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Nominal Word Order Typology in Signed Languages

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Although spoken language nominal typology has been subject to much scrutiny, research on signed language nominal word order typology is still a burgeoning field. Yet, the structure of signed languages has important implications for the understanding of language as a human faculty, in addition to the types of universals that may exist across the world's languages and the influence of language modality on linguistic structure. This study examines the order of nouns and attributive modifiers (adjectives, numerals, demonstratives, quantifiers, genitives, and relative clauses) in 41 signed languages, which span national and village signed languages from various lineages and geographic regions. Despite previous typological research on clausal phenomena indicating that the clausal structure of signed languages differs systematically from spoken languages (Napoli and Sutton-Spence, 2014, among others), the results of this survey indicate that signed language nominal word order typology is strikingly similar to spoken languages in several ways: 1) the most common word orders in spoken languages are also common in signed languages, 2) the uncommon word orders in spoken languages are also uncommon in signed languages, but are attested, unlike uncommon major constituent orders, and 3) the relative ranking of word order strategies, particularly relative clauses, is similar across signed and spoken languages.

Keywords: noun phrase (NP), typology, signed languages, adjectives, numerals, demonstratives, genitives, relative clause (RC)

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INTRODUCTION

Spoken language typology is a robust discipline, with a copious amount of research dedicated to examining linguistic phenomena and how genetic and areal relationships between languages influence the patterns observed across spoken languages. However, much typological research often excludes a fairly large subset of human languages in their investigation of linguistic phenomena–signed languages. Yet, the structure of signed languages has important implications for the understanding of language as a human faculty, in addition to the types of universals that may exist across the world's languages and the influence of modality on linguistic structure. While research aiming to understand linguistic typology must therefore include languages from *across* modalities, this effort is hampered by the fact that the typology of signed languages, as well as the study of signed languages more broadly, is still a burgeoning field and, thus, it is not well-understood how signed languages may inform the existing literature on (spoken) language typology.

Typological research on signed languages has focused almost exclusively on lexical and clausal phenomena, including negation and question formation (Zeshan, 2013a,b; Zeshan and Sagara, 2016; Zeshan and Palfreyman, 2017) and other syntactic and semantic phenomena outlined in **Section 2**. Studies on word order, although thoroughly studied in spoken languages, have focused predominantly on the question of constituent order and agreement, where language modality is argued to influence agreement phenomena (Lillo-Martin and Meier, 2011), which in turn affect the

observed orders of subject, verb, and object (Napoli and Sutton-Spence, 2014). Other studies of phenomena related to nominal structure, such as relative clauses (Branchini, 2014; Wilbur, 2017), have been small-scale and have mostly examined signed languages which are relatively well-researched, such as European signed languages and American Sign Language. While the linguistic phenomena in these studies and others are diverse and hundreds of signed languages now have some form of linguistic documentation, there are relatively few large-scale typological studies of signed languages and some signed languages, particularly non-European ones, still remain understudied and underrepresented in linguistic research. Further, despite ample discussion of clausal word order, there is no typological research on noun phrase (NP) word order in signed languages and it is unknown if language modality may impact NP structure in signed languages, as has been argued for clausal word order.

This study examines the word order of nouns and nominal modifiers (adjectives, numerals, demonstratives, quantifiers, genitives, and relative clauses) in 41 signed languages, using existing linguistic documentation and description those signed languages, as well as primary fieldwork in Mexican Sign Language (LSM). In doing so, this study explores how the nominal structure of signed languages can be categorized typologically, forming a clear description of nominal word order typology in signed languages.

The typology of signed language NP word order is then considered in the context of spoken language NP typology, in an effort to examine what effects, if any, modality may have on nominal structure and how signed languages may inform the study of (spoken) language typology. If there are systematic differences in the attested word orders of modifiers and nouns in signed and spoken languages, or differences in their overall prevalence across this sample compared to results from spoken language surveys, then this would indicate that modality effects on word order may extend to the NP, as well as being present within the clause. However, if the NP word order preferences across signed and spoken languages are similar, then the NP is not a site for modality effects on word order, unlike the clause.

The 41 signed languages, which span both national and village sign languages from various lineages and geographic regions, have the same general word order patterns of nouns and nominal modifiers that have been attested in spoken languages. Although the overall prevalence of some nominal word orders are different, the most common orders found in spoken languages were also exceptionally common in signed languages, namely Noun-Num and Noun-Dem (Dryer, 2013b; Dryer, 2013d), and uncommon NP typological features in spoken languages, such as predicative-only adjectives, post-nominal genitives, and non-externally-headed relative clauses (Dryer, 2013a; Dryer, 2013c; Dryer, 2013e), are also uncommon in the signed languages sampled here, but are attested, unlike uncommon major constituent orders in signed languages (Napoli and Sutton-Spence, 2014). Further, six signed languages are identified as having mixed relativizing strategies, five of which are considered part of the French Sign Language lineage, constituting a previously unreported genetic pattern among some signed languages related to Old French Sign Language.

The similarity in nominal word order across signed and spoken languages is somewhat unexpected given that the prevalence of major constituent word orders in signed languages differs from spoken languages, a difference that has been ascribed to language modality effects on agreement and the use of space in signed languages to mark referents, which in turn impacts major constituent order (Napoli and Sutton-Spence, 2014). This would suggest that, although language modality seems to impact major constituent order in signed languages, modality does not affect noun phrase word order in signed languages, supporting previous hypotheses that modality effects may be generally sparser in syntax, particularly in less accessible levels of syntactic structure, like noun phrases (Lillo-Martin, 2002; Meier, 2002).

In **Section 2**, previous research on signed and spoken language typology is presented. The data and methodology used in this study is outlined in **Section 3** and the results are discussed in **Section 4**, followed by the implications of the analysis and directions for future research in **Section 5**.

SIGNED AND SPOKEN LANGUAGE TYPOLOGY

Previous Research on Typology of Signed Languages

Signed languages, although not themselves homogeneous, typologically differ in a number of ways from spoken languages; these differences, which may involve the presence or absence of certain linguistic structures or variation in their overall prevalence across language modalities, seem to suggest that modality effects are at least partially responsible for the variation observed across signed and spoken language modalities (Zeshan and Palfreyman, 2020).

Most typological research on signed languages seeks to situate the phenomena studied in signed languages within the typological literature on spoken languages, especially since many of the details are quite distinct across modalities. Agreement, for example, is strikingly similar across signed languages (Pfau et al., 2012, 2018), but is also quite distinct from agreement patterns found within most spoken languages (Corbett, 2006). All established signed languages studied to date exhibit a three-way classification system of verbs: plain verbs that do not agree with their arguments, agreeing (directional) verbs that do agree with their arguments, and spatial verbs that agree with the location of their arguments in the signing space (de Quadros and Quer, 2008). This is quite different from the patterns described in spoken languages, where agreement is generally either absent entirely in a language or obligatorily marked on all verbs (Corbett, 2006). Additionally, no known spoken languages make this three-way distinction in verb types that is found in signed languages.

As a result of the unusual nature of agreement in signed languages (from the perspective of spoken languages), investigations of word order typology in signed languages have almost exclusively focused on the clause, or constituent word order (Johnston et al., 2007; Vermeerbergen et al., 2007b,a; Quadros and Lillo-Martin, 2010; Napoli and Sutton-Spence, 2014). Agreement/directionality appears to affect major constituent order in signed languages, with plain and

reversible verbs[1] favoring SVO, but verbs with agreement or non-reversible arguments often showing SOV or other word orders (Napoli and Sutton-Spence, 2014). SOV is also argued to be grammatical in all signed languages and objects are immediately adjacent to verbs[2] (Yau, 2008; Napoli and Sutton-Spence, 2014). While the prevalence of SOV and SVO in signed languages, as well as the adjacency of verbs and objects, is predicted via universal pressures on the structure of language and the internal structure of the verb phrase, the preference for SVO in reversible sentences is not; instead modality effects are responsible for some of the patterns observed in major constituent order across signed languages (Napoli and Sutton-Spence, 2014). Further, other basic word orders[3] are uncommon in spoken languages but are attested (e.g. VSO, VOS), unlike in signed languages. Although this may be an artifact of the number of signed languages compared to spoken languages, the preference for SVO and SOV is likely partially an effect of the language modality (Napoli and Sutton-Spence, 2014), as the visual-gestural modality allows for the proliferation of certain features across signed languages (e.g. agreement, SVO/SOV, visual iconicity, and classifiers) which are otherwise uncommon or unattested in spoken languages, particularly in areas where syntax meets space Lillo-Martin (2002); Meier (2002).

Exceptions to this focus on constituent word order include collections of work from several signed languages that examine other aspects of linguistic structure, either in smaller-scale studies of signed languages from a typological perspective, or in typological studies including many signed languages. These include studies of question particles (Zeshan, 2013b); interrogatives (Zeshan, 2004; Aboh et al., 2005); formation of kinship terms, numerals, and color terms (Wilkinson, 2009; Zeshan and Sagara, 2016); word classes and classification criteria (Schwager and Zeshan, 2008); possessives and existential constructions (Chen Pichler et al., 2008; Perniss and Zeshan, 2008); numeral incorporation (Fuentes et al., 2010); relative clauses (Branchini, 2014; Wilbur, 2017); expression of semantic roles and locatives (Boyes Braem et al., 1990); object marking (Börstell, 2017); the distribution of negative markers (Zeshan, 2013a; Zeshan and Sagara, 2016); irregular negatives (Zeshan, 2013a); coordination and subordination (Tang and Lau, 2012); prosodic cues (Tang et al., 2010); and classifier constructions (Aronoff et al., 2003). There are typological handbooks detailing several linguistic phenomena or short grammatical descriptions of several signed languages (Fischer and Gong, 2010; Pfau et al., 2012; Velupillai, 2012; Zeshan and Palfreyman, 2017; Guen et al., 2020) and some signed languages have also been individually examined from a typological perspective, including Turkish Sign Language (Zeshan, 2006), Indo-Pakistani Sign Language (Zeshan, 2003), Sign Language of the Netherlands (Coerts, 1992; Oomen and Pfau, 2017), German Sign Language (Glück and Pfau, 1998), Italian Sign Language (Branchini and Donati, 2009), Japanese Sign Language (Sagara, 2014, 2016), and Inuit Sign Language (Schuit et al., 2011; Schuit, 2014, 2015), among others.

However, there are no typological studies on word classes and nominal word order more generally in signed languages, only small-scale studies of relative clause types and a few studies on morphosyntactic processes effecting nouns. Generally, signed languages have open and closed word classes and the categories of noun (entity) and verb (event) are present in all signed languages studied to date, with the caveat that some signs may have properties of both nouns and verbs (e.g. may function as either) (Schwager and Zeshan, 2008; Velupillai, 2012).

