The Influence of Community Size on Constituent Order: A Comparison between Emerging and Conventionalized Sign Languages

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Abstract

The current study examines the effect of community size on constituent order by comparing conventionalized sign languages (TID and LIBRAS) and emerging sing languages (CTSL and CENA) from two different countries. When the relevant literature is examined, it is observed that languages that emerge in communities with larger populations tend to have a more uniform structure, while languages that emerge in smaller and closed-knitcommunities exhibit greater diversity regarding their constituent order. Data was collected through an elicitation task comprised of 30 short video clips containing sentences with intransitive, transitive (reversible vs. irreversible events), and ditransitive structures. Significant relationships were found between community size and constituent order, revealing that conventionalized sign languages presented more uniform word orders in intransitive and ditransitive structures and transitive structures with irreversible events, whereas no significant relationship was detected for reversible events. The study contributes to the existing literature by demonstrating that languages from larger communities rely on commonly used constituent orders to describe events; in contrast, languages from smaller communities produce more uncommon constituent orders. The current study has practical implications for the relationship between sign languages in different stages of development and constituent order preferences, highlighting the developmental phases of language emergence and evolution.

Keywords: Community size; constituent order; conventionalized sign language; emerging sign language

1. INTRODUCTION

Communication is one of the primal needs of human beings, and every individual on the planet has some means to communicate. There are about 7000 languages in the world that vary to a great extent, and how these languages are formed and evolved is one of the most researched questions in the field of linguistics. Nevertheless, such questions are also challenging to investigate because finding concrete evidence is a difficult task to achieve, yet not impossible. Lately, many researchers are focused on studying sign languages that recently came into existence because this way, it is possible to carefully observe how these sign languages are being created from scratch and how they evolve throughout generations (Almeida-Silva & Nevins, 2020; Brentari, Ergin, Senghas, Cho, Owens & Coppola, 2021; Ergin, Meir, Ilkbasaran, Padden & Jackendoff, 2018; Ergin, 2022; Kirton, 2021).The main objective of such studies is to have a deeper understanding of the evolution of spoken languages by investigating emerging sign languages.

Word order is a crucial element in investigating and understanding languages. Some researchershave been focusing on word order in their emerging sign language studies because it is considered that investigating word order in these newly emerging sign languages can provide us with an understanding of theevolutionary stages of language conventionalization.A language can acquire several different word orders as dominant word orders, and they vary considerably between languages worldwide.Such differences bring these questions to mind: “Which factors are in play?” and “Is it possible that society and community size can affect such differences?”.Previous studies suggest community size can be an influencing factoroverlanguage structures and word order (Meir, 2012; Brentari et al., 2021; Kocab, Goldberg, & Snedeker, 2019; Raviv, Meyer, & Lev-Ari, 2019),and emerging sign languages carry a high value in studying community size sincesome of them are currently being formed insmall and isolated communities which creates a chance to see ifcommunity size can be a factor.Yet, the current literature does not hold any large-scale cross-linguistic study where emerging sign languages are compared to sign languages from larger communities. With this gap in the literature in mind, this study is aimed at investigating the influence of community size on constituent order by comparing emerging sign languages to conventionalized sign languages.

1.1.Communities and Languages

Languages, by their nature, are bound to be affected by the structures and characteristics of their societies. In the literature, numerous studies that differ in methodologycontribute to the idea thathigh-level diversity in languages and their properties can be the outcome ofdifferent community sizes and network structures of the populations(Kirby, Cornish, & Smith, 2008; Kocab et al., 2019; Lupyan & Dale, 2010; Raviv et al., 2019; Trudgill, 2009). Specifically, community size is argued by some scholars to be one of the main reasons for shaping language features. But when we say"the influence of community size," it can come across as too general. What type of influence is it? In what ways does community size impact the emergence and development of languages?Numerous historical and cross-linguistic studies approach the topic with different language properties. For instance, in a study conducted by Trudgill in 2009, it is proposed that with sparsely populated and isolated communities,there is more redundancy in terms of morphological systems, which results inmore complex and irregular languages.Another research found that languages spoken in smaller communities tend to have a smaller phonemic inventory than those from larger communities (Hay & Bauer, 2007).Lastly, through an examination of 2,236 languages, Lupyan and Dale (2010)came to the conclusion that languages that are a part of small,isolated, and closed communities tend to be more resistant to regularity and have morecomplex structures,while larger communities showed less complexity.Many studies later supported this findingthroughout the years, contributing to understanding the relationship between community size and language structure (Meir,Israel, Sandler, Padden, &Aronoff, 2012; Raviv et al., 2019; Trudgill, 2011).

Several other studies attempted to determine the effect of community size from other potentially influencing factors so that the extent to which a community size affects the development of an emerging sign language can be understood more clearly. Studies were conducted using computational modeling, and the results showed little to no influence in terms of community size on explaining cross-linguistic patterns (Gong, Baronchelli, Puglisi & Loreto, 2012; Lou-Magnuson &Onnis, 2018). In stark contrast with these results, some other computational modeling studies suggest a strong relationship between language and community size (Spike, 2017; Reali, Chater& Christiansen, 2018). When these contradictory results are considered all together, it is apparent that there is a need to investigate this subject further.

1.1.1. Esoteric vs. Exoteric Communities

In relevant literature in linguistics, along with Trudgill and Lupyan & Dale, many researchers havecategorized communities into two: *esoteric* and *exotericcommunities* (Raviv et al., 2020; Roberts & Winters, 2012; Wray & Grace, 2007).The primary assumption is that how individuals communicatein certain social environments changes the characteristics and structure of the language. The idea was originated by Wray and Grace (2007), with the influence of earlier research conducted by Thurston (1987, 1989, 1994). Initially, Thurstontalked aboutthe difference between esoteric and exoteric *languages*; however,Wray and Graceapproached it as esoteric and exoteric *communication,* aiming to clarify the distinction between language and the way it is used by the community.

1.1.1.1.Esoteric Communities

According to Wray and Grace, esoteric communities are small social groups that are isolated and close-knit, where there is esoteric communication.They suggest that languages used in esoteric communities tend to be more morphologically complex and have characteristics that are irregular-that is, complexand uncommon phonemes anddistinct lexical items (Wray & Grace, 2007; Trudgill, 2004, 2009, 2011).The authors put forward a diagram that lays outthe interrelatedfactors that are likely to be the most influentialin the emergence of such complex structures.It is argued that esoteric communities are homogenous -the community members share the same background and history, resulting in members having shared knowledge about each other and their environmentcollectively. As well as being in a homogenous society with esoteric communication helps individuals to transmit and receive the message with minimal required knowledge, it also makes it difficult for people from outside of the community to interact and communicate with the membersin the same way. This situation will create an environment where there are no outsidersto the group, and the majority of language learners will be the children of thesociety.In sum, small, close-knit, and homogeneous societies -i.e., esoteric communities-with just native speakers and no new adult learnerscontribute to the emergence and development of languages with irregular and complex structures.

1.1.1.2.Exoteric Communities

In contrast to communities with esoteric communication, exoteric communication tends to develop in groups where the speakers of the language are not familiar with one another, therefore have different cultural backgrounds and do not share any common knowledge with other members of the group. Individuals who are members of such groups will not be able to

rely on shared knowledge to communicate with each other because they come from other cultural environments,andthe message that needs to be conveyedshould not include irregularity and complexity; otherwise, the communication will not be efficient. As the population of speakers expands, the complexity of language increases due to various linguistic inputs from different adult speakers.Eventually, the language becomes more systematic and compositionalthrough simplifications to generate a communication system that is understandable by most. Thus,languages used inexoteric environments are inclined to be simpler and systematic, or, as in the words of Wray and Grace (2007), "Languages that are customarily used exoterically will tend to develop and maintain features that are logical, transparent, phonologically simple and, significantly, learnable by adults" (p. 551).Many linguistic studies support the notion of esoteric and exoteric communicationand demonstrate that language learners can improve their ability to categorize and generalizewithin the expansion of the learner population (Lev-Ari, 2016, 2018; Perry, Samuelson, Malloy, Schiffer, 2010;Raviv, Meyer, & Lev-Ari,2019b).

