ACQUISITION OF CLAUSE CHAINING

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ACQUISITION OF CLAUSE CHAINING

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Editorial: Acquisition of Clause Chaining

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Editorial on the Research Topic

Acquisition of Clause Chaining

Research on the acquisition of complex syntax has largely overlooked a special type of complex sentence, found in hundreds of languages outside Western Europe: the clause chain. A clause chain contains as few as one and as many as 20 or more "medial" clauses, with verbal predicates that are under-specified for tense and other categories, and a single "final" (finite) clause, with a verbal predicate that is fully-specified for tense and, often, other categories. "Medial" clauses relate syntactically to other clauses in the chain without being subordinated to them. In some languages, each clause in a chain must indicate in advance whether the subject of the next clause will be the same as or different from that of the current clause, through "switch-reference" marking (Haiman and Munro, 1983; van Gijn and Hammond, 2016). Unlike English complex sentences, clause chains' distribution is partially predictable in that it is often associated with description of temporally sequential events or actions.

Clause chaining occurs in typologically diverse languages, but there has been no comprehensive cross-linguistic study of clause chaining; the comparative clause chain literature is limited to book chapters and working manuscripts (Longacre, 1985, 2007; Bickel, 2010; Dooley, 2010). This Research Topic presents the first-ever set of research articles focusing on or relating to children's acquisition of clause chains. Six of these articles describe and analyze child clause chain productions in languages in which clause chains are frequently used, especially to describe sequences of related events/actions/states. Of these, three focus on Eurasian languages—Korean (Choi), Japanese (Clancy), Turkish (Ögel-Balaban and Aksu-Koç)—and three focus on indigenous languages of Australia and New Guinea—Pitjantjatjara (Defina), Ku Waru (Rumsey et al.), and Nungon (Sarvasy). These six studies are analyzed in a seventh synthesis paper (Sarvasy and Choi). An eighth contribution describes and analyzes a complex sentence type in Sesotho that is similar to clause chains, but with some differences (Riedel et al.). Two final contributions provide fresh perspectives on acquisition of complex sentences in non-European languages without true clause chaining: Modern Hebrew (Berman and Lustigman), and K'iche' and Mam (Pye and Pfeiler).

The first six studies use diverse approaches. Defina, Rumsey et al., and Sarvasy present children's spontaneous production of clause chains from naturalistic, longitudinal studies in under-described

languages: Pitjantjatjara of central Australia, and Ku Waru and Nungon of Papua New Guinea. Clancy and Ögel-Balaban and Aksu-Koç use cross-sectional data to investigate clause chain productions in Japanese and Turkish. Here, we note that Clancy is the first to use a mixed-effects statistical model to predict clause chain characteristics, such as chain length (in clauses) and when a speaker chooses to end a chain, for both adults and children. Choi presents both longitudinal and cross-sectional datasets and gives a synthetic analysis of clause chain acquisition in Korean children.

Despite these methodological differences, Sarvasy and Choi found that these studies present a coherent picture of early clause chain acquisition as involving: (a) morphologically error-free complex sentence production, (b) uniform progression from two-clause chains to longer chains, and (c) early accuracy in switch-reference marking and topic continuity in clause chains, albeit with marked cross-linguistic differences, based on distributions in the ambient languages.

Beyond the acquisition of clause chaining, the studies in this Research Topic contribute to a better understanding of the phenomenon of clause chaining in three important ways.