However, the distinction between these categories is upheld by differences in morphological and syntactic processes applied to them. For example, the syntactic distribution of event signs, which in American Sign Language cannot combine with quantifiers or pre-modify other signs (Schwager and Zeshan, 2008), and mouthings, which occur mostly with entity signs in LSM (Quinto-Pozos, 2008), but with event signs in Quebec Sign Language (Voghel, 2005), may distinguish these categories. Nouns may also be inflected for number, frequently via reduplication; however in some signed languages nouns cannot be inflected for number at all, although verbs and pronominal signs might be (Velupillai, 2012). However, other ϕ-features typically associated with nouns in spoken languages, such as gender and case, are not typically present in signed languages. No documented signed language is argued to have grammatical gender, although it may have gendered nominal signs, such as + FEM in LSM, an affix which can optionally indicate the gender of female animate entities. Some signed languages are argued to mark case as part of verb agreement (?) or in possessive pronouns or suffixes (Abner, 2012 for a discussion of the genitive sign POSS in ASL and Johnston and Schembri, 2007 on genitive suffixes in Auslan). Combining these morpho-syntactic properties of nominal signs with the semantic properties of nouns outlined by Croft (1991), which defines nouns in terms of reference, modification, and predication, then researchers working on signed languages can arrive at a criteria for nominal/entity signs which is fairly flexible and allows for the realization of this category and its properties to vary somewhat across signed languages.

Signed languages vary however, as to whether they have other lexical categories and the functions those categories have. Many signed languages have modifiers (property) signs that can modify nouns or verbs (Schwager and Zeshan, 2008; Velupillai, 2012), correlating with the classes adjective and adverb, but others do not. Argentine Sign Language, for example, has been argued to lack most adjectives, instead using stative verbs (e.g. BE-TALL) as attributive nominal modifiers (Massone and Curiel, 2004), while

[1]Reversible verbs can take arguments that can act as either a subject (agent) or an object (patient). For example, the sentence "Violet eats the kibble" is not reversible; only "Violet" can be understood as the agent, barring the existence of a kibble monster. However, in the sentence "Violet hugs Marzipan", either animate argument, Violet or Marzipan, could be the agent and this is disambiguated in some languages through word order.

[2]Napoli and Sutton-Spence (2014) note that OSV occurs in signed languages, but is typically analyzed as object topicalization, yielding a non-adjacent surface order.

[3]However, attempts to define default constituency order in signed languages are complicated by interference from spoken languages and the effect of agreement, topicalization, and other clausal phenomena on surface word order (Johnston et al., 2007).

modifiers in modifiers in Kata Kolok only serve predicative functions (Schwager and Zeshan, 2008). Conversely, while German Sign Language modifiers can act as attributive modifiers or predicatively modify nouns and verbs (Schwager and Zeshan, 2008).

One area of signed language nominal structure subject to much scrutiny is relative clauses; however typological studies of relative clauses in signed languages are small-scale and focused on distinguishing relativization strategies in a few, relatively well-documented signed languages from Europe and the US (Galloway, 2011; Branchini, 2014; Geraci, 2015; Wilbur, 2017). Thus, many non-European signed languages are underrepresented in the literature on relative clauses. Compounding the problem of scarce documentation of many non-European signed languages, efforts to identify and differentiate types of relative clauses in signed languages can be challenging due to the complexity of these structures, the similarities between relative clauses and other embedded structures, and how little is known about relativizing strategies in signed languages more broadly (Branchini, 2014; Kubus and Nuhbalaoglu, 2018; Kubus, 2021). Further, many of the signed languages considered in these small-scale studies have typologically unusual relativizing strategies (e.g. internally-headed, correlative, mixed strategies), when compared to the patterns found in spoken languages, which complicates attempts to generalize signed language relative clause typology and to determine whether there are differences in how languages in different modalities form relative clauses.

Yet, the position of some nominal modifiers (like genitives) in spoken languages is known to correlate with the order of the object and the verb (Dryer, 2013c), and there are some clear areal patterns in the order of the noun and its modifiers, a set of phenomena that would certainly inform much typological literature if it were present (or not) in signed languages. Thus, as it is not known how signed languages may inform the existing literature on (spoken) language typology, nor whether language modality, argued to play a critical role in agreement patterns, acquisition, processing, and constituent word order in signed languages (Morgan et al., 2007; Lillo-Martin and Meier, 2011; Napoli and Sutton-Spence, 2014; Villameriel et al., 2019), has effects on nominal word order in signed languages and their processing, studying nominal word order in signed languages would greatly inform the understanding of language as a human faculty and linguistic typology more broadly, as well as increasing the representation of signed languages in linguistic typology.

NP Typology in Spoken Languages

Due to large-scale investigations of spoken language typology, the word order of nouns and nominal modifiers across spoken languages is well described, as is how these word order patterns vary based on areal, genetic, and other factors. The signed language data presented in this study is compared with data from the World Atlas of Language Structures (WALS). Spoken languages predominantly favor post-nominal modifiers (Dryer, 2013a,b,d,e), excluding genitives, which are cross-linguistically pre-nominal (Dryer, 2013c). While initially there appeared to be a correlation between the order of adjectives and nouns and the order of verbs and objects, subsequent research has shown that there is no correlation between Noun/Adj[4] and Obj/Verb word orders (Velupillai, 2012). However, there is a cross-linguistic correlation between the order of Noun/Genitive and the order of Obj/Verb (Dryer, 2013c).

The most common order of the adjective and noun is Noun-Adj, which accounts for about two-thirds of the languages surveyed in WALS (Dryer, 2013a). Adj-Noun order is second most common order, but is much less frequent. Less than a 10th of languages have either Noun-Adj or Adj-Noun as an option, with neither dominant. It is very rare for languages to lack attributive adjectives entirely; the languages that only have predicative adjectives are all found in the Americas (Dryer, 2013a).

The order of the numeral and the noun exhibits clear geographical patterns (Dryer, 2013d). Num-Noun order, which just under half of the spoken languages have, is found mostly in Europe, the Middle East, North Africa, Asia, Indonesia to western Micronesia, and across the Americas. The order Noun-Num, which accounts for just over half of the languages, is predominant in sub-Saharan Africa, Southeast Asia, New Guinea and eastern Indonesia, and pockets of Canada and the Eastern United States. Relatively few languages in Dryer's sample have neither order as dominant and only two languages have numerals that only modify verbs.

By comparison, the occurrence of pre-nominal and post-nominal demonstratives is much more equivalent across spoken languages; slightly more languages place the demonstrative after the noun (45.8%) than before the noun (44.2%) (Dryer, 2013b). Far less common in Dryer's sample are demonstrative affixes (together accounting for 3%), demonstratives both before and after the noun (1.4%), and languages that have two or more of these types available (5.5%). The Dem-Noun order is dominant in Europe, Asia, and the Americas. Noun-Dem order is found in Africa, Southeast Asia into the Pacific, Australia, and New Guinea. Languages with demonstrative affixes are uncommon, but slightly more common in Africa. Doubled demonstratives are clustered among Tibeto-Burman languages, but are otherwise scattered across the globe. Languages without a dominant strategy are also scattered, but slightly more common in Africa (Dryer, 2013b).

As pre-nominal genitives correlate with pre-verbal objects, Gen-Noun is most common cross-linguistically (Dryer, 2013c). Gen-Noun order is dominant in pockets of Africa, Asia (other than Southeast Asia), New Guinea into eastern Indonesia, and the Americas. Noun-Gen order accounts for a third of Dryer's sample and is common in Europe, Africa, Southeast Asia, Austroneasian languages, the Pacific Northwest, and Mesoamerica. Languages lacking a dominant order are uncommon, but are more common in Australia.

[4]Slashes between modifiers and nouns do not indicate a relative ordering between them, while dashes do indicate a relative ordering; e.g. Noun/Adj does not refer to a specific order, but Noun-Adj refers to post-nominal adjectives.

The order of the relative clause and the noun is the final typological study of nominal word order included in WALS. There are several methods of encoding relative clauses, with two major strategies: pre-nominal externally-headed and post-nominal externally-headed relative clauses (Dryer, 2013e). Noun-Relative is the dominant type across the world's languages, except across most of Asia and in pockets of New Guinea, Ethiopia and Eritrea, and southern Colombia, where the Relative-Noun order is dominant. Internally-headed relative clauses, which are embedded clauses with the head noun in the base position of the clause, are scattered, but more common in North America and northeast India and adjacent areas. Correlatives are another type of internally-headed relative, but the relative clause is located outside of the main clause and anaphorically connected to an NP in the main clause that corresponds to the head. Correlatives as a dominant relativizing strategy are uncommon cross-linguistically, mostly found in Southeast Asia and a small area of West Africa. Adjoined relative clauses are outside the main clause and have an external head which is within the matrix clause; the relative clause does not form a constituent with the head noun. Adjoined relative clauses as a primary strategy are represented in only eight languages in Dryer's sample, mostly in Australia. The final type of relative clause are doubly-headed relative clauses, which have both an internal and an external head. These are found as a primary relativizing strategy in only one language, which is spoken in Indonesia.

These samples from WALS provide a fairly clear indication of the cross-linguistic tendencies found in spoken languages, although there are issues with the notion of *dominant* word order and certain limitations of large-scale samples like these. For example, these samples rely on descriptions of language data collected by researchers using differing methodologies and identifying dominant word order and relative clause types, for example, is notoriously difficult. In particular, it is quite possible that non-externally-headed relative clauses are much more frequent in spoken languages than this sample might indicate, due to these issues (Dryer, 2013e).

DATA AND METHODOLOGY

The process of coding data from 41 signed languages is described in **Section 3.1**. I explore how signed languages fit into the typical model of language family classification, as well as the ways in which signed languages do not easily conform to the model of language classification that has been developed based on spoken languages, in **Section 3.2**.

Typological Data

Using published sources for 41 signed languages, in addition to my own collected data from LSM, I coded the word order of nouns and nominal modifiers (adjectives, numerals, demonstratives, quantifiers, genitives, and relative clauses), which are listed along with sources in **Table 1**. These signed languages comprise a selection from the typological study on constituent word order in 42 signed languages conducted by Napoli and Sutton-Spence (2014).[5] I modeled my sample on theirs to facilitate comparison between their results on constituent order and those on nominal word order presented here (although I do not compare those results here). Additionally, their sample of signed languages represents both village signed languages and national signed languages, as well as signed languages that are both geographically and genetically distant. See the following subsection for discussion of the distribution of this sample and sign language classification issues.

While the LSM data comes from my own fieldwork, supplemented by Cruz Aldrete's (2008) descriptive grammar, the majority of the data used in this typological study comes from published manuscripts, including grammars of particular signed languages, small scale typological studies of other phenomena in signed languages (e.g. Branchini, 2014; Wilbur, 2017; Hauser et al., 2021), and larger scale typological studies and handbooks of signed languages (e.g. Zeshan, 2006; Pfau et al., 2012; Zeshan and Sagara, 2016; Zeshan and Palfreyman, 2017). When a generalization about the Noun/Modifier order was explicitly stated, I coded that statement in the data set (see the supplementary materials for values coded for each signed language). When a source did not explicitly state which order was preferred, reported data (typically glossed in the meta-language with all caps) was used to determine the order of the noun and its modifier. Crucially, the modifier had to be used attributively, which was determined based on a variety of cues, including the syntactic glossing, meta-language glossing, the presence of a verb, etc. While this methodology is typical of large-scale typological studies, this is not an ideal method for collecting information about word order; however, it was necessary in order to report observed word order in these signed languages, many of which are under-represented in linguistic research. As a result, it is possible that the word order listed for a language only accounts for the possible orders in a given language, not the preferred word order in that language. Additionally, language contact with spoken languages may influence what individual signers produce, so the order found in the data may not be the canonical order in that signed language. Further, methodologies for collecting data may differ between studies; if the data is from naturalistic speech, it may more accurately represent the word order of a signed language than direct elicitation or other tasks. However, full nouns are often replaced with pronominal forms, null pronouns (with or without verbal marking) or referential body shift in discourse. As a result, full noun phrases are uncommon in discourse and when present they may be focused or topicalized, sometimes leading to changes in word order. Conversely, if data was collected in an elicitation or interview setting, there may be more "unnatural" utterances. This is an issue not unique to the study of signed languages, and instead is a persistent problem typological studies must contend with because they rely on data collected with varying methodologies.