1.2.Word Order

In the field of linguistics,one of the most studied linguistic concepts is word order. This is unsurprising given that languages are externalized (i.e., put to use) in a strictly linear fashion, in at least spoken languages.It is considered one of the significant components and plays a crucial part in understanding the semantic roles in a sentence. A clear understanding of "*Who did what to whom*" only comes with the uniform use of word order in that language. In the case of transitive constructions, *subject*(S), *object* (O), and *verb* (V) are the threeconstituentsthatform six different orders: SOV, SVO, OSV, OVS, VOS, and VSO.In a comprehensive book called The World Atlas of Language Structures (Haspelmath, Dryer, Gil & Comrie, 2005), about 2650 languages were investigated regarding their structural properties.Many of them (86%)were found to beusing one of the orders more frequently than the others (i.e., dominant word order).The general conclusion of the study is that different languages have different preferences towards leading word order,and it is not equally spread across languages. While SOV (e.g.,Turkish, Korean, and Japanese)and SVO (e.g., English, Portuguese, Italian) are the most commonly used orders-approximately %48 and %41, others appear to be usedrather infrequently -less than 8% (Dryer, 2013).Apart from spoken languages, sign languages also seem to favorone orderover the others.Napoli and Sutton-Spence (2014)researched42 sign languages and reported that SOV and SVO were the most common leading orders, as is also the case in spoken languages.Such findings suggest that regardless of

whether it is spoken or sign language,SOV and SVO are predominately leading word orders. Then what causes such tendencies? Which factors are in play in the uneven distribution of dominant word orders? Why do the majority of both spoken and sign languages prefer some orders over others?Over the years, these questions have been studied through different methodologiesto reveal how one order exceeds others in the course of generational transmission.

According to Newmeyer (2000), SOV wasthe primary word order in the initial stages of language evolution;however,in time,the use of SVO has increased due to various proficiency demands.Maurits& Griffiths (2014) conducted a Bayesian phylogenetics study with 671 languages from different language families. It was suggested that in a hypothetical situation where there is a mutual ancestor of all these language families, SOV would be the most probable dominant word order. They further explain theSVO preference asa drift towards a change in the word order.In an experimental study on the same subject,participants were introduced to four artificial languages with different word orders, and theresults revealed thatthe most commonly used word orders lead to better and faster performance(Tabullo, Arismendi, Wainselboim, Primero, Vernis, Segura, Zanutto&Yorio, 2012), proposing that some word orders are preferred more because they are easier to learn and use.Astudy conducted with the silent gesture paradigm reveals thatparticipantswho differ in native languagesmostly favorSOV during experiments, regardless of the dominant word order used in their native languages (Goldin-Meadow, So, Ozyurek, &Mylander, 2008),which suggests that preferences of word order might be under the influence ofcertain cognitivefactors (Meir 2010; Meir, Aronoff, Börstell, Hwang, Ilkbasaran,Kastner, Lepic, Ben-Basat, Padden& Sandler, 2017; Gibson, Piantadosi, Brink, Bergen, Lim & Saxe, 2013; Hall, Mayberry& Ferreira, 2013).

1.2.1. Animacy: Reversible vs. Irreversible Events

The concept of animacy is highly essential to human beings. From the very early stages of life, humans can recognize whether a creature is alive(Mandler, 1992; Becker, 2014). According to Dahl (2008), animacy is an ontological classification where there is a separation of animate and inanimate entities. He suggests that an interaction of semantic roles with the concept of animacy can imply how we perceive sentences because animate entities are most likely to be presumed as the agent of sentences.

*Reversible events*are the events where the agent and the patient are both animate. When both the subject and the object constituents of a sentence, such as “THE GIRL HIT THE BOY”, are

specified as human, the semantic role that maps to the subject is agent, and to the object is patient. Notice, however, that without any consideration of linear order, both constituents could be identified as agents, for they can potentially act as agents in virtue of bearing the semantic feature of human, which may potentially render an ambiguity in terms of who is the agent and who is the patient.Since the dominant word order is SVO, this sentence would be rather clear in a language like English. However, when the utterance is without a proper word order, it is not transparent who is hitting whom. On the other hand,semantic roles in *irreversible events*cannot be changed because the agent would be an animate character, and the patient is inanimate. In a sentence like "THE GIRL PULLS THE TREE", the animate agent -girl- can perform the 'pull' action whereas the patient -tree- cannot. Even if the sentence wasproducedwithout an order, the recipient would understand the message without difficulty because it would be impossible for the tree to pull the girl.[1]

1.2.1.1.The Noisy Channel Account

Studies that tested animacy on constituent order have shown thatfrequently used word orders in reversible scenarios aretypicallySVO, and for irreversible scenarios, it is mostly SOV(Hallet.al., 2013;Gibsonet al., 2013; Goldin-Meadow et al., 2008).Gibson and colleagues (2013) introduced the *noisy channel account* tocharacterize the causes for such preferences. According to this approach, the prevalence of Subject-Object-Verb order in irreversible scenariosis caused byacognitive tendency to introduce subjects first, whereas the shared preference for Subject-Verb-Object order in reversible scenarios stems from blockingthe "noise"in the conveyed message by placing the verb between the subject and the object.Futrell et al. (2015) later supported the hypothesis by revealing that in a silent gesture experiment,speakers of SVO languagesand speakers ofVSOlanguages bothpreferred to place subjects first and verbs lastfor irreversible events regardless of their language's dominant word order, whereas theyused the SVO order the most for reversible events.

1.2.1.2.The Principle of Agent-First

Jackendoff (2002) put forward an Agent-first principle proposing that people are cognitively inclined toplace the agent of the action first. In cases where a fully developed communication model is absent, it is not likely to rely on an established constituent order. Therefore, challenges created by the ambiguity of two animate characters are resolved by placing agents first. He

[1]Although it is argued that some sentences do not conform to such circumstances. In a sentence like "The rock hit Bill" the subject, the rock, is an inanimate entity. In the absence of a strict word order convention such a sentence will always be interpreted as Bill as the agent, whereas it is the rock who performs the "hit" action.

suggests that a sentence like "*Eat apple Fred*"is an irreversible event which is why it is recoverable regardless of the word order. However, contrary to irreversible scenarios, reversible events imply uncertainty in an order like "*Hit tree Fred*" given that the tree comes before Fred. According to this principle, since it is likely that the tree can hit Fred and it precedes himin the order, one would infer that the agent is in fact the tree in this sentence.In sum, Jackendoff argues that constituent orders of conventionalized languages are shaped according to the Agent-first principle; however, severalemerging sign language studies reported contradicting results to such a claim (Ergin et al., 2018; Meir et al., 2017).

Meir et al. (2017) investigated word order preferences in three different sign languages, with two being newly emerged sign languages. The findings revealed that participants preferred SOV for irreversible events while favoring both OSV and SOV for reversible events. Ergin et al. (2018) later contributed to these results with a study conducted on CTSL, reporting that SOV was the prevalent order in events with inanimate objects and OSV in events including animate objects. Contrary to previous conclusions, both emerging sign language studies have not reported any preference towards SVO but reported OSV instead. Meir et al. (2017) explained such inconsistencies with the *"human first principle"* - signers of emerging sign languages prefer to place human arguments before inanimate arguments. This notion provides a different angle to the "*agent-first*" principle by suggesting that human saliency is a crucial influence on the order of constituents rather than the semantic role of the characters.

1.3.Conventionalized Sign Languages

Sign languages are considered natural languages that are fully developed and conventionalized (Stokoe, 1960).More than 100 conventionalized sign languages are actively used today (Dikyuva, Makaroğlu& Arik, 2017), and just like spoken languages, they have unique grammar and vocabulary that can be studied from all linguistic aspects. Such sign languagesare used by heterogeneousgroups -namely, deaf individuals that extend to distant parts of the population, therefore considered as communities with exoteric communication.Most sign languages used today came into existence when deaf individuals from various backgrounds werepresenting the same environment and formed a shared communication system over a long period of time (Meir et al., 2012).Within the scope of this thesis, we investigated two national sign languages from two different countries, Turkey and Brazil. In chapters 1.3.1 and 1.3.2, we will introduce detailed information about Turkish Sign Language (TID) and Brazilian Sign Language (LIBRAS).

1.3.1. Turkish Sign Language (TID)

Turkish Sign Language (TürkİşaretDili; TID) is a fully developed sign language used by the deaf communities in Turkey, and the number of users is predicted to be over 100.000 (Dikyuva et al., 2017). TID is believed to be one of the oldest sign languages in the world, and it is considered an indigenous sign language that has developed over many years without any substantial influence from another sign language (Zeshan, 2003). There is currently no evidence suggesting a relation between TID and any other sign language on both historical and linguistic terms.

Turkish Sign Language is a natural language that is used by deaf individuals from all around Turkey. It has its own grammar, and there has not been any influence from other sign languages. As part of their research, Dikyuva et al. (2017) studied the syntax of TID and found that the Subject-Object-Verb order is the most common one in TID. When it is broken down into different verb types, the most commonly seen word order for intransitive events is Subject-Verb (SV); for transitive events, it is Object-Verb (OV); and for ditransitive events, the word order is Subject-Indirect Object-Object-Verb (SIOV). Earlier studies also support the finding that SOV is the dominant word order of the Turkish Sign Language. (Gokgoz, 2011; Gokgoz& Arik, 2011).

