound, both are given separated with a slash (e.g. HEAR+NOISE/LOUD 'noise'). English translations will be given in single quotes.

manner that revealed similarities between compound types that would not have been apparent in other frameworks.

We propose three related improvements to the framework. While the Scalise and Bisetto framework is free of explicit references to grammatical category, there are a number of cases where criteria are implicitly dependent on grammatical categories. This is shown to be problematic for languages like ASL, in which roots display considerable syntactic flexibility. We propose reformulating these criteria in purely semantic terms. As part of this project, we propose a second-level criterion "expressed predicate" which is satisfied if all of the implicit predicates required to interpret the relationship between the constituents in the compound are overtly realized. This criterion eliminates a category that was unattested both in our data and Scalise and Bisetto's database while simultaneously increasing the uniformity of the framework. Finally, we suggest that attributive-appositive and subordinate compounds belong to a single supercategory in contradistinction to coordinate compounds.

This paper will review how compounds have been classified, including an in-depth summary of Scalise and Bisetto in Sect. 2. Section 3 is an overview of ASL and its relevant properties. Section 4 describes the current research's methodology and results, and a discussion of ASL compounding is found in Sect. 5. Section 6 offers an evaluation and revision of the Scalise and Bisetto classification in light of our ASL classification. Concluding remarks are in Sect. 7.

2 Classification of compounds

Perhaps even more so than other processes of word formation, compounds can be categorized according to a great variety of criteria. Lexical category is a common way to classify compounds found within languages, such as Danish (Bauer 2009, 2001), Dutch (Don 2009), Mapudungun (Baker and Fasola 2009), Spanish (Kornfeld 2009). On the other hand, Wälchli (2005) suggests a semantic classification of coordinate compounds, based on the constituents' relation to the compound. Other linguists describe compounding in morphological terms, such as classes by headedness or by interpretive types (Fabb 2001). However the classes and types sometimes overlap. As a result some descriptions of compounding are simply by topic. For instance, Rice (2009) describes compounds found in Slave by common types, some defined by word category (noun-noun compounds), some defined by interpretation of the constituents' relationship (attributive and subordinate.) Likewise, Booij (2005) first describes endocentric and exocentric compounds and then separately discusses synthetic compounds (e.g. *bus-driver*), which are defined as a result of a word formation process with simultaneous compounding and derivation, even though they are also considered endocentric. The term *synthetic* has been widely used in descriptions of English compounding, but this kind of compounding has also been called verbal compounding or "Zusammenbildungen" (Kastovsky 2009). Another issue is whether a category (e.g. synthetic compounds) should be given prominence in a classificatory schema when it is not attested in many or most languages.

As Scalise and Bisetto (2009) elucidate, previous systems for classifying compounds have problems. Classifications based on word-category tend to focus on the

most common combinations, which is not insightful for understanding all possible compounding types in the world's languages. In addition, they argue that some classification proposals (e.g. Fabb's exocentric, endocentric, coordinate model) are consistent, but too impoverished considering all of the types of compounding found in the world's languages. On the other hand, lists of compound types, with no structure or framework, gloss over the similarities between some of the subtypes. Several models use an inconsistent application of criteria classification to separate the compounds. Booij's (2005) constructional model, for example, seems to imply that headedness is relevant only to synthetic compounds. Moreover, as Guevara and Scalise (2009) point out, synthetic compounds are defined with a morphological criterion that is not applied (or applicable) to any other compound type. In conclusion, the main issues are: limiting analyses to certain word categories, using terminology created for a single language, and using inconsistent criteria. Scalise and Bisetto attempt to address these problems by offering an alternative classification system with three levels of criteria.

2.1 Scalise and Bisetto compound classification

Scalise and Bisetto's (2009) classification system is a hierarchy of three levels with a different criterion at each level, echoing Marchand (1969). This multi-level analysis better handles intersecting types of compounds. Table 1 shows the three levels with examples. We have altered the order of the categories (in order to indicate the similarity of ground subordinate compounds to attributive compounds) and some example compounds, but remained broadly faithful to the original. Scalise and Bisetto's first criterion is the grammatical relation between the constituents. This is an appealing first level for theoretical and practical reasons. According to Scalise and Bisetto, constituents of a compound have three main relationships: subordinate, attributive-appositive, and coordinate. Subordinate compounds have a head-complement relation, described as having an "*of* relation" (p. 45). Attributive-appositive compounds have a modifier-head relationship, in which a trait, property, or quality of the head is expressed by the non-head constituent. Constituents in coordinate compounds have a conjunctive relation.

The second level in Scalise and Bisetto's model attempts to further clarify the semantic/interpretive relations found within the macro categories. Each macro category has a different mechanism for the head within the compound to select the non-head. First, subordinate compounds are separated into verbal-nexus compounds and ground compounds. Verbal-nexus compounds (such as *bookseller* and *pickpocket*) are clearly identified by a verb-argument or verb-adjunct relation between the constituents. Ground compounds (*table leg* and *windmill*), traditionally called "root compounds", are subordinate compounds that do not consist of a verb and one of its arguments and rely on the semantics of the constituents to interpret the compound's meaning.

Second, attributive-appositive compounds display a head-modifier relationship, either directly or metaphorically. Specifically, the constituents in attributive-appositive compounds have an "attributive relation". Scalise and Bisetto use the term attributive for the typical modifying non-head where the non-head which is either an adjective or

Table 1 Scalise and Bisetto's compound classification (2009)

Subordinate				Attributive-appositive				Coordinate	
Verbal-nexus		Ground		Attributive		Appositive		(None)	
Endocentric	Exocentric	Endocentric	Exocentric	Endocentric	Exocentric	Endocentric	Exocentric	Endocentric	Exocentric
Bookseller	*Pickpocket*	*Windmill*	*Sans papiers*	*Girlfriend*	*Redskin*	*Snail mail*	?	*Student-athlete*	*Father-daughter*

a verb expresses "a 'quality' of the head" (p. 51). The other category under attributive-appositive is appositive, for compounds whose "non-head element expresses a property of the head constitute by means of a noun, an apposition, acting as an attribute" (p. 51). These compounds are often "interpreted metaphorically" (p. 52). (Appositive has also been used in the compounding literature to describe coordinate compounds in which both constituents are referring to a single referent, such as *singer-songwriter*. However, Scalise and Bisetto use this term with reference to an appositive-like duty of the non-head noun attributive/modifying compounds, not to coordinative compounds.) In Scalise and Bisetto terminology, an example of an appositive compound is *mushroom cloud* where only a single feature of the non-head noun (in this example, the shape of the mushroom) is describing the head (the cloud). Later, Scalise and Bisetto clarify that appositive compounds may have a verb acting as the non-head while in attributive compounds "the non-head is an adjective" (p. 52) and gives the example of the Dutch compound druipnat 'drip wet' or 'soaking wet'.

Thus, the 2009 Scalise and Bisetto framework states that the non-head in both attributive and appositive compounds can be a verb. Therefore, lexical category is not a reliable criterion to distinguish compounds within the attributive-appositive category. As such, based on the examples given to distinguish attributive (*high school, blue-eyed, redskin*) and appositive (*snailmail, swordfish, mushroom cloud*) we understand attributive compounds to have a "that is" or "which is" relation while appositive compounds have a "like a" relation. Although Scalise and Bisetto added the appositive category, it should be noted that they did not include an example of an exocentric appositive compound in their chart, claiming that exocentric appositive compounds are difficult to locate in their database. We will return to this subject below.

Third, Scalise and Bisetto do not offer sub-types at this level for the coordinate compound type because they do not see a need to distinguish further the grammatical relation between constituents (p. 52) whereas the second level of the subordinate and attributive-appositive categories are split. Scalise and Bisetto propose that their macro level grouping (subordinate, attributive-appositive, and coordinate) is supported by the need for these different criteria at the second level (p. 49).

The final criterion concerns headedness of the compounds. Each of the previous categories (verbal-nexus, ground, attributive, appositive, and coordinate) are then divided into endocentric and exocentric compounds. By having headedness on a separate level, Scalise and Bisetto extend this criterion to all types of compounds. Scalise and Bisetto state that subordinate and attributive relationships are clear even if the head is missing, in which case the compound is exocentric. With this reasoning it is unclear how coordinate compounds, in which are "characterized by two heads" (p. 46) could be exocentric. As examples of exocentric coordinate, Scalise and Bisetto list *cutthroat* and *lavapiatti* 'wash+dishes = dishwasher'. Therefore, we understand Scalise and Bisetto's headedness as semantic headedness, based on the constituents' semantic relationship to the compound; but that is not explicitly stated. As such, when the compound is a hyponym of the head (Guevara and Scalise 2009), it is considered endocentric. This interpretation, however, sidesteps the issue of how constituents can be interpreted as a metaphorical hyponym. For instance, a *sea horse* is clearly not an actual type of 'horse', but it may be metaphorically considered a (tiny) type 'horse' which lives in the 'sea'. Since in the Scalise and Bisetto framework all compound

types are bifurcated into endocentric and exocentric, arguing the usefulness of labeling metaphoric compounds as exocentric is outside the scope of this paper.