[5]One language from their study was not included, French Swiss Sign Language, which did not have sufficient published data to provide generalizations about nominal modifiers.

TABLE 1 | Signed languages in the study and sources.

Signed Languages	Sources
Adamorobe	Nyst (2007)
Al-Sayyid Bedouin	Sandler et al. (2005), Padden et al. (2010)
American	Valli and Lucas (2000), Chen Pichler et al. (2008), Quadros and Lillo-Martin (2010), Galloway (2011), Branchini (2014)
Argentine	Massone and Curiel (2004), Fuentes et al. (2010), Massone and Martínez (2015)
Australian	Johnston and Schembri (2007), Johnston et al. (2007)
Austrian	Hunger (2006), Chen Pichler et al. (2008), Schalber (2015)
Brazilian	de Quadros (2003), de Quadros and Quer (2008), Nunes and de Quadros (2008), Quadros and Lillo-Martin (2010), Nunes and de Quadros (2004)
British	Deuchar (1983)
Catalan	Morales-Lopez et al. (2005), Fuentes et al. (2010), Mosella Sanz (2011, 2012)
Chinese	Yang and Fischer (2002), Huihua and Liqun (2011), Yang (2015, 2016)
Colombian	Oviedo (2001)
Croatian	Milković et al. (2006, 2007), Chen Pichler et al. (2008)
Danish	Kristoffersen (2003), Engberg-Pedersen (1990, 2003), Hansen (1975), McGregor et al. (2015)
Estonian	Miljan (2003), Hollman (2016)
Finnish	Jantunen (2008), Savolainen (2006), Takkinen et al. (2015)
Flemish	Vermeerbergen et al. (2007b, 2007a)
French	Kuhn (2015), Kuhn and Aristodemo (2017), Millet et al. (2015), Hauser (2020)
German	Glück and Pfau (1998, 1999), Plaza Pust (2008), Pfau and Steinbach, (2005), Wilbur (2017)
Greek	Antzakas (2006b, 2006a), Sapountzaki (2015)
Hong Kong	Sze (2003), Siu (2016), Tang and Lau (2012)
Indian (Indo-Pakistani)	Zeshan (2003)
Inuit	Schuit et al. (2011), Schuit (2014, 2015)
Irish	Johnston et al. (2007), Matthews (1996), Leeson et al. (2015)
Israeli	Vermeerbergen et al. (2007a), Sandler et al. (2005), Tang et al. (2010), Branchini et al. (2007)
Italian	Volterra et al. (1984), Bertone (2010), Geraci (2015), Branchini and Donati (2009), Brunelli (2011)
Japanese	Fischer and Gong (2010), Sagara (2014, 2016), Ichida (2010), Penner et al. (2019)
Kenyan	Jefwa (2009), Morgan et al. (2015)
Malagasy	Minoura (2012)
Mexican	Cruz Aldrete (2008); own video data
New Zealand	McKee and Kennedy (2005), McKee (2016)
Polish	Rutkowski et al. (2015)
Portuguese	Martins et al. (2019), Almeida et al. (2015)
Providence Island	Washabaugh et al. (1978), Woodward (1987)
Quebec	Berthiaume and Rinfret (2000), Parisot et al. (2015)
Russian	Kimmelman (2012, Kimmelman, (2017), Khristoforova and Kimmelman (2020)
Netherlands	Coerts (1992), Oomen and Pfau (2017), van Gijn (2004), Brunelli (2011), Klomp (2019)
South African	Vermeerbergen et al. (2007b)
Spanish	Bobillo-García et al. (2006), Morales-López et al. (2012), Cabeza-Pereiro and Iglesias-Lago (2015), Zeshan (2004)
Swedish	Bergman and Wallin (2003), Nilsson (2007), Börstell (2017)
Taiwanese	Zeshan (2004), Smith (2005), Zhang (2007), Tai and Tsay (2015)
Turkish	Zeshan (2006), Kubus (2016)

If it was unclear whether something was an instance of an attributive nominal modifier in a noun phrase (i.e. a noun followed by a demonstrative point that could be interpreted as a predicate, such as "the NOUN is there", or a noun with an ambiguous string that could be a relative clause or an adjective) I did not include that example in my coding. Frequently, there were other examples in the same source that were analyzed as noun phrases with a nominal modifier, so excluding examples did not impact the coding or results. If sources on a particular language conflicted (for example, Providence Island Sign Language had conflicting claims about Noun/Adj word order), I erred with the source that was more recent, which generally had more examples of the word order they claimed was dominant. If there was no claim about the dominance of one word order over another and both occurred, I coded the order as allowing for either. Finally, when there was a clear dominant word order in a signed language, as stated by the source, but there were other possible orders that occurred rarely in the corpus, I coded that language as having the dominant word order.

Figure 1 contains a map of the signed languages in this sample categorized by family affiliation,[6] with sources for the data presented here listed in **Table 1**. All of the 41 languages were coded for Noun/Adjective order. Criteria for determining adjectives in reported data, if not addressed directly by authors, included: 1) a class of word *attributively* modifying a noun (identified by the presence of a verb or verb phrase that appeared to be a constituent to the exclusion of the noun and attributive modifier) and 2) that word belonged to a semantic field often associated with adjectives following Dixon and

[6]All maps were made using the open-source statistical software R and the R package lingtypology (Moroz, 2017), which links to the Glottolog database and pulls language names and geographic coordinates from there (Hammarström et al., 2020).

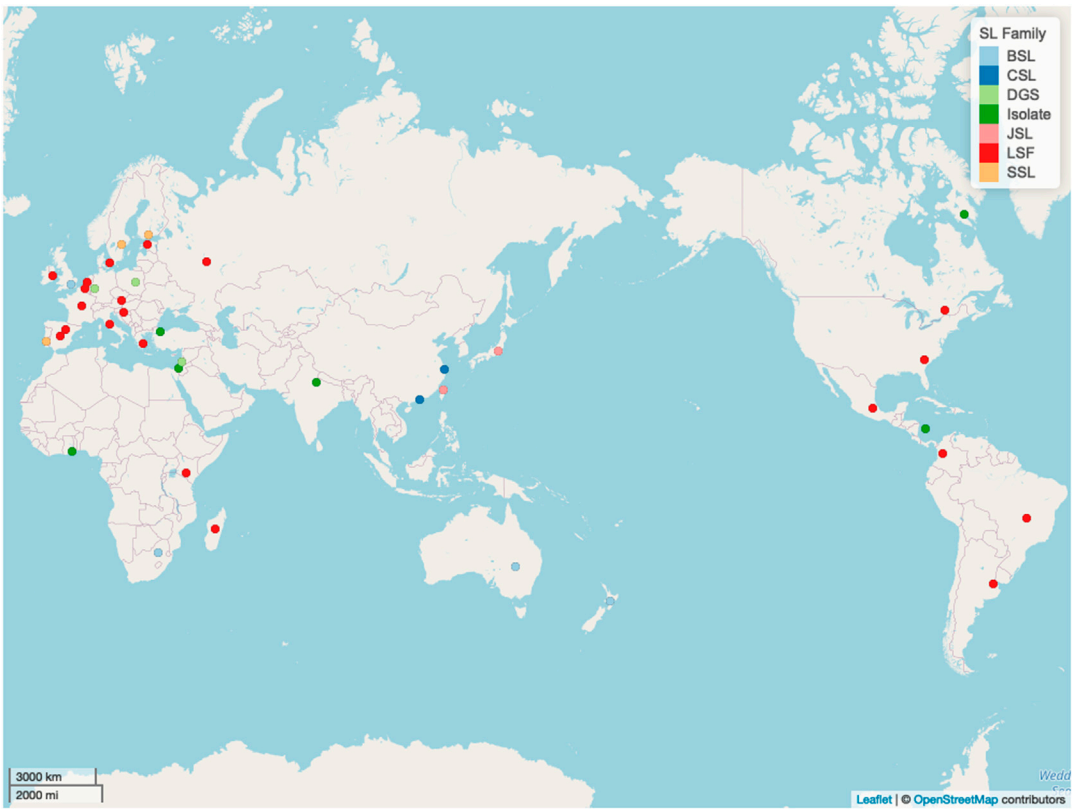

FIGURE 1 | Map of signed languages by family affiliation in the sample.

Aikhenvald (2004). These criteria could inadvertently include modifiers such as reduced relative clauses or relativized verbs, which in many languages may be functionally and structurally identical to adjectives (Gil, 2013). Unfortunately, this is unavoidable due to how data is reported and/or analyzed; questionable examples were noted and excluded from the analysis.

Of the 41 languages in this study, 36 had data that included information on the order of the Noun/Numeral. Only cardinal numerals used attributively to modify a noun were included, identified by the presence of a verb which appeared to form a constituent to the exclusion of the noun and numeral based on data glossing, translation, and analysis. A different but overlapping subset of 36 signed languages had data on the order of the Noun/Demonstrative. If Noun/Demonstrative word order was not stated explicitly by researchers, lexical demonstrative signs and indexical points analyzed as demonstratives were used as evidence. Locative points and indexical/pronominal points that could possibly be interpreted as locatives following the glossing, translation, and analysis of the data were excluded from the coding of demonstratives for the purposes of this study.

Quantifiers were coded separately from demonstratives, for descriptive purposes. Only 28 of the languages included in this study had information on Noun/Quantifier order. Quantifiers used attributively to modify nouns included ALL, SOME, FEW, MANY, etc. If it was not clear if a quantifier was modifying a noun attributively, or if it seemed that the position of a quantifier in relation to the noun may be due to quantifier floating, then that example was excluded. In principle, even supposedly adnominal quantifiers could be floated, so the Noun/Quantifier results presented here should be considered with this in mind.

34 languages had Noun/Genitive order reported in published sources. These languages were coded for the order of the possessor (head noun) and possessum (genitive) that occurred most frequently in the reported data, unless a generalization about genitive word order was stated. Possessors included full nouns, as well as possessive pronouns (sometimes glossed with spoken language pronouns or with POSS) and indexical pronouns/pointing signs. In several signed languages, a dominant order was not apparent based on the scarcity of data, so those languages were coded as having either or multiple strategies.