First, as yet, no one has pinned down criteria for differentiating between a "clause chaining language" and a "non-clause chaining language." As Sarvasy points out, it is relatively easy to approximate a minimal clause chain in English with an adverbial clause-plus-main clause combination, but it is unnatural to stack three or more English adverbial clauses in one prosodic sentence—let alone 20! The acquisition data presented in this Research Topic may aid in differentiating between "non-clause chaining" languages like English, where such stacking of non-finite clauses is unnatural, and "clause chaining" languages like Japanese, Korean, Ku Waru, Nungon, Pitjantjatjara, and Turkish, where it is frequent and natural. Children acquiring "clause chaining" languages begin producing clause chains by around two-and-a-half years (Sarvasy and Choi). But Berman and Lustigman show that speakers of the "non-clause chaining language" Modern Hebrew only begin to produce sequences of non-finite clauses in their teens and older, in occasional use of an advanced, literary speech style. This contrasts with their early production of "extended predicate" multi-verb sequences within a single clause. Further, Sarvasy shows that children acquiring the Papuan language Nungon produce subordinate and coordinate sentences as well as clause chains before their third birthday, but that clause chains are produced with far higher frequency than the other two complex sentence types. (This remains to be confirmed for the other languages in this Research Topic.)

Second, these studies highlight the structural diversity of clause chains across languages. For instance, the number of distinct medial verb forms, with distinct semantic functions,

ranges in these languages from just one (Pitjantjatjara, Nungon) to 100 (Korean). Further, the complex sentence types described by Riedel et al. for Sesotho are similar to clause chains in that they involve clauses with verbal inflections that are under-specified for tense, but different from typical clause chains in that the Sesotho forms can "skip" multiple intervening tensed clauses, often across multiple speakers. They thus represent an extra-long-distance type of clause linkage, the likes of which may never have been described before for any language.

Last, articles in this Research Topic have relevance for study of diachronic aspects of clause chaining. The minimal clause chain (comprising just one "medial" and one "final" clause) has structural counterparts in expressions employing an adverbial clause plus a main clause in many languages of the world (Bickel, 2010). Applying the comparative method of historical linguistics to child language (as in Pye, 2017), Pye and Pfeiler show that this sort of construction evolved into monoclausal complex predicates with morphological markers of directionality in different ways for the Mayan languages K'iche' and Mam. Indeed, more "grammaticalized" functions of clause chains—always two-clause chains—co-exist synchronically with non-grammaticalized clause chains in some of the other languages of the Research Topic, such as Japanese (Clancy), Ku Waru (Rumsey et al.) and Nungon (Sarvasy). If these languages follow the pattern of the Mayan languages, the Japanese, Ku Waru, and Nungon two-clause chain types with more grammatical functions could evolve into monoclausal complex predicates in the future.

The contributions to this Research Topic augment our understanding not only of the acquisition of this special type of complex sentence, but also of clause chain typology in general. We hope that this Research Topic will motivate further research on clause chaining in child language, as well as in adult grammar and language processing.

AUTHOR CONTRIBUTIONS

FUNDING

ACKNOWLEDGMENTS

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The Acquisition of Directionals in Two Mayan Languages

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We use the comparative method of language acquisition research in this article to investigate children's expression of directional clitics in two Eastern Mayan languages – K'iche' and Mam (Pye and Pfeiler, 2014; Pye, 2017). The comparative method in historical linguistics reconstructs the grammatical antecedents of modern languages and traces the evolution of each linguistic feature (Paul, 1889; Campbell, 1998). This history informs research on language acquisition by demonstrating how phonological and morphological features interact in the evolution of new uses for common inherited traits. Children acquiring modern languages must learn the arbitrary constraints imposed on their language by its history.

Keywords: comparative method, K'iche', Mam, prosody, directional clitics, language acquisition

INTRODUCTION

The Eastern branch of the Mayan language family contains 13 languages including K'iche', Mam, Ixil, Tz'utujil, Kaqchikel, and Poqomchi'. K'iche' and Mam are spoken in western Guatemala; K'iche' has approximately a million speakers and Mam has approximately a half-million speakers (Richards, 2003). The Eastern Mayan languages separated into the K'iche'an and Mamean subgroups more than 3000 years ago (Kaufman, 1990, 2017).