Scalise and Bisetto's classification proposal is appealing because it was developed to be universally applicable rather than language specific. In principle, this means that the system can be applied without modification to our ASL data, allowing straightforward comparisons across languages and language modalities (spoken versus signed). In addition, the three levels of analysis promise direction that is needed to classify varied compound types. On a practical note, ASL seems to have flexible word categories, and, as such, classifications centered on word category may complicate analysis rather than clarify it. In the next section, we give an overview of ASL, giving particular attention to the grammar relevant to identifying compounds.

3 American Sign Language

American Sign Language (ASL) is a visual-spatial language used in the United States (Neidle et al. 2000) and North America, generally (Valli and Lucas 2000; Sexton 1999). The community of people identifying themselves with the Deaf[2] community in the United States is estimated to be 300,000 (Emmorey 2002). ASL is genetically related to Old French Sign Language (Lucas and Valli 1992) but is a minority language in an English-dominated culture (Neidle et al. 2000). Most of the people who use ASL may be considered bilingual (Ann 2001) since they regularly communicate in written English (Lucas and Valli 1992; Neidle et al. 2000). ASL users may also use a language contact variety, Pidgin Signed English (Lucas and Valli 1992) or a manual version of English (Neidle et al. 2000). In the discussion section, this language contact between English and ASL is invoked to explain the divergent properties of certain ASL compounds (likely calques from English).

ASL is approximately 250 years old (Aronoff et al. 2005), which is old enough for significant grammatical changes to have taken place, including the grammaticalization of certain derivational processes. Derivational morphology is generally sequentially produced in signed languages whereas inflectional morphology, which is limited to certain verb classes, is generally simultaneously produced (Aronoff et al. 2005). Reduplication (which is sequential, obviously), however, can also be used for temporal aspect, such as the iterative (Sandler and Lillo-Martin 2006). ASL has limited derivational affixation (Sandler and Lillo-Martin 2006). Of importance to this paper, the signs AGAIN, NONE/ZERO, and the agentive ASL suffix as have been identified as derivational affixation rather than compounding (Sandler and Lillo-Martin 2006). Sandler and Lillo-Martin (2006) appealed to both productivity and gaps in occurrence in order to show that these signs have become grammaticalized into affixes. Reduplication of verbs can also derive deverbal nouns (Supalla and Newport 1978; Valli and Lucas 2000). The effects of deverbal reduplication within compounding complicate labeling the constituents' lexical category within compounds.

[2]Capitalized Deaf refers to identification with Deaf culture including using ASL whereas (lowercase) deaf refers to the physical loss of hearing, following convention in the ASL literature.

There is general agreement that ASL uses compounding to create new signs (Emmorey 2002; Valli and Lucas 2000; Klima and Bellugi 1979). Linguists have described how compounds in ASL undergo reduction of an internal movement or a reduction of a repeated movement, movement epenthesis, assimilation (Valli and Lucas 2000), or even a reduction which makes the compound lexeme closer to a blend (Liddell 1984). See Sandler and Lillo-Martin (2006) for a description of the phonological processes that contribute to reduction and assimilation during signing. Sandler (1989) and Sandler and Lillo-Martin (2006) report that the first constituent in ASL compounds are more vulnerable to reduction than the second constituent.

ASL can display inflectional agreement with thematic arguments and with syntactic objects, and these inflection markers can be found on different constituents within compounds. ASL's modality allows the use of space for representation (Padden 1990), in that a referent's location in space can be incorporated into the grammar. There is not complete consensus among linguists about the linguistic status of this use of space, but some consider particular spatial inflection to constitute agreement (Meir 2002; Aronoff et al. 2005; Sandler and Lillo-Martin 2006) albeit somewhat different from verbal inflection in spoken languages. Meir (2002) describes two types of spatial agreement. First, ditransitive verbs show agreement between the source and the recipient, which means direction in space is used to show the thematic arguments of certain verbs. For instance, in ASL the verb HELP is signed from the location of the helper to the direction of the helpee. Second, Meir describes syntactic agreement though a verbal affix of "facing" (the orientation of the hands) which indicates the syntactic object of the sentence. For instance, SELF can be signed with the back of the hand facing the signer, indicating 'myself' or with the back of the hand facing another referent's location indicating 'him/herself'. These two types of spatial agreement are important to this discussion of compounding because some compounds have both thematic and syntactic (object) agreement. Specifically, one constituent in the compound may carry the thematic agreement while the other carries the syntactic agreement, and neither inflection can be avoided, dropped, or moved to the other constituent. In (spoken) languages, the compound's inflection is usually expected to be carried by the head of the compound (Bauer 2003). Since Meir's (2002) analysis, however, describes how verb agreement can differ in signed languages (i.e. the thematic and syntactic inflectional markers are fused onto separate constituents within a compound), we suggest that caution should be used in employing this as a rule in evidence against the compound status of complex signs in ASL. (Further discussion of how the visual-spatial modality of ASL challenges morphological theory is left for later papers.)

Turning to the linguistic units within the lexeme, the phonology of ASL is described with the basic parameters of handshape configuration, location, movement, (Stokoe 1960; Sandler 1989; Sandler and Lillo-Martin 2006) and sometimes occasional non-manual markings (Neidle et al. 2000; Valli and Lucas 2000). Some linguists analyze signs with four main parameters where handshape configuration is separated into handshape and palm orientation (Neidle et al. 2000; Valli and Lucas 2000). Regardless, minimal pairs are found between the three agreed-upon parameters (Neidle et al. 2000; Sandler and Lillo-Martin 2006). ASL lexemes are typically described as having a single input for each parameter. Although this description is a

Fig. 1 Example of ASL sign AREA

simplification of ASL phonology, for this paper on ASL morphology, this basic description suffices. Figure 1 gives an example of a sign's basic phonology. AREA has the 5 handshape with palm orientation down, and is signed at neutral location with horizontal circular movement.

One other linguistic resource used in ASL must be mentioned: classifiers. There is much discussion about classifiers in signed languages. (See Emmorey 2003 for a complete review of the issue.) Relevant to the current topic, there is a subset of ASL classifiers that trace the size and shape specification (SASS) of the object (Klima and Bellugi 1979). These are comparable to "sortal classifiers" found in spoken languages (Grinevald 2003); although in signed languages these morphemes are not redundant. The SASS classifiers are more likely to be compound constituents than other ASL classifiers (Aronoff et al. 2003). Importantly, classifiers are not considered lexemes, but rather something between agreement and affixational morphology (Aronoff et al. 2003). However, the line between signs and classifier constructions is blurred as classifiers become lexicalized (Aronoff et al. 2003). In a well-documented compound (Frishberg 1975), RED+SLICE 'tomato', the second constituent is an example of a classifier predicate of cutting something with a knife which has become lexicalized into SLICE. Another example, HOUSE, is described in the Random House American Sign Language Dictionary (Costello 1994) as '[Shape of house's roof and walls]'. This sign, which is shown in Fig. 2, seems to be derived from a SASS classifier but been listed with its own lexical entry in the dictionary and is accepted as a sign. Although our discussion touches on classifiers, the status of which is the subject of debate, this paper examines ASL compounding within defined parameters which are outlined below. Generally, only lexicalized signs, with their own dictionary entry indicting that has the status of a lexeme, are analyzed for this paper.

Finally, a few explanatory notes on ASL morphosyntax are in order. The basic main-clause word order in ASL seems to be SVO (Neidle et al. 2000), although topicalization of objects is very common and the most frequent surface word order is OSV (Valli and Lucas 2000). It is not clear whether adjectives exist as a separate class or whether the adjective-like signs are actually stative verbs. This determination is difficult to make since there is no overt copula in either equative or predicative clauses. Therefore, when we refer to adjectives in the following discussion we mean "signs that would be translated by adjectives in English" and make no claim about the existence of separate adjective class. When adjectives are modifying a noun attributively, they occur before the noun; when the relationship is predicative, they occur after the

Fig. 2 Lexicalized classifier-HOUSE (start and finish of movement)

noun. Thus YELLOW HOUSE OLD means 'the yellow house is old'. Adjectives are formally identical whether they occur pre-nominally or post-nominally.

4 Current research

4.1 Methodology

We collected compound signs from the Random House American Sign Language Dictionary (Costello 1994). In a first pass, we collected each entry that met the following criteria:

1. It can be analyzed as the concatenation of two or more lexical signs.
2. These signs are produced at distinct locations, typically with distinct contact points on the body.

The purpose of this procedure was to separate compound signs and phrases from simple and derived signs (subsequent tests, described below, were used to distinguish compounds from phrases).