Finally, 30 languages in the set had relative clauses reported in the published sources or were included in research on relative clauses in a particular language or set of languages. The study of relative clauses in signed languages is still ongoing and several signed languages with substantial research on relative clauses, such as ASL and Italian Sign Language (LIS), have conflicting

analyses of relative clause structure.[7] For example, analyses of the structure of ASL relative clauses run the gambit: externally-headed, internally-headed, correlative, conjoined, and all of the above (Liddell, 1978, 1980; Galloway, 2011; Branchini, 2014). As recent research argues that ASL utilizes multiple relative clause types based on a number of diagnostics, ASL was coded as a mixed strategy language.

However, in LIS the structure of relative clauses is less clear due to a number of mitigating factors. Initial proposals argued that LIS has correlatives, but other analyses propose that these are in fact internally-headed relative clauses (Cecchetto et al., 2006; Branchini and Donati, 2009; Brunelli, 2011; Cecchetto and Donati, 2016); the number of conflicting analyses and the structural similarity of the proposed relativization strategies, complicates current attempts at classification. For this study, I followed the generalizations of the more recent research, which gave contextualized counter arguments for why an internally-headed relative clause is a better analysis for LIS than the correlative one (Branchini and Donati, 2009; Cecchetto and Donati, 2016), as well as evidence for the existence of externally-headed relative clauses in LIS (Brunelli, 2011), which would mean that LIS may be a language which uses mixed relativizing strategies.

Coding languages like LIS as using a mix of strategies, given the conflicting analyses, is less than ideal, but is a limitation imposed by the availability of linguistic data and analyses due to the study of signed languages being a burgeoning field. Thus, great care must be taken in forming generalizations about relative clauses in signed languages due to the lack of data in many signed languages allowing a clear determination of relative clause type and the difficulty with confirming that relative clauses are not adjuncts or conjuncts of the main clause (Wilbur, 2017).

Sample Bias and Puzzles for Classification

Unfortunately, it is impossible to know exactly how many signed languages there currently are, but it is likely that there are several hundred signed languages (Zeshan and Palfreyman, 2017), of which only a small portion have been documented or researched extensively. The signed languages that have a lot of documentation over-represent the signed languages of Europe, particularly western Europe (Zeshan and Palfreyman, 2017). Many of the signed languages found in Africa, Eastern Europe, Meso- and South America, and Asia are underrepresented in the literature, and so have very few linguistic sources regarding their grammatical structure.

This survey includes eight languages in North and South America, 18 in Europe, four in Africa, seven in Asia, two in the Middle East, and two in Australasia. As a result, the languages in this survey, while encompassing both village (rural) sign languages and national (urban) sign languages, skew toward over-representing European sign languages, particularly those of western Europe. African sign languages, for example, are most certainly under-represented in this study, as there are only four included in the sample, but there are at least 17 signed languages in use just in West Africa (Nyst, 2010). This geographical bias is in part due to the availability of documentation and research on those languages, compared to non-European sign languages; however, in North America and Australasia, there are few signed languages used in large geographic regions, so no representative sample is possible in these cases. See the next subsection for further discussion about issues involving genetic classification of signed languages. This has been cited as evidence challenging the applicability of language families to signed languages at all, and is certainly a concern for any typological work.

While areal bias may be difficult to avoid in typological studies of signed languages, it is not the only issue signed language typologists have to contend with. Genetic bias, as noted by Zeshan and Palfreyman (2017), is also a problem since signed languages do not have the same genetic relationships that spoken languages do. Many signed languages around the word have developed due to the establishment of schools for the Deaf, where Deaf educators brought their own signed language into a community that may have had some signs or signing systems of their own. Other signed languages, particularly in Africa, have been in extensive contact with ASL brought in by US missionaries. In many cases, we do not know which languages are related at all.

These issues are compounded by the fact that "the very notions of "language family" and "genetic relationship" are not well-defined" (Zeshan and Palfreyman, 2017, p.3) and many of the lexical items that linguists look to in order to determine genetic relationship between spoken languages are iconically motivated in signed languages or shared due to other factors, such as language contact, obscuring genetic relationships. Thus, it is not clear how well traditional historical linguistics methodologies, like the comparative method, may be applied to signed languages, although some recent work in this vein has substantiated traditional signed language families (Power et al., 2020; Reagan, 2021). As a result, the genetic classification of signed languages mostly relies on non-linguistic historical evidence, such as documents, letters, and oral history, and there are a number of difficulties related to defining language families within signed languages, although there appear to be at least some clear instances of contact and shared lineage between some signed languages, including LSM. Yet, some signed languages do not have any clear relationship with other signed languages. Following this, most typological descriptions of signed languages consider signed languages as their own group distinct from spoken languages, although extensive contact with local

[7]Although some spoken languages distinguish restrictive and non-restrictive relative clauses, either syntactically or through other means, this distinction is not part of the analysis presented in Dryer (2013e) and has not been systematically examined in the literature on relative clauses signed languages. A reviewer suggested that contrasts between restrictive and non-restrictive relative clauses may be where modality effects within the NP are visible. Initial description of relative clauses in LSM by Cruz Aldrete (2008) indicated that restrictive and non-restrictive relatives were distinguished by the presence of a relative pronoun. I have not been able to replicate that finding in my own data, but if this is the case in LSM, then it would not constitute a modality effect inasmuch as a point of variation in relative clauses present in some language regardless of modality. Due to the lack of available data and existing evidence of contrasts between restrictive and non-restrictive relative clauses not indicating the presence of modality effects, relative clauses were not coded based on whether they were restrictive or non-restrictive, although this may be possible as more data becomes available.

TABLE 2 | Overall Word Order Typology of SLs (percentages based on SLs with data).

Position	—	Adj	Num	Dem	Quant	Gen	Rel
Pre-nom	—	10 (24.4%)	15 (41.7%)	12 (33.3%)	13 (46.4%)	22 (64.7%)	2 (6.6%)
Post-nom	—	16 (39%)	11 (30.6%)	10 (27.8%)	10 (35.7%)	2 (5.9%)	16 (53.3%)
Either	—	14 (34.1%)	10 (27.8%)	11 (30.6%)	5 (17.9%)	10 (29.4%)	0 (0.0%)
Other	Pred. only	1 (2.4%)	—	—	—	—	—
—	Internal-head	—	—	—	—	—	4 (13.3%)
—	Correlative	—	—	—	—	—	1 (3.3%)
—	Adjoined	—	—	—	—	—	0 (0.0%)
—	Double	—	—	—	—	—	0 (0.0%)
—	Mixed	—	—	3 (8.3%)	—	—	7 (23.3%)
No data	—	—	5	5	13	7	11

spoken languages, a situation unique to signed languages (Quinto-Pozos and Adam, 2012), may further obscure genetic relationships between signed languages and also challenges the notion of language families in signed languages at all[8].

This sample overwhelmingly represents signed languages that have historical ties to French Sign Language (LSF). What type of relationships these signed languages have with LSF likely varies dramatically by language and the extent of the language contact between the LSF-associated language and indigenous sign systems and languages. Additionally, there are a number of isolates and languages from other lineages, including the British, Chinese, German, Japanese, and Swedish Sign Language families.

NP TYPOLOGY OF SIGNED LANGUAGES

Overall, the word order preferences identified in spoken languages also exist in the signed languages surveyed here. Although there is not such a clear preference for post-nominal modifiers across signed languages, post-nominal modifiers are quite common for all modifiers except genitives, as in spoken languages. Additionally, uncommon word orders and modification strategies in spoken languages (such as only having predicative adjectives, or non-externally-headed relative clauses) are also uncommon in the signed languages in this sample. It is possible that these findings are an artifact of the sample and the data available, but these preferences in the sign language sample appear to parallel the general trends of nominal word order in spoken languages. The word order of nouns and nominal modifiers in the signed languages in this sample is summarized in **Table 2**.

Due to limitations on available data for many signed languages, this study examines the order of nouns relative to individual modifiers and leaves word order with multiple nominal modifiers for future research. I discuss the word order data for each noun and modifier set in the following subsections: adjectives in **Section 4.1**, numerals in **Section 4.2**, demonstratives in **Section 4.3**, quantifiers in **Section 4.4**, genitives in **Section 4.5**, and relative clauses in **Section 4.6**.

TABLE 3 | Noun/Adjective order in signed and spoken languages.

Order	Signed	Spoken
Adj-Noun	10 (24.4%)	373 (27%)
Noun-Adj	16 (39%)	878 (64%)
Either	14 (34.1%)	110 (8%)
Verbal Adj only	1 (2.4%)	5 (0.3%)
Total	41	1,366

Noun/Adjective

All 41 signed languages had data available on Noun/Adjective word in the noun phrase, summarized in **Table 3**, with the spoken language data from WALS for comparison. Post-nominal adjectives are the most common, shown in example (1), mirroring what is found in spoken languages. However, signed languages with either order of adjective and noun are quite common,[9] as in example (2), as are signed languages with pre-nominal adjectives, as in (3). Only one language, Argentine Sign Language, did not have a class of signs which are clearly adjectives that can attributively modify nouns; instead, stative verbs may act as attributive or predicative modifiers as in (4), and when they are attributive they have a clearer adjectival function (Massone and Martínez, 2015).

[8]As a result of these challenges associated with categorizing signed languages into families, the familial relations represented in this study may be contested or otherwise artifacts of using Glottolog to create typological maps. For example, as one reviewer pointed out, South Africa Sign Language is classified in Glottolog as part of the extended British Sign Language family, even though this is not the best classification for this language.

[9]While some spoken languages have a dominant modifier word order, changing the order can result in semantic contrasts; for example, the placement of the adjective *viejo* "old" relative to the noun in Spanish and other Romance languages results in a change in meaning (*mi vieja amiga* "my long-time friend" and *mi amiga vieja* "my elderly friend"). These languages are still classified following their dominant word order (post-nominal adjectives, in the case of Spanish), so although there are no examples of this type of semantic shift in the signed language data presented here, it would not impact the classification of these languages.