In this article, we examine the acquisition of directional clitics that K'iche' and Mam use to express the direction an agent takes in the course of accomplishing an event. The directional clitics convey a meaning similar to the meaning that *come* expresses in the English sentence 'We are coming to fix the sink.' Changes to the prosody of K'iche' and Mam triggered changes in the number of directional clitics, their position and their grammatical constraints. While Mam makes heavy use of directional clitics that precede the verb stem, K'iche' relies more on directional clitics that follow the verb stem.

The historical changes to the common inherited trait of directional clitics show what children must learn in each language as well as alternative ways in which the directional clitics could be used. Comparisons between the directional clitics in K'iche' and Mam increase the scope and precision of acquisition research by testing generalizations across two languages. The alternative structures of directional clitics in the other Eastern Mayan languages provide a set of potential hypotheses that children might entertain about the possible uses of the grammatical features in their own language and, thus, a better appreciation of how children acquire language-specific constraints.

Abbreviations: 1, first person singular; 2, second person singular; 3, third person singular; 4, first person plural; 5, second person plural; ABS, absolutive person marker; AP, antipassive; CMP, completive aspect; COMP, complementizer; DEP, dependent status suffix; DER, derived verb status suffix; ENC, enclitic person marker; ERG, ergative person marker; exc, exclusive; EXCL, exclamation; FAM, familiar marker; IMP, imperative; INC, incomplete aspect; IND, indicative status suffix; iv, intransitive verb; ixc, inclusive; NEG, negative; PAST, remote past tense; pl, plural; POS, possessive; PROC, processive; PROG, progressive aspect; REC, recent past tense; sg, singular; STATUS, status suffix; tv, transitive verb.

We organized the presentation as follows. We begin with a description of the basic verb complex in K'iche' and Mam. This section presents the ways in which adult K'iche' and Mam speakers modify the verb complex to express the direction of motion. The following section provides information about the prosody of the directional clitics in K'iche' and Mam. The section on subjects and methods provides general measures for the subjects and describes how we obtained the language data. The following section provides data on the adult and child production of intransitive directional verbs in K'iche' and Mam. There follows a section that presents data on the adult and child production of the preverbal directional clitics in the two languages. The next section examines the adult and child production of post-verbal directional clitics in K'iche'. This is followed by a section on the production of the processive suffixes in Mam. We interpret our results in the section that applies the comparative method to the analysis of the acquisition of directional clitics in K'iche' and Mam. The paper ends with a brief conclusion on the role of prosody in accounting for the production of directional clitics in K'iche' and Mam, as well as in language more generally.

THE VERB COMPLEX IN K'iche' AND Mam

Robertson (1992) uses the term "the Mayan verbal complex" to refer to the combination of aspect, mood, derivational status, and cross-reference marking on Mayan verbs. The structure is syntactically complex in that it straddles the boundary between root and embedded clauses in various Mayan languages. Aspectual elements that occur in a matrix clause select indicative, nominalized and dependent types of complement clauses. The languages have a long history of pressing verbs and verb clitics into service to express aspectual, modal and directional information, and some adverbs may also be inserted into the complex (Pye, 2009).

Verb complexes in Mayan languages mark a fundamental division in transitivity. Both K'iche' and Mam have distinct sets of absolutive and ergative person markers. The ABS person markers cross-reference the subjects of intransitive verbs and the direct objects of transitive verbs, while the ergative person markers cross-reference the subjects of transitive verbs (Pye, 2017). The verbs also have status suffixes that mark the transitivity distinction in addition to marking differences in aspect, derivational status and mood (Kaufman, 1990). The examples in (1) show intransitive and transitive indicative verb complexes in K'iche' and Mam.

(1) Indicative verb complexes in K'iche' and Mam

(a) K'iche'

Intransitive	Transitive
k = at-b'in-ik	*k = at-inw-il-oh*
INC = ABS2-walk-IND$_{IV}$	INC = ABS2-ERG1-see-IND$_{TV}$
'You walk'	'I see you'

(b) Mam

Intransitive	Transitive
ma chin b'eet-a	*ma 0-n-tzyu-ya*
REC ABS1 walk-ENC	REC ABS3-ERG1-grab-ENC
'I walked.'	'I grabbed it.'