1.3.2. Brazilian Sign Language (LIBRAS)

LIBRAS is a conventionalized sign language and the only national sign language used in Brazil. While there is little information about its origin, the records show that its birth can be traced back to 1857 when the first school for the deaf, The National Institute of Deaf Education (INES), was established in Rio de Janeiro.

De Quadros (1999) conducted a study on the syntactic structure of LIBRAS, where she investigated its word order and syntactic operations. According to her study, SVO is the dominant word order in LIBRAS; however, it can change depending on the verb type. De Quadros claims that sentences with directional verbs may show more word order flexibility than plain verb sentences. De Quadros further suggests that participants generate verb-final sentences if they contain handling verbs, classifier verbs, or inflecting verbs (Xavier &Agrella, 2015).

1.4.Emerging Sign Languages

Emerging sign languages arerecently formednatural languages that are still in the process of conventionalization. There are two types of emerging sign languages: *village sign languages*

and *deaf community sign languages*.*Village sign languages*emerge when a small community hasa considerablenumber of inhabitants who are hereditarily deaf and in need of communication with the other deaf and hearing members of the community who are also their friends and families. According to Brentari et al. (2021), such languages are not created purposefully but rather start off as gestures and then evolve into more regular systems of communication because these are the onlyprimarytoolsused to interact with each other. The authors further state, "A key ingredient needed for a sign language grammar to emerge is therefore thought to be the system's use as a primary communication system." (Brentari et al., 2021, p. 573).One of the most studied village sign languages is Al-Sayyid Bedouin Sign Language, which emerged within the last centurywith the increasing number of deaf children in a small communityin Israel (Kisch 2000; Sandler, Meir, Padden&Aronoff 2005).Alternatively, *deaf community sign languages*are formed in educational settings (e.g., schools), where already signing deaf individuals(e.g., home signers) from different places gather andcreate a novel communication system. A popular example of a deaf community sign language would be the Nicaraguan Sign Language which was formed by deaf children in various local schools around the year 1977 and forward (Senghas, Kita &Ozyurek, 2004). Both village and deaf community sign languages are formed and developed without the influence of conventionalized sign languages due to geographical or educational reasons. The members of these close-knit and isolated communities mainly rely on shared knowledge when communicating rather than following the strict rules of language. Therefore, they lack the systematicity and complexity of the established sign languages.

1.4.1. Word Order in Emerging Sign Languages

SOV is claimed to be the prominent word order in the initial phases of language emergence(Goldin-Meadow et al., 2008; Gibson et al., 2013), yet there are puzzling findings in the literature.Research on word order tendencies in early natural language systems has shown no regularity in using word orders in the primary periods of the young language systems (Coppola, Senghas, Newport &Supalla, 1997; Washabaugh, 1988). On the other hand, Sandler et al. (2005) conducted a study on Al-Sayyid Bedouin Sign Language and found that signers as early as the second-generation preferred SOV the most. However, a study on Nicaraguan Sign Language found that even though some signers preferred SOV, there wasstill a significant amount of word order variation (Flaherty, 2014). The results were replicated by Meir (2010), indicating thatthe first two generations of Israeli Sign Language signers used different orders.Research conducted on Central Taurus Sign Language showsthat SOVis one of themost

frequently used word orders; however,there is also diversity in terms of word orders in ditransitive structures (Ergin et al., 2018).

Previous work on novel communication systems discovered an additional strategy that signers use to minimize difficulties during communication. In certain events including two animate arguments, signers use *successive one-argument structures* (terminology from Ergin et al. 2018) described as "One such strategy is to restrict each unit to one animate character per action" (Ergin et al., 2018, p. 615). For instance, in an event like "the woman pushes the girl", signers produce responses such as WOMAN PUSH / GIRLFALL (See Figure 1). Such constructions are seen in sign languages like NSL (Coppola et al., 1997), CTSL (Ergin et al., 2018), and ISL (Meir et al., 2010). This strategy enables the signers of newly emerging sign languages to easily convey the message of who is doing what to whom.

Figure 1

A CENA participant describing the video clip of "the woman pushes the girl" in successive one-argument structures.

1.4.2. Horizontal and Vertical Contact

Emerging sign languages are used in close-knit communities that are disconnected from the outside world. Such circumstances result in a community where the members are homogenous -that is, they all share the same history and have shared knowledge of one another. As previously mentioned, small and isolated communities involve esoteric communication in which the language users interact with almost only one another and thereforehave a certain level of intimacy. This creates two different interaction types: *horizontal contact* and *vertical contact.* Typically, horizontal contact develops wheninitially the first home signers in the community interact with each other. This forms the first generation of signers of the novel communication system, creating animmature linguistic model for the next generation.When signers start communicating with the younger members of the community,it creates verticalcontact, in which

the linguistic model is transmitted through generations of signers. According to Senghas, Senghas &Pyers(2005), both contact types become crucial in systematizinglinguistic structure. In their work on Nicaraguan Sign Language, they presented results indicating thatthe emergence of a language takes at least two generations of signersand thatboth children and adultshave substantial parts informing a viable language.Studies such as Senghas et al. (2005) demonstrate the significance of investigating newly developed sign languages because they discovervaluable informationonthe developing stages of language evolution.And in the current study, weintroducedCentral Taurus Sign Language (CTSL) and CENA -newly emerged sign languagesfrom Turkey and Brazil, which we will presentmore information aboutin chapters 1.4.3 and 1.4.4.

1.4.3. Central Taurus Sign Language (CTSL)

Central Taurus Sign Language is a village sign language developed naturally and spontaneously in a small village near Gülnar/Mersin in southern Turkey (Ergin et al., 2018; Ergin, 2022; Ergin, Kürşat, Hartzell, Jackendoff, 2021). The village is located in an isolated mountainous area in the Central Taurus Mountain Range. CTSL has developed over half a century without any access to a language model as a means of communication for the increasing deaf population in this close-knit community. The reason for the increasing deaf population (approx. 4.6% of the population) is believed to be the result of hereditary deafness caused by members of the community marrying their relatives or deaf members marrying other deaf individuals in the community.

Residents of this small and close-knit village make their living by animal husbandry and agriculture, and the geographical, financial, and social conditions led the residents to be isolated from the outside world. The deaf children in the community could not be schooled due to financial difficulties and the remote location of the village. This resulted in CTSL being developed on its own by the deaf members of the community without the influence of Turkey's national sign language (Turkish Sign Language).

As of today, CTSL is being used in three small villages in the same area, and it has 25 deaf signers, with 17 of them using CTSL as their sole language. There are also hearing signers of CTSL with varying proficiencies, and the population is believed to be approximately 80 people.

Like in many other emerging sign languages, CTSL has no settled grammar and therefore does not involve a dominant word order. However, a study done byErgin (2018) on CTSL's word order indicates some word order preferences in different types of argument structures. For

instance, participants seem to prefer SV for one-argument structures, SOV and SV(o) for irreversible scenarios in two-argument structures, and OSV and SV/OV for reversible scenarios in two-argument structures. However, there is no clear tendency for three-argument structures as the participants use many different word order variations.

1.4.4. CENA

CENA is a village sign language that emerged around the 1950s in an isolated village called VárzeaQueimada. The village is in Piauí, an area located in the northeastern part of Brazil. There are currently 900 members of the community, with a deaf population of 34 (Stoianov, da Silva, Freitas, Almeida-Silva & Nevins, 2022). Currently, three generations in the village use this emerging sign language, with the youngest signers around the ages of 13-15. Most deaf individuals use CENA as their sole language, however, the degree to which they use the language varies between generations, especially with the younger signers. Some of the younger signers of CENA have attended school and had access to the internet and therefore were exposed to LIBRAS, whereas the older generation had little or no exposure to LIBRAS due to underdeveloped living conditions. Like CTSL and many other emerging sign languages, CENA was developed in a community where communication with the outside world was limited or not present, therefore, it was developed without the influence of LIBRAS or any other sign language. At present, some signers, especially younger ones, are influenced by LIBRAS and are borrowing some lexical items; however, the older generation remains mostly uninfluenced.

The study of Almeida-Silva and Nevins (2020) includes some work on CENA, where they present information on its linguistic properties. However, there is still very little research on word order, and with this paper, we aim to reveal the characteristics of CENA's word order in detail.

1.5.Aim and Hypothesis

The present study aims to demonstrate that community sizeis a key influencing factor on languageemergence and development bycomparing the constituent orders ofnaturallydevelopedemerging sign languages, Central Taurus Sign Language (CTSL) and CENA, with conventionalized sign languages, Turkish Sign Language (TID) and Brazilian Sign Language (LIBRAS).An examination of the relevant literature suggests that studies on emerging sign languages do not offer a comprehensivecross-linguistic comparisonof the interaction between group size and constituent order.Therefore, the present study is thus aimed at essentially filling a gap in the literature by shedding light on the initial stages of language

formation and evolution by examining how novel communication systemsare evolving into established languages.