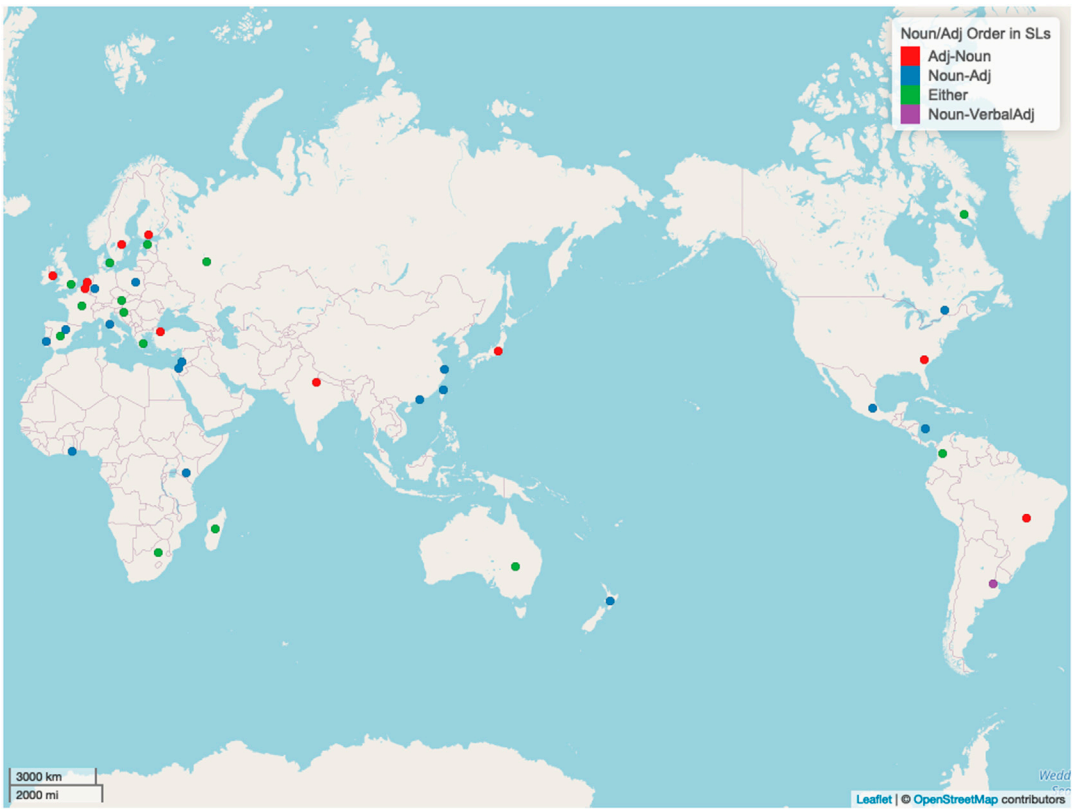

FIGURE 2 | Map of noun/adjective order in sign languages.

(1) OTHER ONE CAT GREY AWAKE SIT+ IN FS(SOFA) CL:V.SITTING-OPPOSITE
[Det Num Noun Adj]
'The other grey cat is awake and sitting on the sofa' (LSM; own field work, 200924_LSM_ELV 08:25)

(2) a. POSS-1 UNCLE WORSE OLD
[Det Noun Adv Adj]
'My uncle is older (my older uncle).' (Auslan; Johnston and Schembri (2007):193)

b. MANY BLACK CAR DISAPPEAR
[Det Adj Noun]
'Many black cars have disappeared.' (Auslan; Johnston and Schembri (2007):191)

(3) DEAF FAMILY HAVE / HAVE SOME/1
[Adj Noun]
'There are some deaf families.' (Japanese Sign Language; Sagara, 2016:314)

(4) MAN BE-TALL ENGINEER
[N Stative] Predicate
'The tall man is an engineer.' (Argentine Sign Language; Massone and Curiel, 2004:82)

The distribution of these orders is in **Figure 2**. There do not appear to be any areal trends in the distribution of Noun/Adjective word orders, nor any clear relationship between signed language family and Noun/Adjective word order. Further, although not analyzed systematically here due to the fact that many (typologically different) spoken languages may be in contact with a given signed language, there is not an obvious association between the default Noun/Adjective order in a signed language and the local spoken language(s).

Noun/Numeral

Of the 36 signed languages which had information available about Noun/Numeral word order, the most common order was Num-Noun, shown in example (5), although the order Noun-Num in (6) was also very common, as was having either pre- or post-nominal attributive numeral modifiers, as in (7). The distribution is summarized in **Table 4**, along with the spoken language data from WALS.

TABLE 4 | Noun/numeral order in signed and spoken languages.

Order	Signed	Spoken
Num-Noun	15 (41.7%)	479 (42%)
Noun-Num	11 (30.6%)	607 (53%)
Either	10 (27.8%)	65 (5%)
Numerals modify verbs	—	2 (0.17%)
No Data	5	—
Total	41	1,153

(5) PRO-3 HAVE THREE KIDS
[Num Noun]
'He has three kids.' (American Sign Language; Chen Pichler et al. (2008):447)

(6) BOOK NEW TWO IX, MINE
[Noun Adj Num Det]
'These two new books are mine.' (Italian Sign Language; Bertone (2010):22)

(7) a. THREE BOY+ C-WALK-D
[Num Noun]
'The three boys are walking' (Colombian Sign Language; Oviedo (2001):196)

b. CHILD-MALE (...) FRIEND THREE CL:Q(obj)OF-c-MOVE-TO-c.dist
[Noun Num]
'The boy gives each of his three friends a fruit.' (Colombian Sign Language; Oviedo (2001):204)

There does not appear to be any areal or genetic trends in Noun/Numeral order, the distribution of which are shown in **Figure 3**.

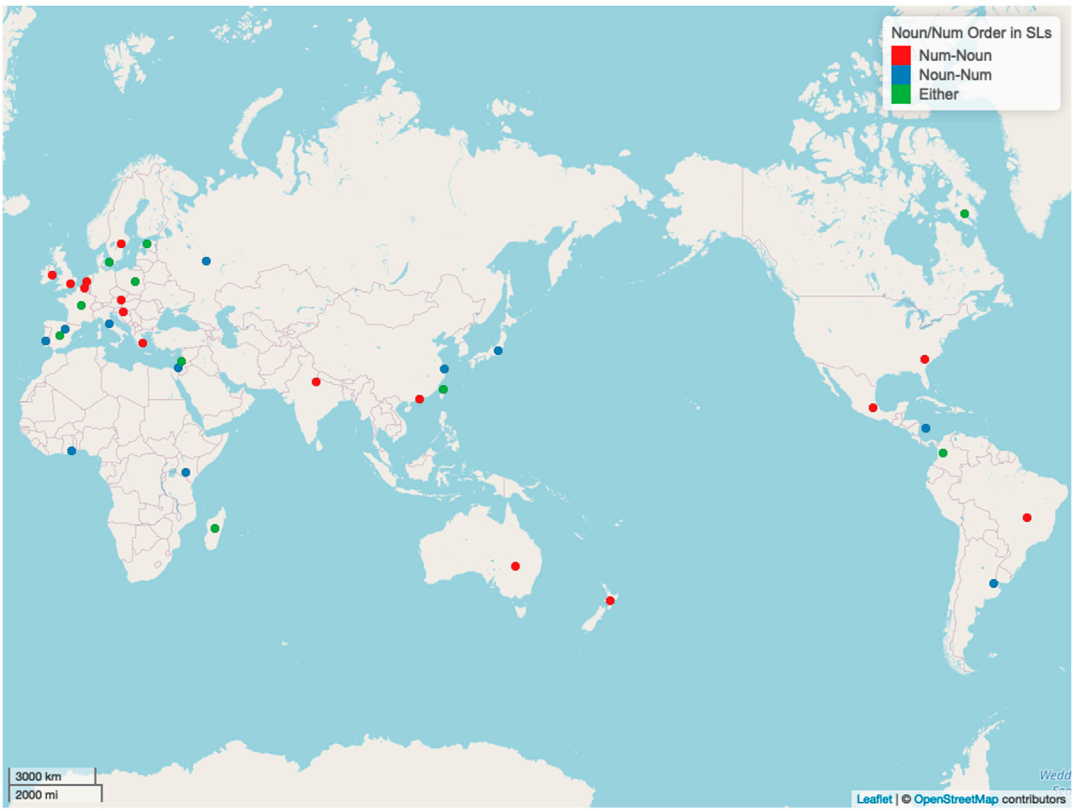

FIGURE 3 | Map of noun/numeral order in sign languages.

TABLE 5 | Noun/demonstrative order in signed and spoken languages.

Order	Signed	Spoken
Dem-Noun	12 (33.3%)	542 (44.2%)
Noun-Dem	10 (27.8%)	561 (45.8%)
Dem prefix	0 (0.0%)	9 (0.7%)
Dem suffix	0 (0.0%)	28 (2.3%)
Either	11 (30.6%)	0 (0.0%)
Dem-Noun-Dem	0 (0.0%)	17 (1.4%)
Multiple types	3 (8.3%)	67 (5.5%)
No Data	5	—
Total	41	1,224

Noun/Demonstrative

Of the 36 signed languages with demonstrative data available, summarized in **Table 5** with the spoken language data for comparison, pre-nominal demonstratives, as in (8), are slightly more common than post-nominal demonstratives, such as (9). Flexible order of Noun/Demonstrative and post-nominal demonstratives are also quite common; in some languages, such as Malagasy Sign Language shown in (10), the order was dependent on noun type (ordinary vs. areal), which is likely an effect of contact with spoken Malagasy. Languages with flexible ordering and demonstrative-doubling, as in (11), were uncommon (categorized as *multiple types* in the signed language data to distinguish from languages with pre-and post-nominal demonstratives), although it is possible that the languages in this category only use doubling in semantically-marked contexts, like topicalization, and would be better classified as one of the preceding categories.

(8) THAT B-E-E-R PINT CHEAP
[Dem Noun]
'That pint of beer is cheap' (British Sign Language; Deuchar (1983):70)

(9) BOOK INDEX INTERESTING INDEX
[Noun Dem]
'Is that book interesting?' (Indo-Pakistani Sign Language; Zeshan (2004):20)

(10) a. BOOK IX WANT BUY IX_2
[Noun Dem]
'Do you want to buy that book?' (Malagasy Sign Language; Minoura (2012):166)

b. HIDE IX HOLE RAT
[Dem Noun]
'The rat hides in the hole' (Malagasy Sign Language; Minoura (2012):166)

(11) a. CAT 3SG MY
[Noun Dem] Predicate
'That cat is mine.' (Danish Sign Language; McGregor et al. (2015):219)

b. WHO BUILD THAT HOUSE WHO
[Dem Noun]
'Who built that house?' (Danish Sign Language; McGregor et al. (2015):223)

c. DET+FR LEADER DET+FR / AFTER PRON+FR TRAVEL^GONE JUTLAND PROFORM+SR
[Det Noun Det].TOPIC
'The leader, later she went to Jutland.' (Danish Sign Language; Engberg-Pedersen (2003):275)

Although there are no signed languages with demonstrative affixes noted in this sample, this strategy is rare in spoken languages and it is possible that the smaller sample of signed languages presented here excludes a signed language with affixal demonstratives. However, identifying manual affixes in signed