The ergative markers in both languages have different allomorphs for verbs that begin with vowels and consonants. Mam lost the second person ergative and absolutive markers and innovated an enclitic that it uses in combination with the absolutive and ergative markers to distinguish the first and second persons from the third person. The enclitic takes the form /a/ after consonants and /ya/ after vowels. K'iche' has two personal pronouns that reference second person singular and plural in formal contexts. K'iche' does not use the person markers on verbs with the personal pronouns. Allomorphs for the third person singular absolutive marker in Mam are a zero marker used with consonant-initial verbs, /tz'-/ used with vowel-initial verbs, /tz-/ used with the verbs *uul* 'arrive here' and *iky* 'pass,' and /k-/ used with verbs in the potential aspect. **Table 1** shows the person markers for K'iche' and Mam.

Mayan languages have a grammatically defined set of intransitive directional verbs. We define the directional verbs in our study grammatically rather than semantically by their incorporation into the verb complex as directional clitics in Mam. Most of the verbs in this set express the direction that the agent takes in the course of the action, although some of the verbs, like the verbs with the meanings 'remain' and 'finish,' express aspectual information. The directional verbs of K'iche' and Mam are shown in (2).

(2) Directional verbs in K'iche' and Mam

Motion	K'iche'	Mam	Motion	K'iche'	Mam
'go'	b'ee	xiʔ	'go out'	el	eel
'come'	peet	tzaaj	'go in'	ok	ook
'arrive here'	ul	uul	'remain'	kaanaj	kyaj
'arrive there'	oopan	poon	'return'	tzalij	aaj
'go down'	qaaj	kub'	'pass by'	ok'ow	iky'
'go up'	aq'an	jaw	'finish'	k'iis	b'aj

TABLE 1 | Absolutive and ergative person markers in K'iche' and Mam.

	Absolutive		Ergative			
			Prevocalic		Preconsonantal	
Person	K'iche'	Mam	K'iche'	Mam	K'iche'	Mam
1 sg	in	chin … = a	inw	w … = a	in	n … = a
2 sg	at	… = a	aw	t … = a	a	t … = a
3 sg	0	0-, tz'-, tz-, k-	r	t	u	t
1 pl exc	uj	qo … = a	q	q … = a	qa	q … = a
1 pl ixc	uj	qo	q	q	qa	q
2 pl	ix	chi … = a	iw	ky … = a	i	ky … = a
3 pl	ee	chi	k	ky	ki	ky

Mayan verbs lexicalize more object properties than verbs in English. Their sensitivity to object properties leads to the proliferation of Mayan verbs for eating (Brown, 2008) and breaking (Pye, 1996) among other event types. Mayan verbs of object transfer are sensitive to the way in which objects are carried. Mayan women carry small children in their arms (K'iche' *q'aluuj*), or on their backs by means of a shawl tied around their shoulders (K'iche' *eqaaj*). They carry water in jars balanced on top of their head (K'iche' *ikraj*). Mayan men and women carry heavy burdens perched on their backs with a tumpline strapped across their foreheads (K'iche' *teleej*). They carry mats over their shoulders (K'iche' *jekeej*), and they carry smaller objects in bags at their sides or in their hands *(k'am)*.

The lexicalization of object and manner properties in Mayan verbs takes priority over expression of the direction of motion. One way that K'iche' and Mam can express the direction in which the agent travels is by adding directional clitics to the verb complex (3). The directional clitics derive historically from the directional verbs, but became grammaticalized as verb clitics. One result of grammaticalization is that the directional clitics contribute a directional component to the meaning of the verb complex rather than a motion component. The directional clitic *ul* in K'iche' is cognate with the directional clitic *uul* in Mam, but its meaning changed to 'come' in K'iche' from the original meaning of the directional verb 'arrive here' preserved in the Mam clitic. The entire complex has one marker for aspect and one for absolutive person marking. Verbs with directional clitics have dependent status suffixes in many contexts (Mondloch, 1978).