These criteria require some additional explanation. While inflection may be simultaneous in signed languages, derivation and compounds are typically concatenative. At the very least, all ASL compounds cited in the literature have this property. Therefore, we did not consider any complex signs whose parts were produced simultaneously as compounds. Potential compounds were identified as those signs with at least two distinct signing locations, usually with two contact points on the body, because this allowed us to filter out morphologically complex signs that are not compounds. Battison (2000) notes that only compound signs have multiple locations. A constituent's general location[3] parameter's value is generally preserved in compounding, but not in other types of complex signs. Even in compounds where location assimilates during compounding, usually the two major locations move closer

[3]To be clear, we do not mean location as the places between movements as described in sequential sign language phonology with movements and holds (Liddell and Johnson 1989) or with location and movements in the Hand Tier model (Sandler 1989), but we refer to location as one of the three simultaneous main parameters of ASL signs.

Fig. 3 ASL Compound MOTHER+FATHER 'parents'

in the signing space with neither location so modified as to be unrecognizable (Liddell and Johnson 1986). Diachronic change in signing location has been described by Frishberg (1975) but the described changes were adjustments either toward or from the perimeter of the signing area, rather than a deletion. If a total reduction has occurred diachronically, identification of the original constituents of the compound would be difficult, so this paper is limited to compounds currently with two distinct major signing locations.

The movement parameter is more likely than location parameter to be completely lost during compounding; especially the first constituent's movement (Liddell and Johnson 1989). In addition, internal movement is eliminated during compounding, following the simple sequence rule in which internal movement or repetition is deleted when signs are combined in compounding (Valli and Lucas 2000). Further, movement was not considered to be a good phonological feature to use since following a more detailed phonological theory, movement is default path between two locations or "holds" (Liddell and Johnson 1989; Sandler 1989). These "holds" are also described as vulnerable to deletion (Liddell and Johnson 1986). Therefore, movement is less distinctive and less reliable criterion.

The other main phonological parameters are also problematic to use for identifying compounds. Handshape seems to be particularly vulnerable to assimilation (Frishberg 1975; Wilbur 1987). Specifically the handshape of one constituent often adjusts to match the handshape of the other constituent (Sandler 1987, 1989) so that one handshape specification extends throughout the entire compound. Further, palm orientation tends to assimilate when handshape assimilates (Sandler 1987, 1989). Therefore, since handshape and palm orientation are vulnerable to assimilation, we would not expect such parameters to consistently differ between constituents of a compound (Marantz 1982; McCarthy and Prince 1995). Thus, signing location, specifically major body area, is the most reliable parameter for distinguishing compounds from single signs.

In many cases, Costello (1994) denoted compound signs with a plus sign (+) between two signs which validated our identification based on location. Figure 3 shows an example of the ASL compound MOTHER+FATHER 'parents'. The two locations are chin and forehead while the other parameters are the same.

Compounds with signs that include gestures and fingerspelling were excluded because it is not clear what their status is in ASL. By focusing on the most prototypical

Fig. 4 Comparison of YELLOW and BLOND

compounding, lexical compounding, this paper can initiate a discussion of the classification of ASL compounds, which later could expanded to include other categories.

Some complex signs (with sequential morphology) were analyzed as affixal derivational following Sandler and Lillo-Martin (2006) as described in Sect. 3. For instance, signs with only one lexical constituent and the agentive marker, which is modification of PERSON, were not included in this analysis. Although these signs have two distinct locations, as discussed, affixal derivational morphology is expected to have some similarity with compounding. These constituents have been analyzed as affixes in previous research, however, and complex signs with only one lexical constituent and an affix were excluded from the list of compounds. Further, some signs, which were previously described as compounds in the literature, were excluded from the current paper because they have undergone sufficient changes to no longer be recognized as a compound of two lexemes with two locations. It is possible that an entire location or constituent may be deleted over time. For instance, YELLOW+HAIR 'blond' was not signed as a separate YELLOW and HAIR, but simply YELLOW at a raised location near the head. Figure 4 compares YELLOW, which is signed with Y handshape at neutral space location with a shaking motion, and blond, which was signed at head location with an arc movement. In addition to an assimilation of signing location, the second constituent, HAIR, was not signed. Similarly, ROCK+SKELETON 'bone' was not included as a compound because 'bone' was a single sign with the location, movement, and palm orientation of ROCK and the handshape of SKELETON. Although these phenomena are interesting, and were probably compounds historically, they now have a synchronic status similar to unanalyzable words, like *daisy* in English (from Middle English *dayeseye* 'day's eye'). We leave further analysis and discussion of this topic for future research.

Compounds consisting of two free, content lexemes (in which both constituents are lexical signs) were separated from compounds with bound or closed-class constituents (classifiers, pronouns, and prepositions) in order to simplify this first classification. At this stage, there were 420 potential two-constituent lexical compounds, an additional seven two-constituent lexical compounds with agentive marker, 55 three-constituent lexical compounds, 235 constituents with a classifier constituent, 27 compounds with a pronoun, and ten compounds with reduplication collected from the Costello (1994) dictionary. We verified a large subset of the compounds, focusing mainly on the two-constituent lexical compounds because it was impractical to ver-

ify all 754 potential compounds. The two-constituent lexical (noun, verb, and adjective) compounds were the largest group, but instances of all attested types were tested (since the goal of our research was a comprehensive classification of ASL compounds). Three-constituent lexical compounds were set aside because the types of compounding found in this group are expected to follow the relationships found in two-constituent compounds when broken into its subconstituents (Fabb 2001), and behaved as expected. For instance, [THINK+SAME]+SIGN 'contract/pact' consists of the compound THINK+SAME 'agree' compounded with sign.

During the verification process, two compounds that were listed in the dictionary as having three constituents (OLD+MENSTRUATION+STOP 'menopause' and BIG+DANCE+ROOM 'ballroom'), were found to have only two-constituents (MENSTRUATION+STOP and DANCE+ROOM) in the production of our language consultants. Therefore the lexical compound set totaled 429 potential compounds: 422 with two lexical constituents and seven with two lexical constituents with an affix.

As mentioned in Sect. 3, the status of classifiers within ASL is debated. Since classifiers share more properties with affixes than lexical stems, we decided to set any compound signs with classifiers aside. Reduplication was also not considered in this paper. While some investigators have viewed reduplication as a subtype of compounding (e.g. Inkelas and Zoll 2005), others have viewed it as equivalent to affixation (Marantz 1982; McCarthy and Prince 1995), and others have taken a position somewhere in between. We sought to limit our database to unambiguous compounds, not to stir a theoretical hornet's nest, and this required excluding both classifier constructions and reduplicative expressions. However, we anticipate that this research will ultimately shed light on both of these construction types in ASL.

The potential compounds were verified at two levels: First, we confirmed that the dictionary entry was a valid compound known by at least one of our language consultants. Second, we explored the compound's properties (grammatical class, function, etc.). Since we wanted to explore the compound's internal properties, we limited the research to compounds produced or recognized by at least one of our language consultants. The compounds were verified by either a linguist familiar with ASL, with fourteen years signing experience, or by one of two language consultants. Both deaf ASL language consultants were fluent in ASL, use ASL as their primary language, and have taught ASL in an academic setting. One language consultant was male and one was female. Fifty potential compounds were verified as in current use by the ASL-signing linguist. These common compounds, such as MEDICINE+STORE 'pharmacy' did not require further verification as the internal properties were understood. A total of 466 potential compounds were reviewed by at least one of the language consultants. These did include some potential compounds outside the scope of this paper (e.g. three-constituent compounds).

Our review of the compounds in context was based on language consultant data. Two elicitation methods were employed. For half of the potential compounds, the potential compound was signed and the language consultant was asked if he/she had seen the sign. Many potential compounds from the dictionary were not recognized by either signing language consultant. As such, these could not be further studied for their properties and were excluded. If the potential compound was recognized, we asked for its meaning and for its use in a sentence. For the other half, the consultant

was presented with two English sentences containing the glosses for an ASL compound ('parents' to elicit MOTHER+FATHER), and the language consultant translated the sentences into ASL. If the target was not signed, we asked if X + Y is a sign for the target concept. This question performs the same function as the other elicitation method. This method was an attempt to have the language consultant produce the compound independently, but it proved to be time-consuming and frustrating to the language consultants.

Some potential compounds were excluded at this stage because the language consultant rejected the potential compounds in favor of a single lexeme sign, including some compounds commonly accepted in the previous literature (e.g. RED+FACE 'embarrassed' and FACE+NICE 'handsome'). When potential compounds were labeled "awkward" by the language consultant, it indicated that the sign was not in the language consultant's lexicon. Again, if the unverified compound was not in either language consultant's lexicon, it could not be further tested in this study and was excluded from analysis.