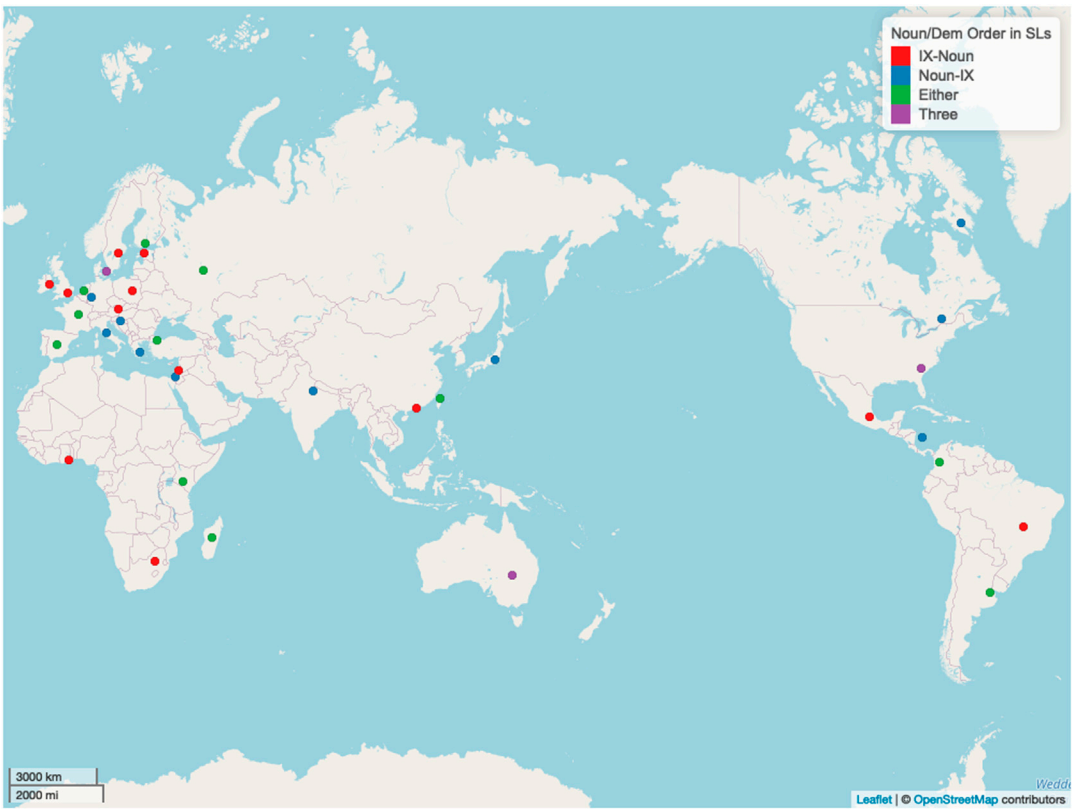

FIGURE 4 | Map of noun/demonstrative order in sign languages.

languages can be difficult. Thus, it is possible that a language identified as Dem-Noun, Noun-Dem, etc. actually has an affixal demonstrative (point or manual sign) attached to the noun, although signed languages generally do not utilize sequential affixation.[10] More research is needed to discern whether this distribution is due to sample size/bias or inadvertent misidentification.

There does not appear to be any areal or genetic trends in the order of Noun/Demonstrative, the distribution of which is shown in **Figure 4**.

Noun/Quantifier

Noun/Quantifier data was available for 28 signed languages, summarized in **Table 6**; Dryer's nominal modifier data in WALS did not categorize quantifiers separately from other modifiers, so the discussion presented here is limited to signed languages. Overall, quantifiers pattern like demonstratives in signed languages, which is not entirely unexpected. Pre-nominal quantifiers, as in (12), are the most common, although closely followed by post-nominal quantifiers, as in example (13). Relatively few languages showed no dominant order, such as the examples in (14), although the signed languages in this sample do demonstrate some flexibility in the order of quantifiers and nouns. Flexible ordering could be due to quantifier floating or other syntactic/pragmatic processes.

TABLE 6 | Noun/quantifier order in signed and spoken languages.

Order	Number
Quant-Noun	13 (46.4%)
Noun-Quant	10 (35.7%)
Either	5 (17.9%)
No Data	13
Total	41

(12) FINISH? ALL MONEY PAY FINISH?
[Quant Noun]
'Have (you) paid all money?' (Hong Kong Sign Language; Tang (2009):25, in Lee (2002))

(13) MAN MANY ENTER-right
[Noun Quant]
'A lot of men entered.' (Adamorobe Sign Language; Nyst (2007):178)

(14) a. SEVERAL MAN DIE-rep-arc
[Quant Noun]
'Several men died.' (French Sign Language; Kuhn and Aristodemo (2017):14)

b. IX-3 MEET-PL GIRLS ALL PI PLAY-PL HOPSCOTCH
[Noun Quant]
'She (Mary) met all the girls who were playing hopscotch.' (French Sign Language; Hauser (2020):58)

There does not appear to be any areal or genetic trends in the order of Noun/Quantifier, the distribution of which is shown in **Figure 5**.

[10]It is worth noting that definiteness and specificity could be marked through the association of a referent with a location in the signing space as part of concord, as argued by Neidle et al. (2000); if so, this could constitute part of an affixal determiner or demonstrative, although this issue is outside the scope of this paper.

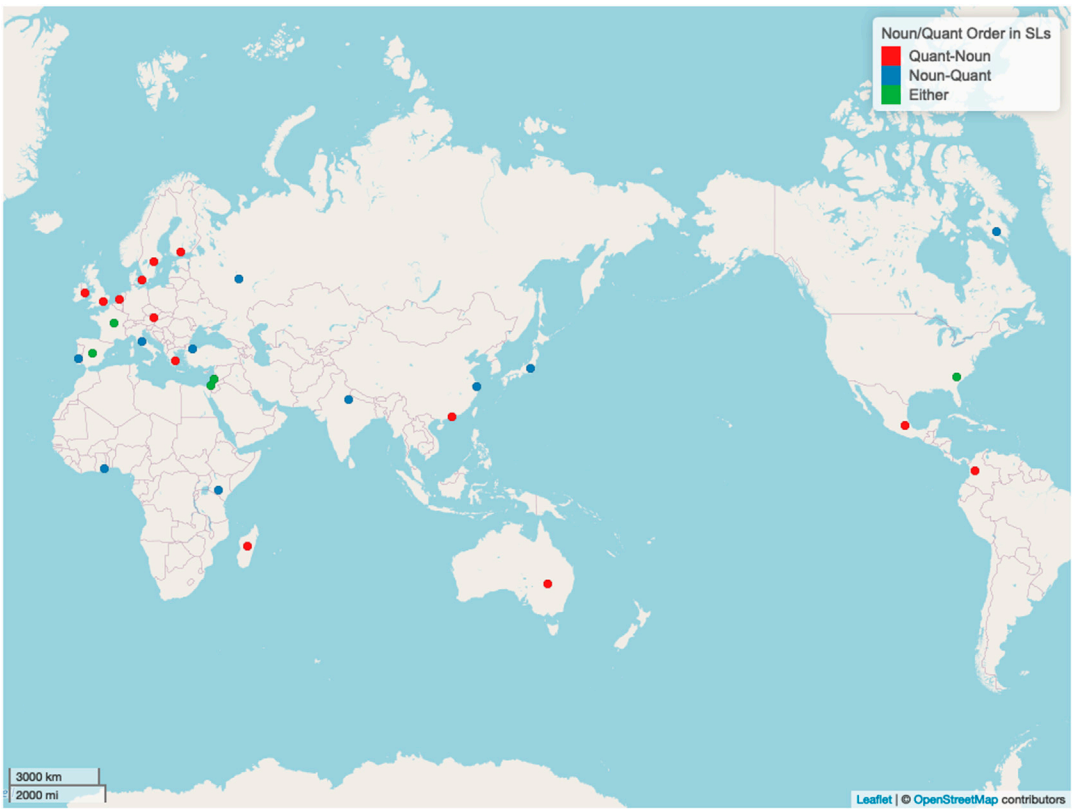

FIGURE 5 | Map of noun/quantifier order in sign languages.

Noun/Genitive

Noun/Genitive order with both pronominal and nominal genitive possessors in signed languages overwhelmingly favors pre-nominal genitives, as in (15) over post-nominal ones, such as example (16), more so than in spoken languages, as shown in **Table 7**. Of those classified as allowing either order, shown in (17), this was generally found when there were pronominal or POSS-type possessive signs that agreed with the location of the possessor in the signing space. It is possible that with full noun possessors in these languages, there is a clear word order preference that was not apparent in the available data. The distribution of Noun/Genitive is shown in **Figure 6**.

(15) (FATHER) POSS-3S BROTHER
possessor POSS Possessum
'My father's brother/his brother' (Austrian Sign Language; Chen Pichler et al. (2008):442)

(16) SCHOOL POSS.SELF, SPECIAL STUDENT GROUP PROFESSOR
[Possessum Possessor]
CL:PROF-GROUP-APPROACH-ONE-PERSON, ALL SAME LITTLE COOL SAME PROUD BECAUSE
BEST STUDENT
'At the school where I was, of all the students in the group the professor led, I was a little cool, proud, because I was the best student.' (Spanish Sign Language; Bobillo-García et al. (2006))

(17) a. FURNITURE ANTIQUE (IX), PE UNCLE MY GIVEN BROKE
Possessum Possessor
'The antique furniture, which my uncle gave me, is broken' (Italian Sign Language; Bertone (2010):9)

b. BOOK HISTORY$_j$ POSS$_j$
Possessor Possessum POSS
'the history of the book/the book's history' (Italian Sign Language; Bertone (2010):15)

There appears to be a weak areal trend for Genitive-Noun order in the Americas and Asia. The possibility of either Gen-Noun or Noun-Gen appears to be geographically spread out and the Noun-Gen order occurs in two unrelated and geographically distant European signed languages.

TABLE 7 | Noun/genitive order in signed and spoken languages.

Order	Signed	Spoken
Gen-Noun	22 (64.7%)	685 (54.8%)
Noun-Gen	2 (5.9%)	468 (37.5%)
Either	10 (29.4%)	96 (7.7%)
No Data	7	0
Total	41	1,249

Noun/Relative Clause

Relative clause typology in signed languages has been described for a small subset of the languages represented in this study. Based on available data, 30 languages had some kind of information about relative clause structure and word order, summarized in **Table 8**. Relativizing strategies in signed languages generally do not correlate with those reported in the ambient spoken languages in WALs (Dryer, 2013e), with a few exceptions where the dominant strategy in both the signed language and the ambient spoken language was pre-nominal externally-headed relative clauses.

Externally-headed relative clauses are by far the most common relativizing strategy in this sample, with post-nominal Noun-Rel externally-headed clauses with (18a) or without (18b) an overt relative pronoun found in over half of the sample and very few languages with predominantly Rel-Noun order (19)[11].

(18) a. GIRL [BICYCLE FALL]$_r$ IS HOSPITAL
N Rel
'The girl that fell off the bicycle is in the hospital' (Brazilian Sign Language; Nunes and de Quadros, 2004:180, in Branchini, 2014:163)

b. [MAN IX$_3$ $\overline{\text{[RPRO-H}_3\text{ CAT STROKE]}_{CP}}^{\text{re}}$]$_{DP}$
N Rel
'The man who is stroking the cat' (German Sign Language; Pfau et al., 2005, in Branchini, 2014:163)

(19) a. WHITE-MAN [INUK] INDEX$_1$ MOVE-CL$_{two-vehicles}$ SNOW-MOBILE GO$_{3a}$
Rel N
'A white man and me, an Inuk, go by snow mobile (to Landing Lake)' (Inuit Sign Language; Schuit et al., 2011:22)

b. [SODA] BOX [SODA] BOX MANY
Rel N Rel N
MOVE$_{up}$:CL$_{box}$ SHELFS MOVE$_{up}$:CL$_{box}$ MOVE$_{up}$:CL$_{box}$
'I put boxes with soda onto the shelves' (Inuit Sign Language; Schuit et al., 2011:23)

Internally-headed relatives are reported as a primary relativizing strategy in two signed languages in the Chinese Sign Language family, Chinese Sign Language and Hong Kong Sign Language, and three unrelated sign languages, Catalan Sign Language (French Sign Language family), Israeli Sign Language[12] (German Sign Language family) and Turkish Sign Language (isolate). The example in (20) shows the relative clause non-manual marker squint scoping over the head noun and relative clause, which is evidence for the head noun being internal (Kubus, 2016).