(3) Verb complexes with preverbal directional clitics

   (a) K'iche'
        x = uj-ee-war-oq.
        CMP = ABS4-go-sleep-DEP$_{IV}$
        'We went to sleep.'

   (b) Mam (England, 1983, p. 212)
        ma Ø-tzaj   t-tzyu-ʔn   Cheep ch'it.
        REC ABS3-come ERG3-grab-DEP$_{TV}$ José   bird
        'José came and grabbed the bird.'

These examples show that the K'iche' directional *-ee* 'go' and the Mam directional *-tzaj* 'come' are placed after the aspect and absolutive markers and before the verb, if intransitive (3a), or before the ergative subject marker if the verb is transitive (3b). The single ABS person marker *-uj* 'we' in (3a) cross-references the subject of the intransitive verb *war* 'sleep.' The null third person absolutive marker in (3b) cross-references the object of the transitive verb *tzyu* 'grab.' The directional clitics indicate the motion that the agents take in the event.

Mayan verb complexes with directional clitics are translated into English in several ways including a verb with an infinitive complement (3a) or a compound verb construction (3b). These options are also available in K'iche' and Mam, but K'iche' and Mam speakers prefer the use of verb complexes with directional clitics. The differences between the Mayan verb complexes with directional clitics and their English translations encapsulate the basic problem that clause chains create for theories of language

acquisition, i.e., events that are expressed by several clauses in some languages may be expressed by a single clause in other languages (Harris, 2003).

The examples of verb complexes with directional clitics in (3) differ from those in (1) in that the verb complexes in (3) incorporate a directional clitic, and end with a dependent status suffix rather than the indicative status suffixes shown in (1a) for K'iche'. The dependent status suffixes are evidence that the verb complexes with directional clitics derive historically from complex sentences with dependent clauses (Pye, 2009). The presence of a single marker for aspect and absolutive affixes for the verb complexes in (3) is evidence that verb complexes with directional clitics function synchronically as single verb complexes. Independent directional verbs require their own aspect and absolutive markers. The directional clitics uniformly modify the action of the agent and not the action's effect on the patient.

Mam elaborated the expression of direction with more preverbal directional clitics than K'iche'. K'iche' only has three preverbal directional clitics: *e* 'away,' *ul* 'hither' and *ok'ow* 'passing.' Mam has 12 directional clitics in preverbal position. Directional clitics are optional in K'iche' but obligatory for all but three transitive verbs in Mam (England, 1983, p. 170). Furthermore, K'iche' only allows the use of one directional clitic at a time, whereas Mam allows sequences of up to three directional clitics. The directional clitics *jaw* 'up,' *xi* 'away' precede the main verb *ii* 'carry' in the Mam verb complex shown in (4). The entire complex only has one aspect marker (*ma*) as well as a single subject (*w-*) and object marker (*0-*). The main verb has the transitive dependent suffix/-ʔn/to indicate that the verb complex contains directional clitics.

(4) Multiple directional clitics in a Mam verb complex
     ma   0-jaw-xi   w-ii-ʔn-a
     REC ABS3-up-away ERG1-carry-DEP$_{TV}$-ENC
     'I took it up.'