According to Wray and Grace (2007), languages used in esoteric communities tend to be more complexand morphologically irregular, whereas languages used in exoteric communities are more uniform and systematic. It is argued that such structural differences can be attributed to reduced communication challenges originating from shared backgrounds and knowledge. (Trudgill, 2004, 2009, 2011; Wray & Grace, 2007; Raviv et al., 2019b). Furthermore, previous work on word order suggests SOV as the dominant word order in the earlier phases of language development (Goldin-Meadow et al., 2008; Gibson et al., 2013). It is further claimed that regarding event types,SOV is the prevalent word order in irreversible scenarios, whereas it is SVO in reversible scenarios (Hall et al., 2013; Gibson et al., 2013). However, recent studies on novel sign languages revealed that in reversible scenarios where the subject and the object are human entities, participants preferred OSV rather than SVO, suggestingan influence of human saliency (Meir et al., 2017), rather than the cognitive tendency to introduce subjects first. One of the supporting studies was conducted on CTSL (Ergin et al., 2018), replicating the same results.

In light of previous work, we predict that emerging sign languages, CENAand CTSL, will show more word order variations compared to conventionalized sign languages, TID and LIBRAS. Correspondingly, our further hypotheses are as follows: (a)Due to age, community size, and structure similarities, CENA signers will resemble CTSL signers regarding word order in different event types and argument structures.Due to the absence of anobject in intransitive (one-argument) structuresand the cognitive bias towards subject-first, (b) all four sign languages will prefer SV the most. Considering the findings reported by Ergin et al. (2018), it is hypothesized that (c)in transitive (two-argument) structures, CTSL and CENA signers will most commonly useSOV in irreversible events and OSV in reversible events.Since TID and LIBRAS areconventionalized sign languages with established grammar, (d) the most frequently used word orders in each event type will be the dominant orders of the languages (i.e., SOV for TID and SVO for LIBRAS) regardless of whether a sentence involves a reversible event or an irreversible one. In connection with earlier work on TID (Dikyuva et al., 2017), (e) the most frequently usedword order in ditransitive (three-argument) structures will be SIOV, however, since researchon LIBRAS suggests different word order in specific situations (De Quadros,

1999; Xavier &Agrella, 2015), (f) it is predicted that in events including ditransitive structures, LIBRAS willinclude more diverse word ordersthan TID.

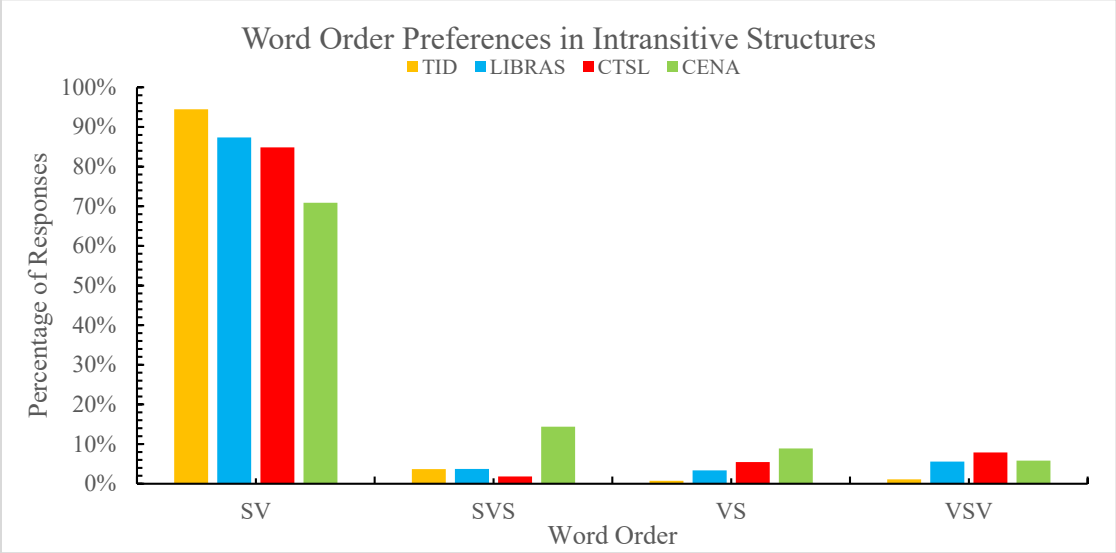
2. RESULTS

2.1.Word Order Preferences in Intransitive Structures

A total of 997 responses were analyzed for intransitive structures. The word order analysis on intransitive structures for all four sign languages revealed that while all four languages exhibited a preference for the SV order, the degree of preference varied across languages. Specifically, TID responses showed the highest preference for SV at 95%, while CENA responses showed the lowest at 70.9%. LIBRAS and CTSL fell in between, with 87.4% and 84.8% of participants selecting the SV order in intransitive structures, respectively. The rest of the responses also include SVS, VS, and VSV orders, with most at 14.4% and below (See Figure 2).

Figure 2

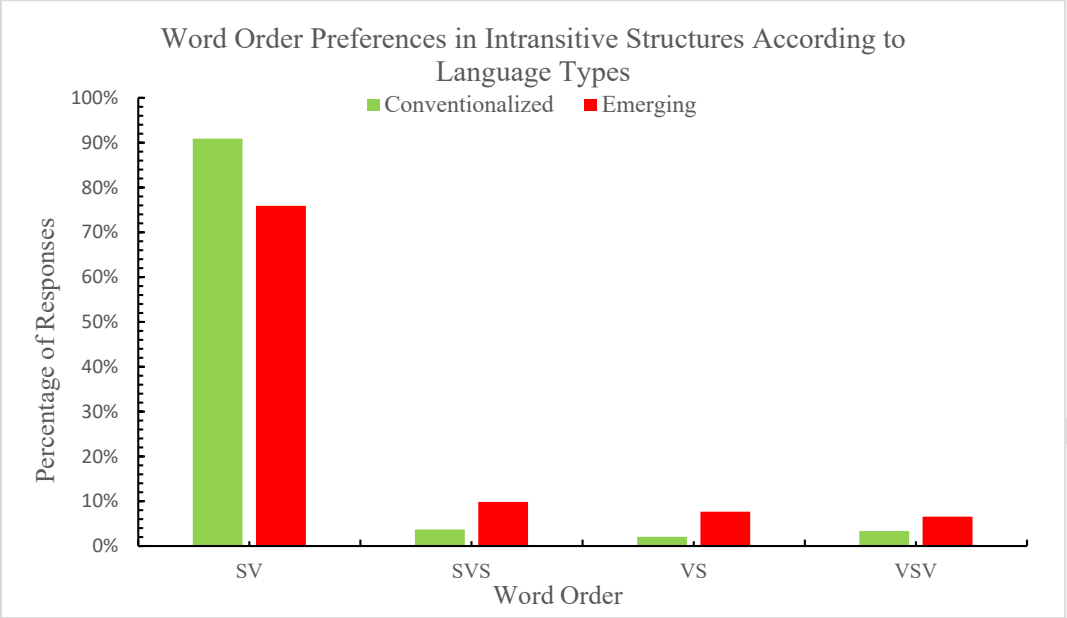
The percentage of word order preferences of all four sign languages (CENA, CTSL, LIBRAS, and TID) in intransitive structures.



The preference towards SV was significantly higher than other word orders ($X^2(3, N=997) = 1854.9$, $p = <.001$), and the responses of conventionalized sign languages were significantly higher than the responses of emerging sign language signers ($X^2(1, N=997) = 6.9$, $p = .009$) (See Figure 3).

Figure 3

The percentage of word order preferences intransitive structures according to different language types (Conventionalized vs. Emerging Sign Languages).