(20) $\overline{\text{[GIRL FAR VILLAGE IN]}}^{\text{sq}}$ BOY$_i$ IX$_i$ LOVE
'The girl, who was from a village far away, loved the boy' (Turkish Sign Language; Kubus, 2016:208)

Only Swedish Sign Language was identified as using correlatives (based on available data), and no signed languages were identified as only using adjoined relative clauses. However, adjoined relatives are very rare in spoken languages, so this could be an artifact of the sample. The relative clauses in (21a) and (21b) are internally headed and adjoined at the periphery of the matrix clause, the right edge and left edge, respectively. The non-manual marker (rel) in (21b) consists of raised brows, raised cheeks, and chin drawn back, which scopes over the head BOY, an indication that the head is inside the relative clause.

(21) a. PLUS NON-1ST-SING-1 GLADLY MUCH DISCUSS WITH PERSON PATIENT OBJ.PL DIE PATIENT WILL ON WAY DIE INDEX-F-FL
'And she enjoys discussing a lot with patients who are going to die' (Swedish Sign Language; Nilsson, 2007:23)

b. $\overline{\text{TWO BOYS HERE,}}^{\text{rel}}$ DEAF-MUTE BOTH
'The two boys who were here are both deaf' (Swedish Sign Language; Bergman, 1994:315)

Several signed languages showed mixed relativizing strategies; it is unknown if this category is in fact larger than represented here, since relative clauses are understudied in signed languages and identifying the type of relativizing strategies a given language uses to encode relative clauses can be extremely difficult (Dryer, 2013e; Branchini, 2014; Kubus and Nuhbalaoglu, 2018). As a result, it is likely that many languages (spoken and signed) use strategies other than externally-headed and have not been identified as such.

The distribution of Noun/Relative Clause orders and strategies is in **Figure 7**, which indicates several patterns in the distribution of relativization strategies. Namely, the use of internally-headed relative clauses in Chinese Sign Language and Hong Kong Sign Language appears to constitute a genetic pattern among the Chinese Sign Language family that is not the result of contact with ambient spoken languages, which have pre-nominal externally-headed relatives (see Dryer, 2013e). Data from Taiwan Sign Language may substantiate this, since it is a member of the Japanese Sign Language family and has had substantial contact with Chinese Sign Language. If Taiwan Sign Language has internally-headed relative clauses, this may indicate that this strategy is an areal phenomenon, rather than a purely genetic one; however, if Taiwan Sign Language patterns like Japanese Sign Language, then this would provide evidence for internally-headed relative clauses being a genetic feature of the Chinese Sign Language family.

Of the seven signed languages with mixed strategies, six are part of the French Sign Language family and are geographically disparate, forming a genetic pattern: American Sign Language, French Sign Language, Italian Sign Language, Malagasy Sign Language, LSM, and Russian Sign Language. The other signed language which uses mixed strategies is Japanese Sign Language (part of the Japanese Sign Language family).

DISCUSSION

Although this is a small sample compared to large-scale typological studies of spoken languages, the smaller number of signed languages and lack of documentary material for most of them limited the number of signed languages which could be included. Despite this limitation, the signed language data in this sample is generally comparable to the typological studies of

[11]As a reviewer suggested, (19a) and (19b) may be analyzed as a parenthetical and as a compound or adjective, respectively, rather than as examples of relative clauses. Parentheticals may take the form of nominal appositions and non-restrictive relative clauses and the syntactic structure of parentheticals varies (Dehé and Kavalova, 2007). In the case of (19a), INUIT represents a possible parenthetical relative clause or apposition following the typology laid out by Dehé and Kavalova (2007) and based on the translation provided in Schuit et al. (2011). As for (19b), the classification of SODA as a reduced relative clause is more tenuous. Many languages, attributive adjectives and relative clauses may be (nearly) functionally indistinguishable (Gil, 2013), making an analysis of relative clauses difficult; Inuit Sign Language may be one of those languages. For both of these examples, more evidence would be needed to confirm the presence of multiple relativizing strategies in Inuit Sign Language, including prosodic and other diagnostic evidence.

[12]Branchini et al. (2007) tentatively proposed that Israeli Sign Language has internally-headed relative clauses, based on the distribution of non-manual markers on the relative clause reported in Sandler (1999). However, the non-manual marker squint on relative clauses in Israeli Sign Language appears to be prosodic, rather than grammatical (Nespor and Sandler, 1999; Dachkovsky, 2018), and also serves to mark other structures, in addition to relative clauses, which are low on the Accessibility Hierarchy (Dachkovsky and Sandler, 2009). Other research on relative clauses in Israeli Sign Language focuses on prosody and non-manuals, rather than relativizing strategy; while further research is needed to determine whether Branchini et al. (2007) proposal is accurate, relative clauses in ISL are generally considered by linguists to be internally-headed, although this is not explicitly stated.

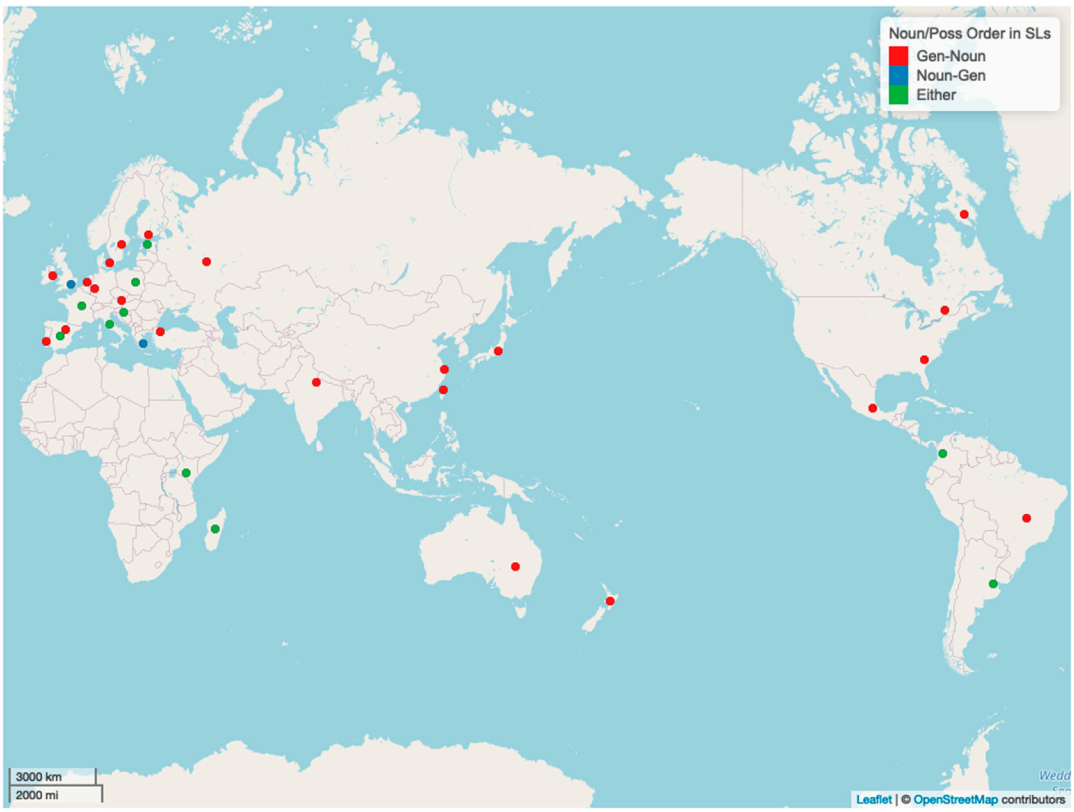

FIGURE 6 | Map of noun/genitive order in sign languages.

TABLE 8 | Noun/relative clause order in signed and spoken languages.

Order	Signed	Spoken
Externally-headed Noun-Rel	15 (50.0%)	579 (70.3%)
Externally-headed Rel-Noun	2 (6.6%)	141 (17.1%)
Internally-headed	5 (16.7%)	24 (2.9%)
Correlative	1 (3.3%)	7 (0.8%)
Adjoined	0 (0.0%)	8 (1.0%)
Double-headed	0 (0.0%)	1 (0.1%)
Mixed strategy none dominant	7 (23.3%)	64 (7.8%)
No data	11	0
Total	41	824

spoken language nominal word order in WALS (Dryer, 2013a,b,c,d,e). Overall, the signed languages have similar nominal word order patterns to the spoken languages in the samples in WALS, although a higher proportion of signed languages than spoken languages allow for multiple word order options in the noun phrase. This flexibility is likely an artifact of the available signed language data, which often did not address nominal word order directly or refrained from generalizing it, or is due to other factors, such as language modality. Further, relativizing strategies are strikingly similar across signed and spoken languages, with a clear preference for externally-headed post-nominal relative clauses while other strategies for encoding relatives have a similar relative prevalence across both samples.

Noun-Adj order is more common than Adj-Noun in the signed language data, as in spoken languages (Dryer, 2013a). However, it is far more common for signed languages to allow for either order than it was for the spoken languages in Dryer's study, likely for the reasons stated above. Of note is that only one signed language (2.4%) in this set, Argentine Sign Language, has only predicative adjectives, which is also extremely uncommon in spoken languages (5 languages, 0.3%). It would seem that, regardless of language modality, it is typologically unusual for languages to lack attributive adjectives.

The same proportion of spoken languages (479 language, 42%) (Dryer, 2013d) and signed languages (15 languages, 41.7%) have Num-Noun as the preferred word order. However, it is far more common among the signed languages to have no dominant order of Noun/Num, compared to the spoken languages, and the most common order in spoken languages, Noun-Num (607 languages, 53%), is the second most common strategy in the signed languages sampled (11, 30.6%). No signed languages were identified as having numerals that only modify verbs; however, this strategy is only attested in two languages (0.17%) in Dryer's sample, so this may be an exceedingly rare structural limitation on nominal modification that is not represented in the signed language sample for that reason.