With both elicitation methods, we employed additional tests on the recognized compounds to determine if the compound acts as a single lexical item or as a phrase. Most of these tests relied primarily on the inseparability criterion. For instance, a language consultant accepted the insertion of the modifiers indicating size between the constituents PICTURE and BOOK in the potential compound 'album'. Therefore, this potential compound was judged to violate the inseparability criterion and was excluded. When appropriate, the elicitor also tested the scope of modification. For example, in the potential compound BOY+BRAVE 'hero', only BRAVE would be modified, not the compound as a whole, violating the integrity criterion. Compounds that did not satisfy both the inseparability criterion and the integrity criterion were excluded.

Elicitation also provided qualitative information not available from dictionary glosses that aided the classification of compounds. For certain problematic items, the researcher elicited multiple example utterances to disambiguate the compounds' constituent structure or other properties. For instance, FOOD and EAT are both produced with the same handshape configuration, location, and with similar movement. As discussed earlier, the deverbal nouns (e.g. FOOD) have repeated movement, but this kind of repeated movement can be lost in a compound. We have analyzed this compound as EAT+MORNING 'breakfast' (Fig. 5), following analysis of previous researchers on the EAT compounds (Klima and Bellugi 1979) and the dictionary (Costello 1994).

During the verification phase, two additional compounds were used by a language consultant. Both PIG+MEAT 'pork' and TRUE+WORK 'seriously' passed the syntactic tests for compounding criteria. Since these were not found in the dictionary in the first phase of data collection, and our goal was a relatively unbiased sample of compounds, they are not included in the study's figures but are noted here.

4.2 Results

Of the potential two-constituent lexical compounds collected, 124 were found to be valid compounds. The rest were unfamiliar to the language consultants or judged to be phrases and in both cases excluded from further analysis. The verified compounds

Fig. 5 EAT+MORNING 'breakfast'

confirm that ASL has all three main types of compounds in the Scalise and Bisetto taxonomy: subordinate, attributive-appositive, and coordinate. Each of these main types is described in the following subsections. Subtypes of the major types are given wherever possible.

4.2.1 Subordinate compounds

Table 2 lists the ASL compounds that show a subordinate (head-complement) relationship. Using the Scalise and Bisetto terminology, the subordinate compounds are split into verbal-nexus and ground and then labeled endocentric or exocentric. As with all of the tables, an example from a spoken language, usually English, is also listed for reference, when possible. The identified ASL compounds are listed under the applicable section.

Within the subordinate level, verbal-nexus compounds are only moderately common in ASL. Both endocentric and exocentric examples are found within the verbal-nexus category. The endocentric verbal-nexus compounds are left-headed, including object-verb (MAN+MARRY 'husband') and verb-adjunct compounds (SLEEP+SUNRISE 'oversleep') and right-headed, including MONEY+GIVE 'to tip' and KNOW+GIVE 'inform'.

One sign of interest is the endocentric verbal-nexus compound KILL+SELF 'commit suicide'. In ASL this compound, KILL shows thematic agreement; and SELF shows syntactic agreement with the object. For example, if a person is signing that she, herself, attempted suicide, KILL is signed pointing toward the signer and the SELF would be signed on the signer's chest (Fig. 6), but if the compound was being used to describe the suicide of another person, KILL is signed pointing away from the signer and SELF would be signed toward the referent's signing space (Fig. 7). (See Meir 2002 for more information about verbal agreement in signed languages.) This use of referent's signing space is also found in one other compound, the endocentric attributive THINK+SELF 'think for yourself'. This subtype of attributive compound is further discussed in the attributive-appositive subsection, and the phenomenon of inflection within compounds is discussed in Sect. 5 discussion.

Although exocentric compounds are less frequent within the subordinate macro category, there are more exocentric verbal-nexus compounds than endocentric verbal nexus compounds. Some exocentric verbal-nexus compounds (e.g. HEART+BEAT

Table 2 Subordinate compounds in ASL

Subordinate				
Verbal-nexus		Ground		
Endocentric	Exocentric	Endocentric		Exocentric
Bookseller	Pickpocket	Windmill		
SLEEP+SUNRISE	EAT+MORNING	MEDICINE+STORE	ANIMAL+DOCTOR	CLOTHES+DOOR
'oversleep'	'breakfast'	'pharmacy'	'veterinarian'	'closet'
KILL+SELF	EAT+NOON	FOOD+STORE	JESUS+BOOK	MONEY+GIFT
'suicide'	'lunch'	'grocery'	'Bible (New Testament)'	'charitable organization'
MAN+MARRY	EAT+EVENING	MUSIC+GROUP	HOUSE+PLAY	BED/SLEEP+SOFT
'husband'	'dinner'	'band'	'playhouse'	'mattress'
WOMAN+MARRY	EAT+NIGHT	LETTER+CARD	DANCE+ROOM	
'wife'	'dinner'	'envelope'	'ballroom'	
MONEY+GIVE	RED+SLICE	LETTER+STAMP	WALL+PAPER	
'to tip'	'tomato'	'postmark'	'wall paper'	
KNOW+GIVE	FAMILY+PASS_DOWN	SHOE+LINE	TEAM+WORK	
'inform'	'heirloom'	'shoe lace'	'team work'	
MIND+DROP	THINK+THAT	AIRPLANE+ARMY	BIRTH+DAY	
'faint'	'likely'	'Air Force'	'birthday'	
	HEART+BEAT	BATTLE+AREA	BED/SLEEP+ROOM	
	'heart-attack'	'battlefield'	'bedroom'	
	MENSTRUATION+STOP	TOWN+LAW	WEEK+END	
	'menopause'	'ordinance'	'weekend'	
	LIFE+SAVE	JUDGE+HOUSE	MOON+LIGHT	
	'life jacket'	'courthouse'	'moon light'	
	HEAR+NOISE/LOUD	JEW(ish)+FOOD	TOLIET+PAPER	
	'loud'	'kosher food'	'toilet paper'	
	BECOME+QUIET	JEW(ish)+TEMPLE	RAIN+COAT	
	'peace'	'synagogue'	'raincoat'	
		SCOTLAND/SCOTTISH+SKIRT 'kilt'	WATER+MELON 'watermelon'	

Fig. 6 KILL+SELF 'suicide' (1st person)

Fig. 7 KILL+SELF 'suicide' (3rd person)

'heart attack', RED+SLICE 'tomato') also display object-verb relationships, though the relationship is sometimes less clear because the object is not overtly stated. For instance, in the compound RED+SLICE 'tomato', the object's color is denoted by the first sign rather than the object itself. It is exocentric because the compound is not a hyponym of either compound, in that it refers to a particular red food, not a kind of slice or shade of red.

As stated earlier, EAT+MORNING 'breakfast' and the other meal compounds were analyzed as having the verb EAT as the first constituent, rather than the noun FOOD. These are verb-adjunct verbal-nexus compounds. These meal compounds were labeled exocentric because the compound is not a hyponym of either constituent (i.e. neither a type of eating nor a type of morning), but the compound generally refers to a noun, the event or the food eaten at the time specified.

The exocentric HEAR+NOISE/LOUD 'loud' illuminates another challenge in classifying compounds by lexical category. NOISE and LOUD are produced the same, i.e. the same sign represents both concepts, perhaps by conversion. It is difficult to conclude with certainty whether this compound's structure is verb+noun (V+N) HEAR+NOISE or verb+adjective (V+A) HEAR+LOUD. Although it might be classified as HEAR+NOISE, a noun-incorporation V+N, we classified it as a V+A compound structure, which is also the structure of the exocentric verbal nexus compound BECOME+QUIET 'peace'.

Fig. 8 Example of subordinate ground compound MEDICINE+STORE 'pharmacy'

ASL has more ground compounds within the subordinate macro category, and subordinate ground endocentric compounds are very common. Subordination in these ground compounds can be paraphrased as an 'of' or 'for' type relationship. Exemplars of this type include: MEDICINE+STORE 'pharmacy' (found in Fig. 8) and ANIMAL+DOCTOR 'veterinarian'. To be clear, subordinate ground compounds may have a verbal constituent. HOUSE+PLAY 'playhouse' is analyzed as a ground compound because in this compound the verb PLAY is not the head of the compound that selected the non-head HOUSE, which is required to be labeled verbal-nexus. This compound has the head HOUSE as it describes a type of house which is for playing.[4] These endocentric ground compounds are overwhelmingly right-headed, including many English calques, but as HOUSE+PLAY 'playhouse' shows, not exclusively right-headed.

We only identified three exocentric ground compounds. BED/SLEEP+SOFT 'mattress', an exocentric ground compound, is of a similar construction to the exocentric verbal-nexus RED+SLICE 'tomato'. This compound could be paraphrased as something soft for a bed or sleeping. MONEY+GIFT 'charitable organization' is exocentric because the compound as a whole refers to the recipient of the money, not the money itself. The third exocentric is CLOTHES+DOOR 'closet', however, this vocabulary-based sign was less favored than a classifier predicate construction[5] indicating clothes hangers on a bar.