England (1983, pp 170–171) notes that each transitive verb in Mam is closely associated with its own set of directional clitics. The directional clitics also have secondary senses. For example, the directional *xi* has a primary sense of 'away' and a secondary sense of 'incipience.' The corresponding directional clitic in K'iche' *ee* has a primary sense of 'go' as well as a secondary sense of 'incipience.' The Mam directional *el* has a primary sense of 'out' and a secondary sense of 'motion to the west.' The directional *kyaj* has a primary sense of 'leave here' and a secondary sense of 'completion.' The directionals *xi* 'away' and *b'aj* 'complete' are the most frequently cited directionals in over a third of transitive verbs in Mam, and especially with verbs that lack a directional component in their meanings. The directionals *kub'* 'down,' *jaw* 'up,' *el* 'out' and *ok* 'in' correspond to the four cardinal directions of the Mayan cosmos: down, up, west, and east.

Although the directional verbs have meanings that overlap with those of other motion verbs such as *fall* or *walk*, their incorporation in the Mam verb complex distinguishes them from all other verbs. The directional clitics follow the directional verbs in Mam but precede non-directional verbs

such as *fall* or *walk*. The directionals *xi* 'away/incipience,' *kyaj*, 'leave here/completion' and *b'aj* 'complete' have semantic components that are aspectual as well as directional. The K'iche' verbs *tajin* 'continue,' *majiij* 'begin,' *tanab'a* 'finish' and their counterparts in Mam have aspectual meanings as well, but do not incorporate into the verb complex like directional clitics. Thus, the directional verbs form a closed, grammatical class rather than a semantic class.

The directional verb *b'ee* 'go' in K'iche' has a suppletive imperative form. Imperative verbs with the directional clitic *b'ee* 'go' in K'iche' use the suppletive form of the directional verb. Imperative verbs with the directional clitics *ul* 'hither' and *ok'ow* 'passing' in K'iche' use the regular imperative prefix *ch-*. The main verb in both cases takes the dependent status suffix (5a). The directional clitics follow imperative verbs and contract in Mam (5b).

(5) Imperative verbs with directional clitics

	Intransitive	Transitive

(a) K'iche'

j = at-b'in-oq   *ch = 0-ul-aw-il-a'*
go.IMP = ABS2-   IMP = ABS3-come-
walk-DEP$_{IV}$ ERG2-see-DEP$_{TV}$
'Go walk!'   'Come see it!'

(b) Mam (England, 1983, pp 173–176)

chi mok'ee-0-ka-x-a   *chi 0-tzyuu-n-ka-tz-a*
ABS5 crouch-IMP$_{IV}$-   ABS6 ERG2-grab-IMP$_{TV}$-
down-away-ENC   down-toward-ENC
'Crouch down (you all)!'   'Grab them!'

The change from preverb position to post-verb position for directional clitics on imperative verbs in Mam (in 5b) is noteworthy because change in position is one of the defining features of clitics (Zwicky and Pullum, 1983). The absence of an aspect marker to host the directional clitics on imperative verbs in Mam triggers the movement of the directional clitics to a post-verbal position. This change echoes the change in K'iche' from preverbal clitic to post-verbal clitic and is evidence of a common underlying structure that continues to direct the historical development of directional clitics in K'iche' and Mam.

In addition to these shared means of expressing direction, K'iche' and Mam each have language-specific ways of expressing direction. K'iche' has a set of post-verbal directional clitics that are used in combination with the main verb to indicate the direction of the action. The preverbal directional clitics are a subset of clitics that occur in post-verbal position (6).

(6) K'iche' expression with the post-verbal directional clitic *la-oq* 'hither'

x = 0-in-k'am   *la-oq*
CMP = ABS3-ERG1-carry hither-STATUS
'I brought it.' (lit. 'I carried it here.')

Like the preverbal directional clitics, the K'iche' post-verbal directional clitics derive from the directional verbs. They have

suffixes like the status suffixes of intransitive verbs (7). Unlike the preverbal directional clitics, the post-verbal directional clitics do not trigger the use of the dependent status suffix on the main verb. Mam does not have a separate set of post-verbal directional clitics.