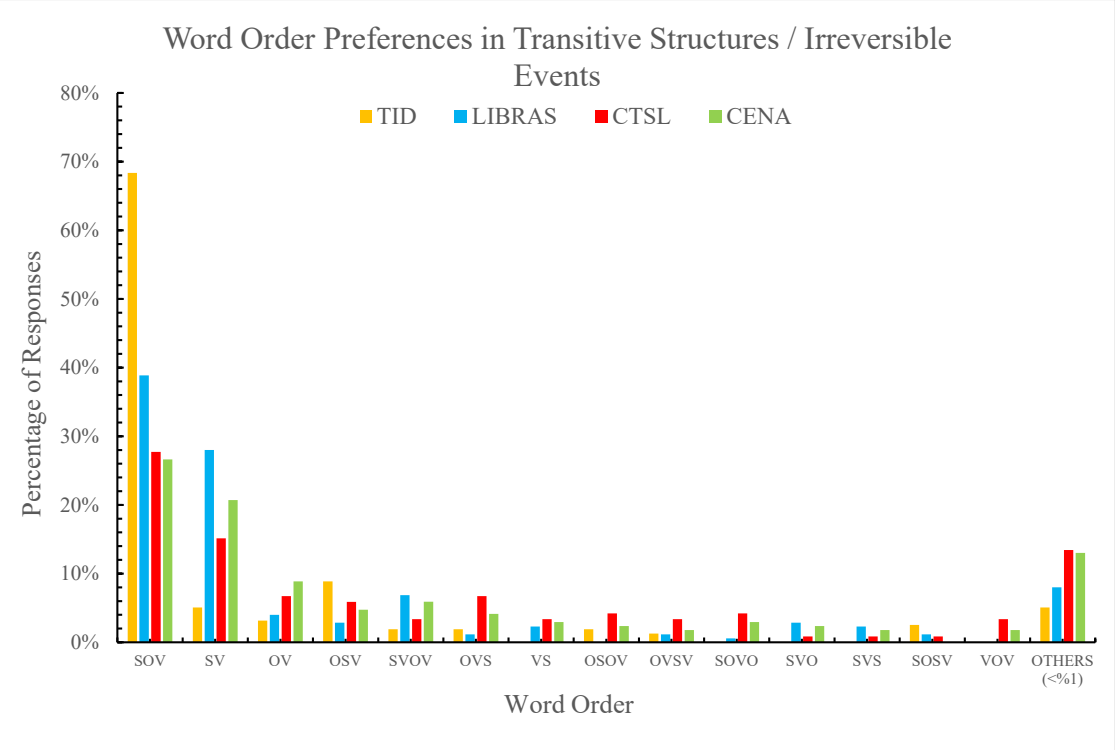


2.2.Word Order Preferences in Transitive Structures with Irreversible Events

For transitive structures with irreversible events, a total of 621 responses were analyzed. The results indicated that, in transitive structures with an animate agent and inanimate object, the majority of TID responses included the SOV order with a frequency rate of 68.4%, while OSV (9%) was the second most frequently used order, followed by SV (5.1%), the"*Others*" category (5.1%) and some additional word orders below 3%. The " Others " category was formed to classify responses that did not conform to common word orders, including responses with a frequency proportion of 1% or less, corresponding to 3 or fewer occurrences in the dataset. Furthermore, the responses given by the LIBRAS users for irreversible events were more evenly distributed among the two categories, with 38.9% in SOV and 28.0% in SV order, and the "Others" category was the third most used word order at 8.0%. The results coming from CTSL exhibited a similar trend, with 27.7% in SOV and 15.1% in SV; however, the "Others" category comprised 13.4% of the total responses, making CTSL the highest in the category. Finally, CENA had the lowest percentage of SOV order (26.6%), with 20.7% in SV order and 13.0% in "Others", making it the language with the most similar frequency proportions to CTSL (See Figure 4).

Figure 4

The percentage of word order preferences of all four sign languages (CENA, CTSL, LIBRAS, and TID) in transitive structures with an animate subject and inanimate object.

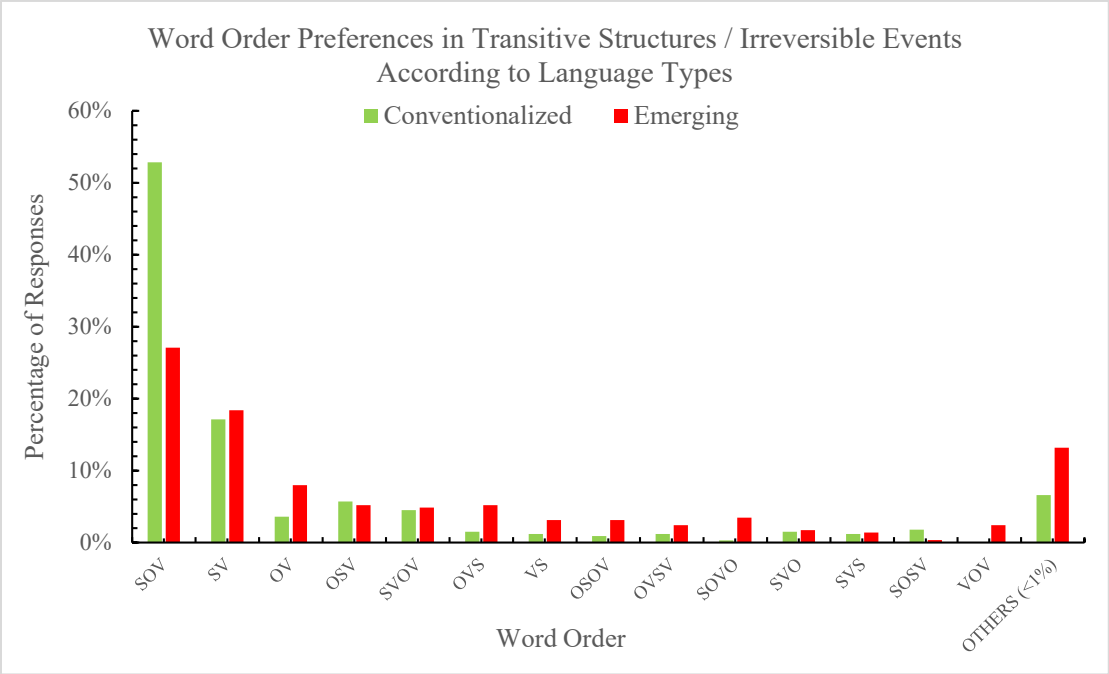


The analysis of overall frequencies of SOV, SV, and "Others" revealed that SOV was significantly higher than SV ($X^2(1, N=354) = 56.9, p = <.001$), and "Others" ($X^2(1, N=314) = 119.8, p = <.001$). While the TID preference for SOV was significantly higher than LIBRAS ($X^2(1, N = 176) = 9, p = .003$), CTSL ($X^2(1, N=141) = 39.9, p = <.001$), and CENA ($X^2(1, N=153) = 25.9, p = <.001$), the SOV difference between CENA and CTSL was not significant ($X^2(1, N=78) = 1.8, p = .174$). Similarly, there was a non-significant relationship between CENA and CTSL regarding the use of word orders that fall into the "Others" category ($X^2(1, N=38) = .95, p = .330$); however, they differed in SV ($X^2(1, N=53) = 5.45, p = .020$). Results further showed that LIBRAS participants' preference for SV differed between CTSL ($X^2(1, N=67) = 14.3, p = <.001$) and TID ($X^2(1, N=57) = 29.5, p = <.001$), but there was no difference when compared to CENA ($X^2(1, N=84) = 2.3, p = .127$). When the two language types are compared to each other, the results reveal that conventionalized sign languages have a significantly higher preference towards SOVthan emerging sign languages ($X^2(1, N=204) = 107.4, p = <.001$). However, we see the opposite pattern in the "Others" category, where emerging sign languages are higher than conventionalized sign languages ($X^2(1, N=60) = 4.3, p = .039$). Lastly, a non-significant

relationship exists between SV responses of both sign language types ($X^2(1, N=110) = .145, p = .703$) (See Figure 5).

Figure 5

The percentage of word order preferences in transitive structures with irreversible events according to different language types (Conventionalized vs. Emerging Sign Languages).