4.2.2 Attributive-appositive compounds

As described above, Scalise and Bisetto's modifier-head compounds are labeled attributive-appositive and are split into attributive and appositive compounds. Attributive relationships, where the non-head constituent describes or modifies the head

[4]We entered this compound as the language consultant signed it, but the dictionary listed the compound as PLAY+HOUSE (matching the English translation). Other differences include: the dictionary listed 'temper' as HOT+MIND (signed by the language consultant as THINK+BLOW_YOUR_TOP) and 'outburst' as MIND+EXPLODE (signed by the language consultant as THINK+POP_UP). THINK and MIND are signed similarly, as was described with EAT and FOOD.

[5]Predicate classifier constructions differ from the previously mentioned SASS classifiers. ASL predicate classifiers can encode entire propositions (Emmorey 2002).

constituent are common in ASL. Again, since lexical category of the non-head insufficiently differentiated between attributive and appositive compound, we categorized compounds with a "which is" or "that is" relationship between the head and the non-head constituents as attributive, and compounds with a "like a" relation as appositive. For instance, in the attributive compound *girlfriend*, the entire meaning of *girl* specifies the attributes of *friend*.

Many endocentric attributive compounds (Table 3) were identified. With so many identified compounds, we will only review a few patterns in the data. Attributive compounds are generally right-headed (e.g. MAJOR+GROUP 'majority', SHORT+NAME 'nickname'). However, the high-frequency GIRL+SAME 'sister' and BOY+SAME 'brother' are left-headed. BOY+BABY 'son' and GIRL+BABY 'daughter' were analyzed as attributive and as right-headed with our understanding of attributive compounds having an internal relation of a head constituent which is/that is non-head ("a baby who is a boy/girl") not left-headed ("a boy/girl who is a baby") nor appositive ("a boy/girl who is like a baby"). We chose to classify INVENT+STORY 'fairy tale' as a attributive compound rather than a verbal-nexus compound because the compound describes a story that is invented, rather than describing a type of inventing via noun-incorporation (Mithun 1984) reading might have. LEMON+DRINK 'lemonade' has a similar ambiguous structure.

There are groups of endocentric attributive compounds that share a sign, either the head or the modifier. For instance AREA is the head of two right-headed compounds in the set, NEXT_TO+AREA 'neighborhood' and DIRT+AREA 'land'. Likewise, the language consultant offered many compounds to indicate kinds of meat, such as DEER+MEAT 'venison', BIRD+MEAT 'poultry'. These are also right-headed. In each compound, the kind of MEAT (the compound's head) is specified by the non-head. (The language consultant preferred MEAT rather than COW+MEAT for 'beef' and was not included in the chart.) Admittedly, these MEAT compounds could be considered either subordinate ground compounds "meat of deer" or as attributive "meat that is deer" which underscores the difficulty distinguishing these two categories (and why these categories are adjacent in Table 1).

ASL includes a group of endocentric attributive compounds with THINK as the head and a manner of thinking as the non-head. Although THINK and MIND are produced similarly these were translated as the verb THINK, which is supported by the dictionary translation (Costello 1994). These left-headed compounds include THINK+SAME 'agree' (see Fig. 9), THINK+OPPOSITE 'disagree', THINK+MIX 'confuse', THINK+CONFIDENT 'have faith', and THINK+BEND 'freak out' (translated as "insane" by Costello). THINK+SELF 'think for yourself' was grouped with this subset because it shares the same structural properties and SELF 'self' can be viewed as specifying manner in the same way as SAME 'same', OPPOSITE 'opposite', MIX 'mix', and so forth. THINK+SELF's second constituent, like KILL+SELF 'suicide', shows referent agreement and may be considered as agreeing with the syntactic object. In addition to the THINK compounds, ASL has a few other verb-manner attributive compounds, such as WRONG+GROW 'deformed'.

Classifying compounds in which modifiers are verbs or nominals specifying the manner of an event under attributive is an extension of Scalise and Bisetto, who only described attributive compounds as adjective-noun compounds (p. 45). This extension is a natural consequence of an attempt to free the classificatory framework

Table 3 Attributive-appositive attributive compounds in ASL

Attributive				
Endocentric				Exocentric
High school				Redskin
BOY+BABY	BIRD+MEAT	BLUE+BERRY	THINK+YOURSELF	EAR+YELLOW
'son'	'poultry'	'blue berry'	'think for yourself'	'gold'
GIRL+BABY	DEER+MEAT	NEW+YEAR	THINK+MIX	EAR+CLOSE
'daughter'	'venison'	'New Year'	'confused'	'deaf'
BABY+DOG	SHEEP+MEAT	NEW+ENGLAND	THINK+HOPE	NOSE+OPPOSITE
'puppy'	'mutton'	'New England'	'hope'	'allergic'
FALSE+FATHER	MIX+BREED	NORTH+AMERICA	THINK+CONFIDENT	
'step-father'	'mixed breed'	'North America'	'have faith'	
FALSE+MOTHER	FOOD+LIST	SOUTH+AMERICA	THINK+GRAB	
'step-mother'	'menu'	'South America'	'memorize'	
SECOND+FATHER	CENTER+AGE	PRE+SCHOOL	THINK+POSITIVE	
'step-father'	'middle age'	'pre-school'	'be optimistic'	
SECOND+MOTHER	CENTER+WEST	NEW+TESTAMENT	THINK+SAME	
'step-mother'	'midwest'	'New Testament'	'agree'	
GIRL+PRINCE	SHORT+NAME	OLD+TESTAMENT	THINK+OPPOSITE	
'princess'	'nickname'	'Old Testament'	'disagree'	
BOY+PRINCE	SMALL+KNIFE	OLD+FASHION	THINK+TINY	
'prince'	'pocketknife'	'old-fashioned'	'senseless'	
GIRL+SCOUT	INVENT+STORY	RED+HAIR	THINK+BEND	
'girl scout'	'fairy tale'	'red headed'	'freak out'	
BOY+SCOUT	POLITE+ROOM	PEANUT+BUTTER	THINK+BLOW_YOUR_TOP	
'boy scout'	'living room'	'peanut butter'	'temper'	
NEXT_TO+AREA	WRONG+GROW	SIGN+LANGUAGE	THINK+POP_UP	
'neighborhood'	'deformed'	'sign language'	'outburst'	
DIRT+AREA	LIGHT+WEIGH	POLICE+CAPTAIN	KNOW+STAY	
'land'	'underweight'	'police captain'	'remember'	
MAJOR+GROUP	GIRL+SAME	LEMON+DRINK	TALK+SLOW	
'majority'	'sister'	'lemonade'	'drawl'	
MINOR+GROUP	BOY+SAME			
'minority'	'brother'			

Fig. 9 Example of attributive-appositive attributive compound THINK+SAME 'agree'

Fig. 10 Attributive-appositive attributive exocentric EAR+CLOSE(D) 'deaf'

from dependence on lexical categories and state its criteria instead in terms of the grammatical and semantic relationships between its constituents. If compounds in which an adjective or noun specifies attributes of the entity referred to by the compound as a whole may be described as attributive, the same may be said of compounds in which a verb, an adverb, or other modifier literally specifies attributes of the event (or other eventuality) to which the compound refers. A few exocentric attributive compounds exist. For the compound EAR+CLOSE 'deaf', (Fig. 10) although CLOSE is most often signed as a verb, it seemed to act more like a modifier (the English 'closed') in the compound rather than an example of object incorporation (like INVENT(ED)+STORY). Thus, according to our analysis, a 'closed ear' is 'deaf', and EAR+CLOSE is an attributive compound rather than a verbal nexus subordinate compound. The relationship in the compound EAR+YELLOW 'gold' is problematic for the Scalise and Bisetto framework. It might be best paraphrased as 'something yellow often worn on the ear'. Under this analysis, YELLOW specifies an attribute, as does OPPOSITE in NOSE+OPPOSITE 'allergic'. However, in both cases, the semantic head of the compound has no overt correspondent. For this reason, we classify them as attributive exocentric.

In this data, we did not identify any appositive compounds, where only one feature or property of the non-head constituent is used to modify the head constituent. For instance, in the appositive compound *swordfish*, only one property of the *fish* is

like a *sword*. Therefore, Table 3 lists only the attributive subtype of the attributive-appositive group.

4.2.3 Coordinate compounds

The constituents in coordinate compounds have an equal relationship, not a hierarchical one. The coordinate compound category has only one sublevel in the Scalise and Bisetto framework, distinguishing between endocentric and exocentric compounds. Scalise and Bisetto did not give any explicit criteria (only examples) for classifying coordinate compounds as endocentric or exocentric, despite headedness being markedly different in coordinate compounds than with the hierarchical (i.e. the subordinate and attributive-appositive) compounds. However, it appears to the authors that the endocentric subcategory is meant only for compounds where both constituents are hypernyms of the compound as a whole. Arcodia et al. (2010) call these endocentric compounds hyponymic coordinating compounds as the compound's referent is subordinate to the constituents. Table 4 lists the coordinate compounds, both endocentric and exocentric, in ASL, and gives English examples.