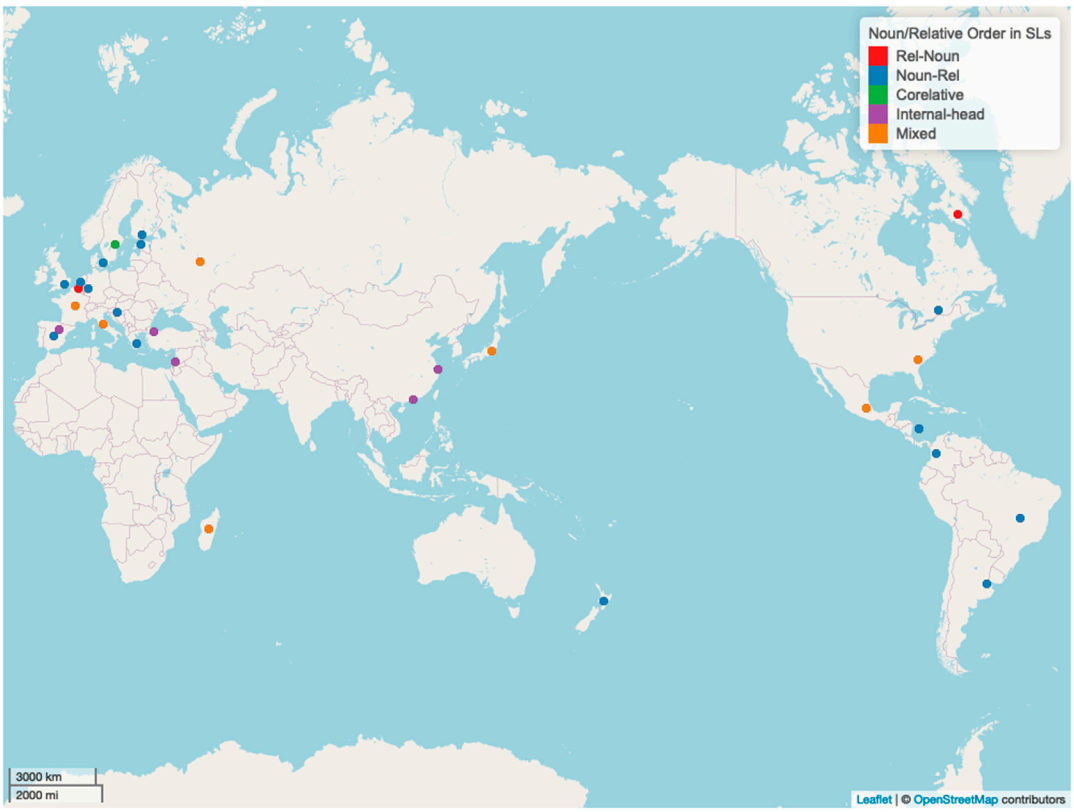

FIGURE 7 | Map of noun/relative order in sign languages.

A third of signed languages (12 languages, 33.3%) predominately use Dem-Noun word order, but Noun-Dem, which is most common in spoken languages, is present in just under a third of the signed language sample (10, 27.8%). The remaining third of signed languages are split across flexible word order (11 languages, 30.6%) and multiple types (3 languages, 8.3%). Although this is a different distribution than was noted in Dryer, 2013b sample, there are several possible reasons for this difference. First, there is a difference in how demonstrative word orders were grouped in this study, compared to Dryer's, for descriptive purposes. This study distinguishes signed languages which have either order (Noun-Dem or Dem Noun) from signed languages which have either word order and demonstrative doubling (Dem-Noun-Dem), classified as multiple types. Dryer's sample collapses these categories into languages which have any combination of two or more strategies (multiple types), which mostly includes languages with flexible word order. If these two categories are collapsed following Dryer, then a substantially larger percent of signed languages have multiple types than in spoken languages. However, this difference may be an artifact of the sample and the data reported in the signed languages, which did not generally indicate a dominant word order when there were examples of multiple types. Further, changes to demonstrative and noun word order due to topicalization and other syntactic and discursive processes have been documented in many signed languages, so it is likely that some signed languages coded here as having multiple word orders may, in fact, have a dominant word order that was not identified or was otherwise obscured by those processes. Finally, the overall prevalence of demonstrative affixes and demonstrative doubling in spoken languages is very low, so their absence from the signed language sample may be either a sampling artifact, or due to difficulties with distinguishing affixes from free morphemes.

Quantifiers overall patterned like demonstratives in signed languages; Quantifier/Noun word order was not included in WALS, so it is not possible to make a direct comparison with spoken language data. In a few signed languages, quantifiers and demonstratives were identified as having different patterns; for example, Austrian Sign Language and Danish Sign Language were both identified as having multiple word orders for demonstratives, but only one word order for quantifiers. However, the amount of data available for these languages is likely influencing the results reported here, so more investigation is needed to determine if this pattern is due to the availability of data, or if quantifiers and demonstratives really do pattern differently in these languages.

Gen-Noun order is common in both signed languages (22 languages, 64%) and spoken languages (685 languages, 54.8%); yet, the prevalence of the other possible orders is quite different between signed and spoken languages. Noun-Gen order was

found in only two signed languages (5.9%), but is far more common in the spoken languages in Dryer, 2013c sample (468 languages, 37.5%). However, both orders were attested in almost a third of signed languages (10 languages, 29.4%), but were only present in 7.7% of Dryer's sample (96 languages). It is possible that the occurrence of flexible genitive word order in signed languages is over estimated, as languages may have a preferred order that was not reported in the literature and the use of POSS-type genitive signs could influence the order of possessors and possessums due to spatial marking of referents. Additionally, flexible word order is possible with many nominal modifiers in signed languages, including genitives, and is often influenced by syntactic, semantic, or discursive practices, which may in turn complicate efforts to discern dominant word orders.

Lastly, there are two notable observations about relative clauses across signed and spoken languages. The first is that the least common relativizing strategies in spoken languages are also uncommon in signed languages, but are attested (adjoined and doubly-headed relative clauses occur as part of mixed strategies), unlike uncommon constituency orders in signed languages (Napoli and Sutton-Spence, 2014). Conversely, the most common relativizing strategy in spoken languages, externally-headed post-nominal relative clauses (Dryer, 2013e), is also the most common among signed languages. The second observation is that despite limitations due to the small number of signed languages with documented relative clause strategies, the similarities in the ranking of those strategies in signed and spoken languages–especially the most common and uncommon strategies–are striking. Externally-headed post-nominal relative clauses are the most common relativizing strategy in both spoken and signed languages, with pre-nominal relative clauses only used by less than a 10th of signed languages as a dominant strategy and by a fifth of spoken languages. Other uncommon relativizing strategies (internally-headed, correlative, and mixed) also have the same relative ranking according to prevalence in signed and spoken languages, although the small sample of signed languages makes direct comparisons of the proportions difficult.

The similarity across signed and spoken language relative clauses is somewhat unexpected, given that clausal constituent word order in signed languages differs from spoken languages, a difference that has been ascribed to language modality effects (Napoli and Sutton-Spence, 2014). This suggests that, although language modality may impact other linguistic phenomena in signed languages and may aid processing of some linguistic structures, modality does not affect the structure of relative clauses in signed languages and their overall prevalence in the same way; nor does the visual-manual modality aid in the processing of the uncommon and syntactically more complex relativization strategies or prosodically-heavy constituents like relative clauses. Instead, these preferences in spoken and signed languages must be due to the structure of language as a human faculty, providing support for cognitive processing and economic (structural complexity) hypotheses regarding the competing pressures to reduce structural complexity, as well as patterns of language contact and descent resulting in areal and genetic patterns, like the genetic pattern of mixed strategies observed in the French Sign Language family, that have led to pockets of typologically uncommon relativization strategies among historically associated languages.

The parallels in nominal word order between signed languages and spoken languages suggests that noun phrases occupy a level of syntactic structure which is less susceptible to modality effects on word order than clausal syntax and major constituent word order is. Given that many of the modality effects observed in the syntax of signed languages are related to the use of space in linguistic structure (Lillo-Martin, 2002; Meier, 2002; Napoli and Sutton-Spence, 2014), it is not immediately clear why noun phrases are not subject to the same modality effects. Both nouns and nominal modifiers can be associated with locations in the signing space, including relative clauses, and noun phrases themselves may be subjects and objects whose order in the clause is impacted by the modality effects on verb agreement. Thus, while modality effects are common in the interface of syntactic structure and the use of space, not *all* syntactic structure is affected equally. Under some theories of syntax, this could possibly be accounted for either by phase boundaries (wherein structure is "locked", preventing it from being accessed or changed by other syntactic processes) as in Distributed Morphology, or by movement due to agreement processes under the Minimalist Program, leading to differences between noun phrases and verb phrases/clauses. A more atheoretical approach may consider that the properties of nouns and verbs could give rise to a distinction between these categories, such that modality effects are different between them. If so, we might expect that a signed language which does not functionally distinguish between nouns and verbs (a language with a type 1 or type 7 part of speech system under Rijkhoff, 2007) would exhibit modality effects equally across syntactic structure.

Although not explicitly examined, it is worth noting that the signed languages studied here, known to prefer either SOV or SVO word orders with relatively equal frequency (Napoli and Sutton-Spence, 2014), show a marked preference for Gen-Noun word order. Previous typological studies of spoken languages have noted a correlation between verb/object and noun/genitive word order, but it would seem that correlation is not present in the signed language sample here. If this is not an artifact of the sample and available data, it would seem that language modality may have influenced constituency word order patterns in signed languages, as discussed in Napoli and Sutton-Spence (2014), and disrupted the correlation between genitive word order and verb/object word order in some way. However, further research is needed to confirm that signed languages do not have this correlation between constituent word order and genitive word order, as this was outside the scope of this paper.

Future research should focus on expanding this survey to include more signed languages, especially those that are not associated with the French lineage, which are over-represented here. Attempts to include more signed languages should also try to make the set as geographically unbiased as possible given current available research, as European signed languages and American Sign Language continue to be at the forefront of linguistic research on the structure and typology of signed languages. Additionally, more data on many of these signed

languages is needed to fill in the gaps in the data presented here. Due to the sample size of 41 languages in this study, not all of which had data for all nominal modifiers, it is possible that the weaker trends presented here and at least a few of the unusual features of signed languages, such as the prevalence of flexible nominal word order, are due to sampling and availability bias, and are not representative of signed languages as a whole. Further, it is possible that languages which were coded as having either order did, in fact, have a dominant order that was not presented in the sources or was obscured due to contact with local spoken languages. Conversely, it is possible that there are more signed languages which have variable word order than this study seems to suggest, due to the availability of data, contact with other languages, and how data was collected, and other factors not addressed here, such as non-manual markers, topical prominence, etc., which may facilitate alternations in word order.

Finally, this survey did not examine relative modifier-noun word order with multiple nominal modifiers due to the scope of this paper and the lack of data available for many signed languages. However, a few signed languages did have data with multiple nominal modifiers; typically, these examples had two modifiers, such as an adjective and a numeral or an adjective and a determiner, but a couple of signed languages had data with three modifiers (determiner, numeral, and adjective). In these cases, Greenberg's 1963) universal 20 and Cinque's (2005) subsequent identification of 14 attested orders of nouns, demonstratives, numerals, and adjectives out of 24 possible orders (see discussion in Bertone 2010), was adhered to in the observed signed language data. Of course, more evidence and thorough analysis is needed to confirm this initial observation, especially as many of the signed languages included in this study did not have a plethora of nominal modifier data or generalizations available due to available research.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Texas at Austin Internal Review Board. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

CC is the sole author of the article and conducted the literature review, data coding, analysis, and original article and figure/table drafting. Any inaccuracies or mistakes in the generalizations and data represented here are my own.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcomm.2021.802596/full#supplementary-material

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