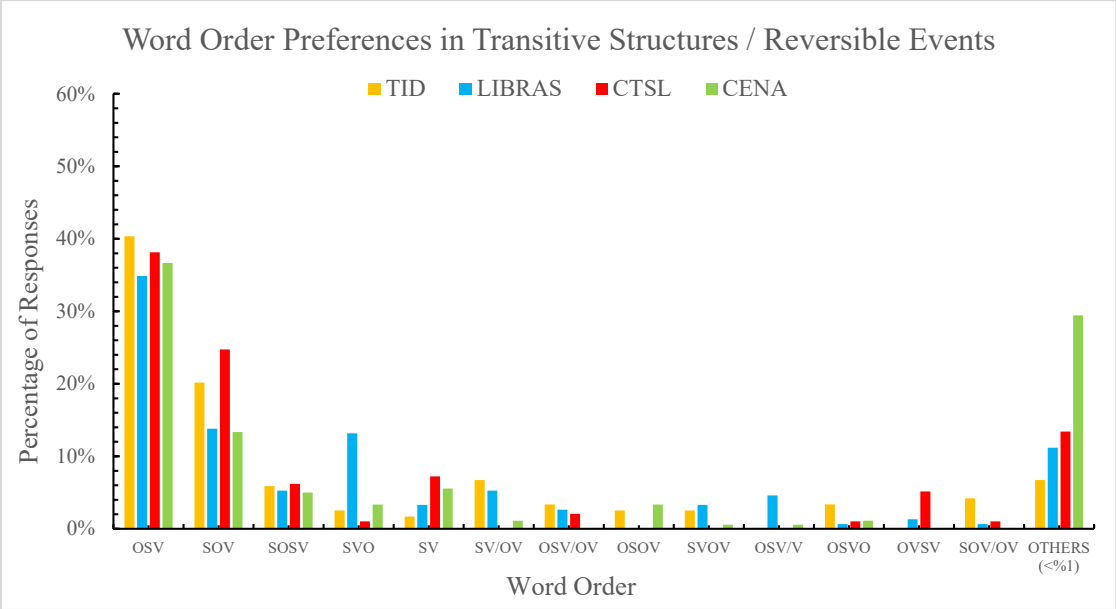
2.3.Word Order Preferences in Transitive Structures with Reversible Events

The analysis focusing on transitive structures with reversible events encompassed a total of 548 responses, and the results revealed that OSV was the most frequent word order for all sign languages, with TID having the highest percentage at 40.3%, followed by CTSL at 38.1%, CENA at 36.7%, and LIBRAS at 34.9%. The second most common order was SOV, in which CTSL (24.7%) and TID (20.2%) had a higher preference than LIBRAS (13.8%) and CENA (13.3%). After favoring OSV and SOV to describe the clips, participants from all languages preferred to produce orders that are not common -a total of 3 occurrences or less- therefore grouped under the category of "Others". Participants with the highest percentage in the "Others" category were from CENA at 29.4%, while TID participants were at the lowest with 6.7%. In addition, CTSL and LIBRAS participants showed similar preferences, with 13.4% and 11.2%. Lastly, when the total frequency percentage of four languages in SOSV and SVO is calculated, results showed identical percentages at 5.5%; however, the language frequencies varied within the word orders. With a 13.2% preference rate, LIBRAS participants produced SVO more than

the other languages, which ranged from 1% to 3.3%. Nonetheless, calculations for SOSV displayed more evenly distributed preferences with a percentage range of 5.0%-6.2% (See Figure 6).

Figure 6

The percentage of word order preferences of all four sign languages (CENA, CTSL, LIBRAS, and TID) in transitive structures with an animate subject and object.

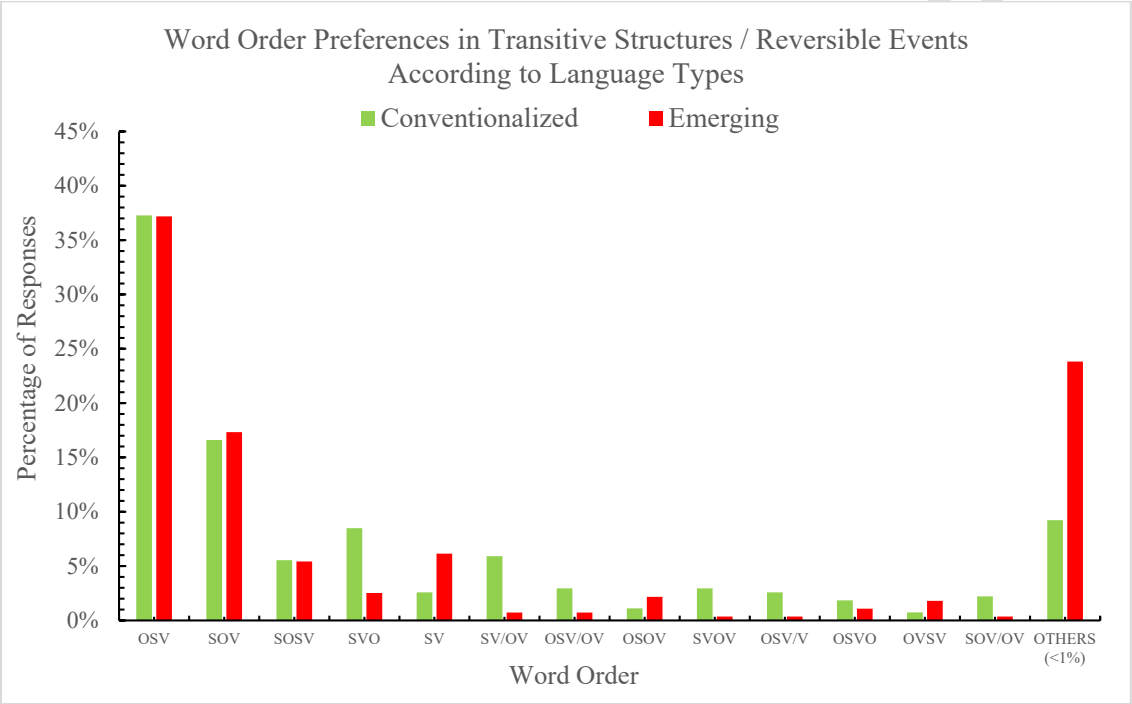


The Chi-Squared Independence Test revealed a non-significant difference between the four languages in the production of OSV ($X^2(3, N=204) = .347, p = .951$).On the other hand, CTSL had the highest percentage for SOV ($X^2(3, N=93) = 17, p = <.001$), while CENA and LIBRAS had similar percentages($X^2(1, N=45) = .200$, p = .655).CTSL and TID responses for SOV are also significantly higher than CENA and LIBRAS ($X^2(1, N=93) = 4.5, p = .034$).Additionally, when the overall preference of all sign languages in OSV and SOV was tested, OSV was found to be favored more than SOV ($X^2(1, N=297) = 41.5, p = <.001$). Analysis of the "Others" category revealed that CENA participants produced more uncommon word orders than the other three languages ($X^2(3, N=91) = 55.4, p = <.001$), but there was a non-significant relationship between CTSL, TID, and LIBRAS ($X^2(2, N=38) = 3.2, p = .201$). Finally, the difference between the total frequencies of SOSV and SVO was not significant ($X^2(1, N=60) = .000, p = 1.00$), as well as the SOSV frequency between all languages ($X^2(3, N=30) = .667, p = .881$). And within the SVO order, LIBRAS was significantly higher when compared to other sign languages ($X^2(3, N=30) = 29.5, p = <.001$).The comparison analysis of

emerging sign languages and conventionalized sign languages reveal that there is no difference in the preference of OSV(X^2(1, N=204) = .020, p = .889)and SOV(X^2(1, N=93) = .097, p = .756);however, they differ in terms of "Others" category (X^2(1, N=91) = 18.5, p = <.001) (See Figure 7).

Figure 7

The percentage of word order preferences in transitive structures with reversible events according to different language types (Conventionalized vs. Emerging Sign Languages).



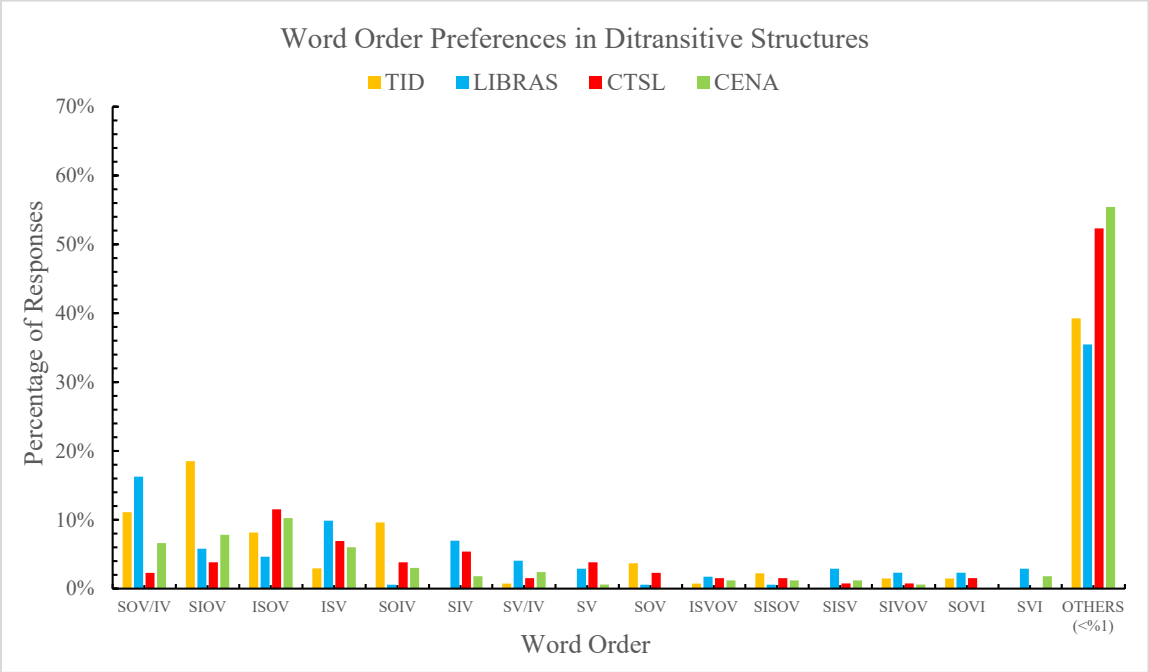
2.4.Word Order Preferences in Ditransitive Structures