Scalise and Bisetto do not elaborate on the possible relationships within this category. Therefore, we will use Wälchli's (2005) terms to better describe the compounds in this category. GIRL+FISH 'mermaid' has an appositional (as Wälchli used the term) relationship between the constituents. ASL's endocentric coordinate compounds also show intersecting relationships between the constituents (e.g. RUN_AWAY+MARRY 'elope') since the coordination includes only referents that are both A and B (Wälchli 2005). These can be described as endocentric because the compound is a hyponym of both constituents (e.g. 'elope' is a manner of 'marry(ing)' and a manner of 'run(ning) away').

ASL also has some coordinate compounds which match the English translations (e.g. NORTH+EAST). Scalise and Bisetto placed these compounds as exocentric, which matches a directional reading (i.e. go *northeast* for a mile). With this reading the direction is neither a clear hypernym of *north* nor of *east*, but a direction between the two directions. If, however, they are given a regional reading (i.e. I live in *the north-east*), the compounds are endocentric in that the region is both a hypernym of the both larger regions (i.e. of the *north* and of the *east*). The Random House American Sign Language Dictionary (Costello 1994) lists both meanings. The current data suggest that these direction coordinate compounds can have either reading so they are listed in both the endocentric and exocentric columns.

Although this paper mainly focuses on two-constituent compounds, we explored some additional potential compounds, such as compounds of three constituents, particularly those in which the compound's meaning is the constituents' superordinate (called hyperonymic coordinating compounds by Arcodia et al. 2010). This 'listing' kind of compound could be a sub-type of exocentric coordinate compounds. Both Klima and Bellugi (1979) and Sandler and Lillo-Martin (2006) suggest that there are valid ASL compounds having this structure (e.g. APPLE+ORANGE+BANANA 'fruit'). While both of our language consultants accepted and used a list of members for the superordinate category 'furniture' (CHAIR+TABLE+SOFA), neither used a three-constituent expression for 'fruit'. The

Table 4 Coordinate compounds in ASL

Coordinate			
Endocentric		Exocentric	
Student-athlete, bittersweet		North-east, father-daughter	
GIRL+FISH 'mermaid'	NORTH+EAST 'north-east (region)'	MOTHER+FATHER 'parents'	NORTH+EAST 'northeast (direction)'
HOT+WET 'humid'	NORTH+WEST 'north-west (region)'	EAT+SLEEP 'home'	NORTH+WEST 'northwest (direction)'
LAZY+APATHY 'lazy'	SOUTH+WEST 'south-west (region)'	EAR+MOUTH 'deaf'	SOUTH+WEST 'southwest (direction)'
RUN_AWAY+MARRY 'elope'	SOUTH+EAST 'south-east (region)'	CHAIR+TABLE+SOFA 'furniture'	SOUTH+EAST 'southeast (direction)'

Fig. 11 Coordinate compound EAT+SLEEP 'home'

ternary compound CHAIR+TABLE+SOFA is included here because earlier literature suggests that this type of coordinate compounds for superordinate categories must be ternary rather than binary. Considering that in this analysis, the compound must be a hyponym of (one of) the constituents to be called endocentric, we classified this as exocentric because the constituents are hyponyms of the compound.

Exocentric coordinate compounds show a coparticipant relationship between the constituents but with an exocentric semantic relationship to the compound. In addition to CHAIR+TABLE+SOFA 'furniture', ASL has other exocentric compounds. For instance, in the compound EAT+SLEEP 'home' (Fig. 11), the two constituents have equal status within the compound (one both 'eat(s)' and 'sleep(s)'), but the compound as a whole represents a third entity ('the place where one eats and sleeps', 'home'). Since the compound is not a hyponym of either constituent, it is exocentric. Likewise, 'deaf' is not actually a type of ear or a type of mouth, and 'parents' is not a type of mother or a type of father.

In sum, we identified ASL compounds whose constituents have a head-complement (subordinate) relation, modifier-head relation (attributive-appositive), and conjunctive (coordinate) relation. According to these data, the attributive-appositive compound and subordinate compounds are more common than coordinate compounds. ASL compounds are overwhelmingly endocentric, but headedness is not consistently right-headed or left-headed. Subordinate ground compounds tend to be right-headed. There are, however, left-headed ground and verbal-nexus subordinate compounds. In addition, there are right- and left-headed attributive compounds. Since coordinate compounds are dual headed, these cannot be labeled right or left-headed, but the compounds were categorized as endocentric and exocentric.

5 Discussion

These data have implications on several fronts, including universal patterns, language change, and inflection within compounds. First, compounding in ASL generally follows the pattern in other languages in that hierarchical compounds (subordinate and attributive-appositive) are common. Within the subordinate macro category, verbal-nexus compounds are not highly productive in ASL. This differs from English where

verbal-nexus endocentric compounds are highly productive (Lieber 2009). Specifically, none of the seven potential ASL compounds (with two lexical constituents) with simultaneous derivation (e.g. BOWL+MAKE+ER 'potter' STORY+TELL+ER 'narrator') were verified by our language consultants, so the existence of this type of compound could not be confirmed in ASL. Within the attributive-appositive main group, attributive endocentric compounds are the most common compound type in ASL. An interesting finding was the group of THINK compounds in the attributive endocentric category, and this group underscores an additional type of attributive relationship, event-manner compounds.

Attributive compounds are highly productive in ASL. As noted, appositive attributive-appositive compounds were not found in the ASL data. One possible reason for this is a shortcoming in the classificatory criteria. Appositive compounds said to be characterized by metaphorical associations in which one attribute of the complement is attributed to the referent of the compound. However, since metaphorical expressions are pervasive in language, it is difficult to distinguish cases where a modifier is functioning literally from those where it is functioning metaphorically (e.g. a *high school* is not a school that is high in space, but it is not considered metaphoric). Also, Scalise and Bisetto's examples of appositive compounds *mushroom cloud* and *swordfish* show how English uses a single physical property of the non-head noun to describe the head. One possible explanation for the absence of these compounds in ASL is that this function, describing the size shape of the object, is filled by SASS classifiers (Aronoff et al. 2003). Of course, not all appositive attributive-appositive compounds are driven by physical description, as *snailmail* shows, but this may account in part for the relative rarity of appositive compounds in ASL.

Although coordinate compounding does not seem to be productive, three of the coordinate compounds, MOTHER+FATHER, EAR+MOUTH, and EAT+SLEEP are very common ASL signs. These also seem to be highly fossilized. For example, EAR+MOUTH 'deaf', which historically was signed with a non-manual negation marker (indicating no hearing and no speaking), has lost its negation due to reduction, and EAT+SLEEP has handshape assimilation (the second constituent's changed to match the first's) and each constituent's location has moved closer to the other's due to assimilation.

The hierarchical (subordinate and attributive) compounds in ASL also show variation in headedness, even within macro categories. Therefore, ASL cannot be designated a right-headed or left-headed language. But, there may be a pattern. Many of the left-headed compounds are high frequency signs, such as GIRL+SAME 'sister', THINK+SAME 'agree', MAN+MARRY 'husband'. There are also high-frequency signs that are right-headed, such as BOY+BABY 'son', BIRD+MEAT 'poultry', FOOD+STORE 'grocery'. All of the compounds that parallel English compounds, however, are right-headed, such as SIGN+LANGUAGE, BED+ROOM, NORTH+AMERICA. We propose, following Isenhath (1990), that these are calques from English. These calques were found in each of the three main categories, subordinate (e.g. PEANUT+BUTTER, WEEK+END, WATER+MELON), attributive (e.g. BLUE+BERRY, GIRL+SCOUT, NEW+YEAR), and coordinate (e.g. NORTH+EAST). The existence of loan translations (Haugen 1950) like this is unsurprising in view of ASL's long history of language contact with English. Even when calques are ex-

cluded, there is still variation in the headedness of ASL compounds, a subject that should be addressed in future theoretical research.

Internal language change may also be affecting compounding in ASL. There were few verified coordinate compounds. The dictionary, however, offered several potential synonymic coordinate compounds (to use a term from Wälchli 2005), where both parts and the compound seem to have the same general meaning. Only LAZY+APATHY 'lazy' was accepted by our language consultant, the others (e.g. GOOD+KIND 'kind') were not accepted, primarily on grounds of redundancy.

The acceptability of "list" coordinate compounds was also questionable. Sandler and Lillo-Martin (2006) conclude that these might be novel compounds that get replaced by new lexical items. Our data, based only on two signers, do not fully support their conclusion because neither consultant favored the lexeme FRUIT (which is initialized F-handshape twisted on the cheek); but both grudgingly used it rather than the list-type compound for fruit. It may be that the only accepted list compound, CHAIR+TABLE+SOFA 'furniture', is a frozen lexical item. One language consultant accepted MUSIC+GROUP 'band' but did not use it, instead signed a novel list compound in the sentence, seemingly for its illustrative effect. Considering that Klima and Bellugi's (1979) research listed over twenty of these "list" coordinate compounds, the contrast might indicate language change in process (Lucas et al. 2001), but this is only speculative. Decreased use of these collective compounds and fewer confirmed synonymic coordinate compounds may suggest an on-going loss of both of these types. Since Wälchli (2005) states that synonymic compounds emerge diachronically from collective compounds, it is unsurprising that their frequencies would decline concomitantly. However, verifying that this is a broad change, and not an idiosyncratic preference of our consultants, would require a large-scale cross-section study of signers.

As mentioned in the methodology subsection, some complex signs were excluded from this study. Some signs were excluded because they were analyzed as containing only one lexical constituent and a derivational affix, following Sandler and Lillo-Martin (2006). ASL's most frequent derivational affix is the person marker, which is signed like the sign PERSON with a change in handshape. If these complex signs would be considered as a type of compound (historically), they would be subordinate ground endocentric compounds. This suggests that subordinate ground endocentric compounds may have been more productive at an early stage in the history of ASL. Perhaps constituents of compounds from certain categories are more likely to evolve into derivations, rather than remain compounds. On the other hand, if the excluded classifier compounds were included, attributive-appositive compounds would be more common because compounds with classifiers generally fall into the attributive-appositive attributive endocentric category. For instance, 'shark' is FISH+CL-B (a classifier construction with a B handshape to represent the fin) and 'swordfish' would be FISH+CL-1 (a classifier construction with a 1 handshape, signed at the nose). These topics are left for future research.

As described in the results Sect. 4.2.1, some ASL compounds with the constituent SELF may be argued to have internal inflection. Inflection within a compound has been found in spoken languages, but any such forms are expected to be on the non-head constituent since the compound's inflection is usually expected to be carried

by the head of the compound (Bauer 2003). In contrast, ASL's KILL+SELF 'suicide' shows agreement on both constituents which varies depending on the compound's role in the sentence. This is exceptional in the compounding literature. The reason for this exceptionality seems to be ASL's spatial modality and its encoding of space as part of the morpho-phonology. The compound has thematically determined spatial agreement (direction of the sign's movement) on the first constituent showing the source and the goal as well as syntactic agreement on the second constituent. In a highly referent-dependent sign, such as SELF, the facing of the hands marks for syntactic object in the sentence. Since this facing assigns dative case (Meir 2002), this internal inflection cannot be avoided. Future study is needed to see if other signed languages have this type of internal inflection within compounds.

In summary, this study of ASL compounding furthers the understanding of universal patterns in compounding, language change, and morphological theory. The pattern of compounding types in ASL generally follows the patterns found in the spoken languages analyzed in the Scalise and Bisetto framework. ASL compounds are not consistently right- or left-headed, even within the macro categories, as Ceccagno and Basciano (2007) report for Chinese compounds. Compounding can illuminate language change, either by considering historical compounds lost to affixes or lexical changes or by looking for the effects of language contact. Finally, the ASL data challenge the widely-held theory that inflection within a compound is not relevant to the compound's role in the sentence.

6 Evaluation of the Scalise and Bisetto framework

Overall, we find the Scalise and Bisetto (2009) classification framework to be an advance over previous classification schemes. We found that Scalise and Bisetto's first criterion, the relationship between the constituents, to be uniformly applicable as we classified the relationship of the constituents as subordinate, attributive, or coordinate, in a replicable fashion. However, the second level lacked a consistent criterion and made consistent classification of compounds more difficult than might have been necessary. The third criterion (endocentric versus exocentric) was consistent across all groups but was difficult to apply consistently because it was inadequately defined, particularly for coordinate compounds.

Although the Scalise and Bisetto's first level was generally provided an insightful classification for the ASL data, it does have some significant shortcomings. First, the framework wrongly implies that the three macro-categories are equally distinct. The constituents in subordinate compounds and attributive-appositive compounds are both hierarchical, while the constituents in coordinate compounds have an equal status. Since both subordinate and attributive-appositive main types have a hierarchical relationship, separating compounds as subordinate or attributive is sometimes difficult. For instance, BATTLE+AREA 'battlefield' shows a subordinate relationship but is very similar to the attributive DIRT+AREA 'land' and NEXT_TO+AREA 'neighborhood'. In fact, Scalise and Bisetto recognized that two of the three main types have a hierarchical relationship and used the type of hierarchical relationship to distinguish the categories of the second level. (Of course, this criterion could not be

applied at the second level for the coordinate compounds.) Furthermore, compounds showing a hierarchical relationship are more easily labeled endocentric or exocentric. It is difficult to classify coordinate compounds as endocentric or exocentric since both constituents are often considered co-heads (e.g. Guevara and Scalise 2009; Ceccagno and Basciano 2007). Second, this first level seems to be developed for only lexical constituents. Since this paper also focused on lexical compounds, this framework worked well at this level. Even though most compounds found in the world's languages are nouns, adjectives, verbs, and adverbs (Guevara and Scalise 2009), would the relationship between the constituents (subordinate, attributive or coordinative) be valid if one of the constituents were from another word category, such as a preposition, or would these fall under a fourth "other" category? Further consideration of this topic is necessary since the framework was designed to be applied cross-linguistically.

Most notably, the second level of Scalise and Bisetto framework suffers from inconsistent criterion application, which was a criticism that the framework was meant to address. For subordinate compounds, the second level is separated by the presence or absence of a verb selecting its non-head as an argument or adjunct of the verb head. For attributive-appositive compounds, however, the second level is separated into compounds where the non-head is attributive (an adjective or a verb) or metaphorically attributive (a noun or a verb). It is terribly unclear how to differentiate if the non-head could be a verb in either attributive or appositive compounds. Additionally, it is unclear how *druipnat* 'drip wet' meaning "dripping/soaking wet" is appositive (as given by Scalise and Bisetto) rather than being attributive when it seems so similar to other attributive compounds (*druipnat* is a 'wet' that is 'drip(ping)', just as a *blackbird* is a *bird* that is *black*). And, of course, no criterion was applied for separating coordinate compounds. As such, in the Scalise and Bisetto framework, for each macro type, the head selects the non-head within the compound in a different way. Scalise and Bisetto state that this inconsistency supports their macro category groupings. We suggest, however, that a consistent criterion at each level would strengthen the framework and increase its applicability. Furthermore, languages with extensive and varied coordination warrant more than the current two Scalise and Bisetto subtypes of coordinate compounds.

Moreover, the use of lexical category at all as part of the second level criteria is confusing and perhaps even theoretically unsound. In some theories of morphology (e.g. Distributed Morphology), roots, the constituents of compounds, do not carry word category information (Harley 2009). Scalise and Bisetto appeal to Lieber's Lexical Semantics for describing the relationship between the head and the non-head in compounding. Scalise and Bisetto state that for attributive (attributive-appositive) compounds and subordinate compounds, the lexeme's skeleton has no significant role (p. 49). Since it is the skeleton that carries the grammatical information, grammatical information should not be relevant, and yet, word category acts as a de facto criterion in the Scalise and Bisetto framework. This theoretical critique is especially relevant when working with data from languages with flexible word class. As mentioned earlier, the same ASL sign could be translated as LOUD or as NOISE depending on its context. When, as in ASL, a language allows widespread conversion, classification based on word category is difficult. Further, criteria based on word category may

obscure patterns in the data. Within the attributive-appositive category as described by Scalise and Bisetto, attributive compounds seem limited to adjectives modifying nouns. For our data, however, the group of THINK compounds can be understood as attributive-appositive compounds, even though Scalise and Bisetto did not give any verb-adjective examples. Including verb-manner compounds in the attributive category is our extension of the Scalise and Bisetto framework. Again, the Scalise and Bisetto classification framework might be more easily applied cross-linguistically if subtypes were not defined by lexical category.

Although the attributive-appositive group was specifically expanded in the Scalise and Bisetto (2009)'s model to include the appositive category, it was not useful for the ASL data. Rather than illuminating a gap in ASL compounding, the results may highlight a weakness in the framework. It is unclear how many languages would need this category, given the difficulty distinguishing the category. Scalise and Bisetto themselves do not list any exocentric appositive compounds. In fact, describing appositives as often metaphorical may be unsound (Grandi 2009), especially given the attributive example *high school* is also only metaphorically *high*. Additionally, as mentioned in the subsection describing the framework, Scalise and Bisetto chose a confusing title for this type of compound, as 'appositive' is already in the literature as a type of coordinate compound.