Word order analysis for ditransitive structures comprised 600 responses. The results revealed that the "Others" category has the highest percentage, comprising 45.4% of the entire ditransitive responses. The distribution of the "Others" category in ditransitive structures varied across the sign languages. CENA had the highest percentage of "Others" at 55.4%, followed closely by CTSL at 52.3%. LIBRAS exhibited a comparatively lower percentage of "Others" at 35.5%, while TID had the lowest percentage at 39.3%. Regarding the distribution of SOV/IV in ditransitive structures, it was observed that this category was less prevalent across all sign languages, with a cumulative percentage of 9.5%. Signers of LIBRAS had the highest percentage of SOV/IV responses at 16.3%, followed by TID at 11.1%, whereas CENA and CTSL exhibited a relatively lower SOV/IV percentage at 6.6% and 2.3%. The results further

disclosed that the percentage of responses for SIOV (8.8%) and ISOV (8.5%) were similar, with TID being the highest in SIOV at 18.5% and others ranging between 7.8%-3.8%. Furthermore, in the ISOV responses, CTSL (11.5%) and CENA (10.2%) exhibited rather similar percentages, whereas TID was slightly lower at 8.7%, followed by LIBRAS, with the lowest at 4.7% (See Figure 8).

Figure 8

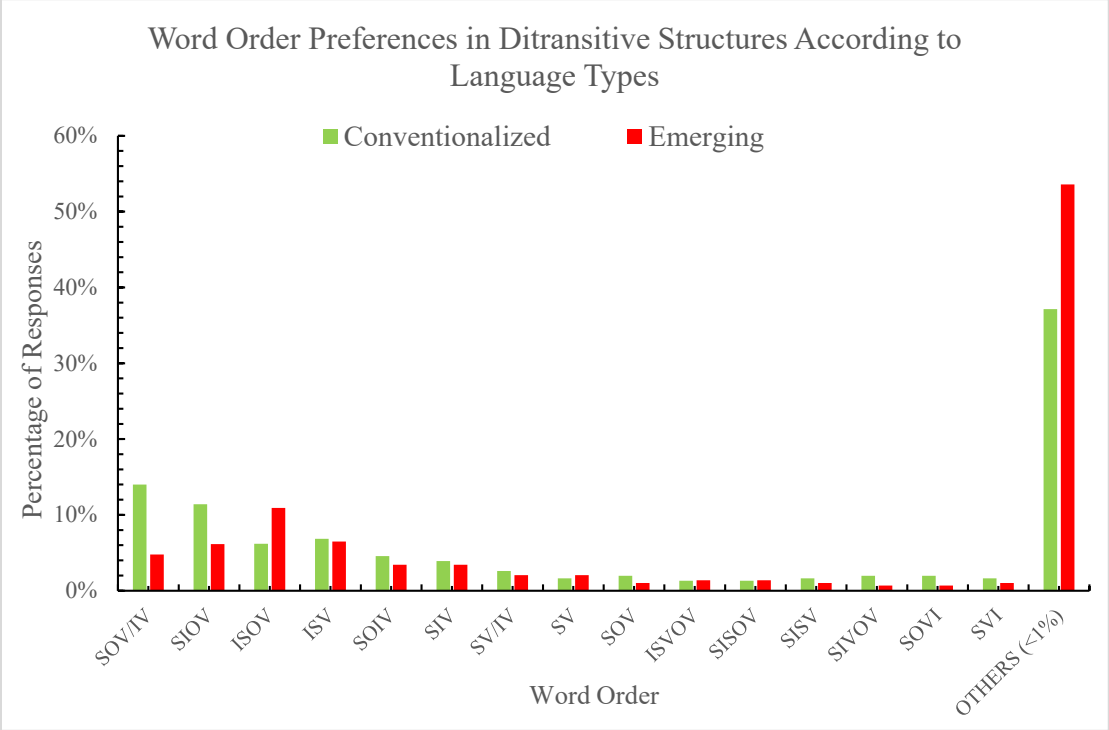
The percentage of word order preferences of all four sign languages (CENA, CTSL, LIBRAS, and TID) in ditransitive structures.



The analysis of the "Others" category in ditransitive structures presented significant differences between emerging sign languages, CTSL and CENA, and conventionalized sign languages, TID and LIBRAS, ($X^2(1, N=271) = 6.8, p = .009$), in which the relationship between CTSL and CENA ($X^2(1, N=157) = 3.4, p = .066$), and TID and LIBRAS ($X^2(1, N=114) = .561, p = .454$) were non-significant. Within the SOV/IV responses, LIBRAS was significantly higher than other sign languages ($X^2(3, N=57) = 22.9, p = <.001$), and the sign language with the second highest percentage, TID, also exhibited significant results when compared to CTSL and CENA ($X^2(2, N=29) = 7.7, p = .021$). Furthermore, TID participants produced more SIOV than the participants from other sign languages ($X^2(3, N=53) = 16.4, p= <.001$); however, there was no significant relationship between the sign languages for the ISOV preference ($X^2(3, N=51) = 3.8, p = .281$) (See Figure 9).

Figure 9

The percentage of word order preferences in ditransitive structures according to different language types (Conventionalized vs. Emerging Sign Languages).



3. DISCUSSION

Building upon the aim of the study, which is to assess the influence of community size on constituent order, four sign languages were compared according to their word order responses in different argument structures and event types. The results of word order in intransitive structures revealed an SV prevalence for all sign languages,contributing to Jackendoff's agent-first principle (2002). Yet,there is insufficient evidence to suggest that human saliency is another contributing factor (Meir et al., 2017) since experimental clips also include inanimate subjects (e.g., Ball bounces). Results also revealed that signers of conventionalized sign languages exhibited higher SV preference than those of emerging sign languages, which have implications for a community size impact over constituent order in one-argument structures.

Further in the study, we analyzed responses for transitive structures with irreversible scenarios. The results revealed that SOV was the most produced word order in all four languages, and TID had the highest proportion of responses. This result is parallel with the work of Dikyuva et al. (2017), in which SOV was suggested to be the dominant word order of TID. Furthermore, the SOV prevalence in irreversible scenarios suggests a cumulative preference

towards SOV, which provides evidence to the notion that it is, in fact, the primary word order in all language types (Napoli & Sutton-Spence, 2014; Newmeyer, 2000). Similar trends were also observed in the study of Meir et al. (2017) and the study of Ergin et al. (2018), where SOV was the most frequently used word order in irreversible events regardless of the language or language type (e.g., spoken vs. sign or conventionalized vs. emerging). Though, contrary to expectations, LIBRAS participants also favored SOV the most even though it was suggested that SVO was the dominant word order of LIBRAS (De Quadros, 1999); however, it was also claimed that word order preference might change depending on the word type. Moreover, LIBRAS has the highest percentage of SV responses, which may be interpreted as participants producing SV instead of SVO because it still conveys a recoverable meaning of the action without producing the object.

The analysis of irreversible events further indicates that SOV was the prevalent word order in both CENA and CTSL, and the "Others" category was at the same percentage of use. It is evident from the data that novel communication systems, such as emerging sign languages, prefer SOV the most. This claim was supported by the previous work of Sandler et al. (2005) on Al-Sayyid Bedouin Sign Language, however, some studies also presented findings suggesting no prevalent word order in emerging sign languages (Meir, 2010; Flaherty, 2014). In addition, results show that CENA and CTSL exhibited substantially similar percentages in responses for transitive structures with irreversible events, specifically for SOV and the "Others" category. These observed relationships can be attributed to similarities in both languages' characteristics, such as community structure, group size, and language age.

Lastly, the findings revealed that for transitive structures with animate subjects and inanimate objects, conventionalized sign languages favored SOV more than emerging sign languages, whereas it was the opposite for the "Others" category, where emerging sign languages used more scarce word orders in comparison to conventionalized sign languages. It is likely that full-blown sign languages produced more common word orders because the signers are from larger groups of society and rely on uniform word orders when interacting with other signers. On the other hand, being from the same community and having shared knowledge of one another can be why signers of emerging sign languages construct more responses with random orders. These results contribute to the understanding of esoteric and exoteric communities where the type of communication that originates from the structure of the community is claimed to have an impact on language structure (Wray & Grace, 2007, Trudgill, 2004, 2009, 2011). Thus, these findings

have important implications in that the size of the community can be an influencing factor over word order preferences, hence the formation of constituent order in language development.