We propose the following solution to address the inconsistent criterion at the second level: separate the second level of the hierarchical (subordinate and attributive-appositive) compounds by an expressed predicate criterion satisfied if all predicates implicit in the meaning of the compound as a whole are expressed via an overt element in the compound. For instance, under the subordinate category, for the verbal-nexus compound *bookseller*, the predicate 'sell' is expressed. ASL compounds of this type include MAN+MARRY 'husband' and KILL+SELF 'suicide'. Whereas, for other compounds (often the ground compounds), the predicate which connects the constituents is unexpressed in the compound. For instance, *windmill*, meaning 'mill (powered by) wind', has an unexpressed predicate essential to the interpretation of the compound. ASL compounds with unexpressed predicates include FOOD+STORE 'store (which sells) food' and ANIMAL+DOCTOR 'doctor (who treats) animal(s)'. The same criterion can be used for the attributive-appositive compounds. Many attributive compounds have sufficiently expressed descriptors; THINK+SAME 'agree' means to 'think the same' or 'think similar(ly)'. In addition, compounds with a simple attribute proposition are considered as expressed predicates without overt copulas because the attributive copula is not a predicate; the predicate adjective or predicate noun is the expressed predicate. For instance, *boyfriend* ('friend who is a boy') and SHORT+NAME ('name that is short') have expressed predicates, whereas, (the previously appositive) *mushroom cloud* ('cloud that is shaped like a mushroom') has an unexpressed predicate which illuminates the relationship between the constituents of the compound. Likewise, *snailmail* ('mail that moves as slow as a snail') has an unexpressed predicate as does EAR+YELLOW ('something yellow that is often worn on the ear'). Table 5 summarizes our proposed framework for head-complement compounds, improving on Scalise and Bisetto with examples from spoken languages, usually English, and ASL.

This criterion can be applied in a more replicable fashion than a criterion based on metaphoric interpretation or word category. For instance, *high school* and *druipnat*

Table 5 Proposed framework for hierarchical compounds

Hierarchical compounds							
Subordinate				Attributive			
Expressed predicate		Unexpressed predicate		Expressed predicate		Unexpressed predicate	
Endocentric	Exocentric	Endocentric	Exocentric	Endocentric	Exocentric	Endocentric	Exocentric
bookseller	*pickpocket*	*windmill*	*sans papier*	*high school*	*redskin*	*snailmail*	*shithead*
dogcatcher	*cutthroat*	*mushroom soup*		*blackboard*	*killjoy*	*swordfish*	*birdbrain*
city-employee	*lavapiatti*	*water pipe*		*druipnat*	*loudmouth*	*milkman*	
MAN+MARRY ‘husband’	RED+SLICE ‘tomato’	FOOD+STORE ‘grocery’	MONEY+GIFT ‘charity’	THINK+SAME ‘agree’	EAR+CLOSE ‘deaf’	POLITE+ROOM ‘livingroom’	EAR+YELLOW ‘gold’
KILL+SELF ‘suicide’	FAMILY+PASSDOWN ‘heirloom’	MUSIC+GROUP ‘band’	CLOTHES+DOOR ‘closet’	DEER+MEAT ‘venison’	NOSE+OPPOSITE ‘allergic’		
HOUSE+PLAY ‘playhouse’	EAT+NOON ‘lunch’	JEW+TEMPLE ‘synagogue’		SHORT+NAME ‘nickname’			
MONEY+GIVE ‘to tip’	MENSTRUA-TION+STOP ‘menopause’	ANIMAL+DOCTOR ‘veterinarian’		FALSE+FATHER ‘step-father’			
SLEEP+SUNRISE ‘oversleep’	BECOME+QUIET ‘peace’	TOILET+PAPER ‘toilet paper’		BABY+DOG ‘puppy’			

('a wet that drips') are accurately classified as attributive with or without a deciding if *high* is metaphoric or deciding based upon the lexical category of *druip*. By using the expressed/unexpressed criterion, it is easier to classify compounds. For instance YELLOW+EAR 'gold' more clearly has an unexpressed predicate of "worn" than it could be classified in the Scalise and Bisetto's framework.

Moreover, Scalise and Bisetto's use of the terms "head" and "non-head" in the second level categories creates an inconsistency or confusion when then classifying the compounds as endocentric or exocentric on the third level. Scalise and Bisetto did not address this confusion by explaining how headedness is defined within a compound, compared to headedness of the compound as a whole. For instance, for *loudmouth* or *greybeard* to be labeled attributive, the non-heads within the compound (*loud*, *grey*) modify the heads (*mouth, beard*), but for these compounds to be labeled exocentric, the (head) constituent's relationship to the compound must be analyzed. Scalise and Bisetto glossed over how to determine endocentricity or exocentricity by focusing on the fact that the three levels allow endocentricity or exocentricity to be applied to each of the other categories, i.e. "The compounds of these three classes can be both endocentric and exocentric…" (p. 46). This endocentric/exocentric distinction is often difficult to discern. Further, the Scalise and Bisetto criterion for determining endocentricity for coordinate compounds is even less clear. This confusion can be solved by clearly defining the third level criterion as the constituents' relationship to the compound. The framework, however, still assumes that all compounds are either endocentric or exocentric, but it may be that the hyponymy test is not valid for compounds with a metaphoric interpretation (Bauer 2010).

Although the classification of coordinate compounds almost certainly requires further classification criteria, there are too few ASL coordinate compounds to inform a modification of the Scalise and Bisetto framework. In addition, the ASL compounds do not challenge the assumed exocentricity of metaphoric compounds. Therefore, we have left any modifications to be informed by other work.

To summarize, we agree with the first level criterion of determining the relationship between the constituents. However, we would recommend acknowledging that subordinate and attributive compounds are both hierarchical compounds; in the current framework design, subordinate, attributive-appositive, and coordinate seem equally similar. Our proposed improvement on the Scalise and Bisetto framework offers the second-level criterion as expressed/unexpressed predicate. This suggestion has the additional benefit of not adding terminology (such as Scalise and Bisetto's attributive-appositive and appositive) to the compound discussion, which was another criticism the Scalise and Bisetto framework wanted to address. The third level, regarding headedness, should be clearly stated as the relationship of the constituents to the compound. This revised classification framework would ease labeling of languages, and we speculate that it is more cross-linguistically valid.

7 Conclusion

This study confirmed 124 two-constituent compounds and a single three-constituent compound. ASL compounds commonly have a subordinate or attributive relationship

between the constituents. There were few coordinate compounds. These data showed that endocentric compounds are common in ASL. It should be stressed that some signs that have been commonly accepted to be compounds (e.g. RED+FACE 'embarrassed', PICTURE+BOOK 'album') were found to be signed as a single sign rather than a complex sign or were analyzed as a phrase separable by a modifier during the process of the research reported here. This finding underscores the need to verify that the forms are valid before doing analysis that could affect morphological theory.

The Scalise and Bisetto classification, which attempts to address the varied types of compounding found in the world's languages, was sufficient as a basic classification of the compounds found in ASL. The subordinate, attributive-appositive, and coordinate groups of their first level of analysis did illuminate rather than obscure the compounding patterns in ASL. But Scalise and Bisetto's framework implies that the three main groups are equally distinct, whereas subordinate and attributive-appositive compounds are both hierarchical while coordinate compounds are not. The second level specification (for the non-coordinate compounds), however, was difficult to apply. Placing headedness on a separate level allowed this feature to be assessed for each of the compounding types although it is debatable if and how coordinate compounds should be classified as endocentric or exocentric.

Our proposed classification framework is this: first, the syntactic relationship between the constituents, second, expressed/unexpressed predicates (for hierarchical compounds), and third headedness. At the second level, the hierarchical compounds are better separated by based on whether or not the predicate is expressed in the compound. Headedness remains the final criterion, determined by the relationship of the constituents to the compound. This revised framework has clearer and more consistent criterion at each level, avoiding debatable definitions and lexical categories, which makes the framework more applicable across languages and across morphological theories. Although this revised framework is an improvement and likely has universal applicability, it may be that some languages warrant additional levels to further illuminate the compounding patterns of that language, in particular for coordinate compounds.

With a basic classification of ASL compounds completed, researchers will be better able to study this word-formation process, such as distinguishing productive compounding mechanisms from historical compounds and further distinguishing derivation and compounding. Additionally, more research is needed on the frequency of inflection within compounds (specifically, referent space inflection), the use of classifiers within compounds, and the location of predicate only signs (Valli and Lucas 2000) within compounds.

Other language consultants might have been able to confirm additional compounds; however, there is no evidence to suggest that the acceptance of additional compounds would greatly alter the overall conclusions of this paper. A larger survey should be done to determine if preferences for subtypes of compounding is related to the signer's age, race, class, geographic location, etc., following previous research concentrating on phonological or lexical differences.

Acknowledgements Many thanks to the people who have given important feedback to this paper, especially Claude Mauk, Helen Stickney, the journal reviewers and editor. Thanks also to the language consultants M.J. Shahan and Jason Norman.

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