The analysis of word order preference in transitive structures with reversible events revealed that OSV was the most used word order for all four sign languages suggesting that when both agent and the patient are animate characters, signers prefer to place the object before the subject. Previous work shows similar findings for reversible events (Ergin et al., 2018; Meir et al., 2010; Hall et al., 2013); however, there are also studies indicating that there is a higher preference towards other word orders instead of OSV (Gibson et al., 2017; Goldin-Meadow et al., 2008; Futrell et al., 2015). The findings of this study contribute to the principle of human-first (Meir, 2017), which claims that human entities are placed before inanimate objects due to the saliency of humans. She further claims that such a principle can also explain findings where OSV is prevalent in events with an animate subject and object because the human is still placed at the beginning. However, we observed an additional factor for OSV prevalence upon close examination of the response clips. Participants from all four sign languages could disambiguate the semantic roles by putting the object first because they placed the object in a location in the space and then performed the action on that location. For instance, to describe an event like "the girl pulls the man", the participants would sign FATHER[He is here (Location-1)]CHILD PULL (Location-1) (See Figure 10).

Figure 10

A TID participant describing the video clip of "the girl pulls the man" in Object-Subject-Verb (OSV) order.

While this adds a dimension to the human-first account (Meir et al., 2017), it does not contribute to the noisy channel account (Hall et al., 2013) in the sense that placing both object and subject before the verb to describe reversible events would not disambiguate the semantic roles.

Further analysis of reversible events reveals that total responses of SOV and the "Others" category exhibit similar percentages, suggesting that signers in all sign languages prefer to produce either SOV or an uncommon word order after producing OSV the most. When the languages are examined individually in both SOV and the "Others" category, it is observed that CTSL and CENA show differences. While CTSL signers favored SOV more than the CENA signers, it is the opposite for the category of "Others". Such findings indicate that CENA signers do not refer to the use of common word orders as much as CTSL signers do and instead try to overcome ambiguities without any uniformity. The reason for such tendencies might be that CTSL signers have developed a further understanding of the influence of constituent order over ambiguity, whereas CENA signers rely more on the shared knowledge of the other signer. Overall, the results implicate that although they resemble in age and community size, CENA and CTSL exhibit differences in constituent order preferences for structures with reversible scenarios.

Additionally, the study presents results that TID is observed to have a high percentage of SOV responses, whereas LIBRAS is the highest in the SVO responses. Contrary to expectations, using dominant word orders for reversible cases was not the first preference of LIBRAS and TID signers since the data indicates that they used dominant word orders after referring to OSV the most. The findings have implications that the word order preference of fully developed sign languages like TID and LIBRAS often exhibit shifts from dominant word order to strategies mentioned before (i.e., describing the action on the object after placing the object in a specific location), resulting in OSV prevalence, and indicating a human-first principle (Meir et al., 2017). Moving forward with the analysis, it is observed that conventionalized and emerging sign languages do not differ in terms of preference toward OSV and SOV orders. Also, results from the "Others" category suggest that responses from emerging sign languages signers contained more uncommon word orders than responses from conventionalized sign language signers, however, such an assumption might be a misinterpretation since CTSL includes the most responses among the emerging sign languages whereas the percentage of CENA responses are closer to conventionalized sign languages. Given all the findings, it is likely that community size has no effect on constituent order regarding two-argument structures with animate subjects and animate objects.

In the next phase of the study, we analyzed how responses are distributed among sentences with a ditransitive structure. The results demonstrated no consensus on a single word

order, as the "Others" category has the highest percentage in all languages. When languages are individually examined, it is observed that SIOV is the second most frequently preferred word order in TID. A notable difference between this study and others is that Dikyuva et al. (2017) suggested SIOV as the most frequently used word order for ditransitive structures, whereas our results revealed it to be the prevalent word order only after signers preferred to produce uncommon word orders the most. Moreover, findings reveal SOV/IV to be the most produced word order after the "Others" category, suggesting that signers attempted to use the strategy of successive one-argument structures (Ergin et al., 2018) to describe ditransitive sentences, although SOV/IV is not comprised of one-argument structures per se. Thus, in this case, it would be more suitable to use the term "split-sentence constructions" suggested by Napoli and Sutton-Spence (2014). The findings present contradicting results to relevant studies where it was argued that the strategy of split-sentence constructions was adopted by the signers of emerging sign languages (Coppola et al., 1997; Ergin et al., 2018); however, our results indicate that the signers of TID and LIBRAS, fully-fledged sign languages, implemented the strategy more than CENA and CTSL signers. Additionally, analysis concerning ditransitive responses of CENA and CTSL exhibits findings where both have similar percentages in SOV/IV, SIOV the "Others" category, suggesting that both CENA and CTSL signers follow the same word order preference in ditransitive responses. Such results may be attributed to similarities in language properties and community characteristics between CENA and CTSL.

Expanding on the analysis of ditransitive structures, the findings reveal some significant differences between emerging and conventionalized sign languages. The signers of emerging sign languages formed more scarce word orders than those of conventionalized sign languages, whereas it was the opposite case for the SOV/IV preference. Considering all findings on ditransitive structures, the observed patterns have implications that neither the signers of fully developed sign languages nor newly developing sign languages rely on rigid word order to describe three-argument structured sentences, though when compared to emerging sign languages, the signers of conventionalized sign languages are more inclined to produce common word orders such as SOV/IV or SIOV. As mentioned in the earlier sections of the study, the reason for such variations in the responses of both CENA and CTSL can be attributed to the communication between signers, which is shaped by the structure and the size of the community (Wray & Grace, 2007; Raviv et al., 2020; Lupyan & Dale, 2016). Thus, the findings highlight the influence of community size over constituent order in ditransitive structures.

4. CONCLUSION

In conclusion, the findings suggest that in intransitive structures, signers of TID, LIBRAS, CTSL, and CENA exhibited a prevalence of SV word order, supporting the agent-first principle (Jackendoff, 2002). Similar trends were also observed in transitive structures with irreversible events, where SOV was the prevalent word order in all four sign languages. This finding aligned with previous research suggesting that SOV is the most commonly used word order in irreversible scenarios (Meir et al., 2010; 2017; Gibson et al., 2013; Ergin et al., 2018). Similar to the work of Dikyuva et al. (2017), TID responses presented the highest percentage of SOV in irreversible cases. However, it was unexpected that LIBRAS, which was believed to have SVO as its dominant word order (De Quadros. 1999; Xavier &Agrella, 2015), also favored SOV. On the other hand, in addition to OSV being the most frequently used word order in reversible cases, TID and LIBRAS were among the highest percentagesin their dominant word order. OSV was also the most produced word order in CENA and CTSL responses, suggesting an OSV prevalence in reversible events, which contributes to the notion of the human-first principle (Meir et al., 2017), whereas it fails to support the claims of the noisy channel account (Hall et al., 2013). Continuing with the irreversible analysis, CENA and CTSL responses demonstrated similar frequency rates of SOV and the category of "Others", likely stemming from being newly developed sign languages that formed over 70 years and belonging to close-knit communities with esoteric communication. While such findings were replicated in the analysis of ditransitive structures, the responses for transitive structures with reversible events revealed opposite findings, suggesting that word order preferences of CENA and CTSL essentially demonstrate similarities, however, it may vary depending on the animacy of arguments.

Findings on ditransitive structures revealed that the prevalence of any word order was absent, and all languages preferred to produce uncommon word orders with a frequency of three or less, suggesting that signers of both conventionalized and emerging sign languages do not rely on word order to describe three-argument structures. It is likely that there are other communicative mechanisms or strategies that the signers implement, which future studies should aim to investigate further.

The comparison of emerging and conventionalized sign languages revealed that in transitive structures with animate subjects and inanimate objects, conventionalized sign languages showed a higher preference for SOV than emerging sign languages. Conversely, emerging sign

languages exhibited more diverse and uncommon word orders. This difference could be attributed to the more uniform use of grammar in fully developed sign languages, while emerging sign languages relied more on shared knowledge among signers, resulting in various constituent orders. Such implications can also be applied to findings of intransitive and ditransitive structures, as both emerging and conventionalized sign languages showed contrasts in responses. Nonetheless, such a difference was absent for reversible events. The findings have important implications for the influence of community size on constituent order, though such an effect does not apply to two-argument structures with animate subjects and animate objects.

In summary, the current study demonstrated that community size is an influencing factor on constituent order in sentences of intransitive and ditransitive structures and irreversible events. The findings shed light on the initial stages of sign language emergence, highlighting the relationship between community size and constituent order.

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