(7) K'iche' post-verbal directional clitics (Kaufman, 1990, pp 82–83)

apan-oq	'over there'
aq'an-oq	'up'
b'ii-k	'away from here'
kaan-oq	'remain'
ka-oq	'into'
la-oq	'hither, in this direction'
qaaj-oq	'down'

Mam has its own unique way to express direction using the processive suffix with the meaning 'movement away.' The processive suffix has different forms for declarative and imperative verbs (8). Unlike the directional verb clitics, the processive suffix does not trigger the use of the dependent status suffix on the main verb. K'iche' does not have a processive suffix.

(8) Mam verbs with processive suffixes (England, 1983, pp 108–109)

(a) Declarative verb   (b) Imperative verb

b'eeta-kj-a.   *la-7tz-a!*
walk-PROC.IND-ENC   see-PROC.IMP-ENC
'Go and walk.'   'Go and see!'

The presence of directional clitics in K'iche' and Mam is evidence of a shared antecedent for the structures in the two languages. Mam elaborated the preverbal clitics, while K'iche' elaborated its post-verbal clitics. **Table 2** summarizes the features of directional clitics in K'iche' and Mam. We present the morpheme frequency data for K'iche' and Mam in the results section of the paper.

PROSODY

The structural differences in the expression of direction in K'iche' and Mam reflect changes to the prosodic structure in the two languages. Primary lexical stress occurs on the final syllable in K'iche' (Norman, 1976). This syllable happens to be the syllable that contains the status suffixes on verbs and post-verbal clitics.

TABLE 2 | Features of directional expression in K'iche' and Mam.

Feature	K'iche'	Mam
Directional verbs	Frequent	Frequent
Preverbal directional clitics	Rare	Almost obligatory
Post-verbal directional clitics	Frequent	Only with imperative verbs
Number of preverbal directional clitics	3	12
Number of post-verbal directional clitics	7	None
Multiple directional clitics	No	Yes
Processive suffix	No	Rare

Phrasal stress shifts to the final clitic following the verb complex, in effect metrically connecting the directional clitics in K'iche' to the verb complex. Stress in Mam is determined by syllable weight, falling on the long vowel in a word or on the vowel preceding the last glottal stop. In words that lack long vowels or glottal stops, stress occurs on the vowel preceding the last consonant in the root (England, 1983, pp 37–38). Bennett (2016) provides an overview of stress in the Mayan languages including K'iche' and Mam.

K'iche' and Mam also differ in the realization of unstressed vowels. They are retained in K'iche' but deleted in some contexts in Mam (England, 1983, pp 43–44). The deletions in Mam are apparent in comparisons between cognate words in K'iche' and Mam (9). K'iche' retains the initial /a/ in (9a), the initial /u/ in (9b) and the second /o/ in (9c). The cognate words in Mam have one less vowel.

(9)   Cognate words illustrating unstressed vowel retention in K'iche' and deletion in Mam

	Meaning	K'iche'	Mam
(a)	shoe	xajab'	xjab'
(b)	grasp	tzuru	tzyu7n
(c)	let go	tzoqopiij	tzaqpi7n

England states that the directional clitics retain their status as phonological words in that a pause can occur after them and they can also receive stress, although they are usually not stressed in connected speech (England, 1983, p. 40). Additional evidence for the phonological independence of the preverbal directional clitics, as well as the aspect and ABS person markers in Mam, is that they do not undergo the deletion of their vowels in syllables preceding the stressed vowel in a root as in the words in (9). This is the reason that Mam linguists follow England's convention of writing the Mam verb complex with a space following the directional clitic as shown in (4).

The combining forms of the preverbal directional clitics in Mam provide additional evidence of vowel deletion in unstressed syllables. England (1983, p. 168) states that when the clitics *xi* 'away' and *tzaj* 'toward' combine with other clitics they have the reduced forms -x and -tz respectively (10). Vowel preservation in the aspect marker *ma* 'recent past' and the combined forms of the directional clitics shows that these morphemes retain enough phonological independence to resist stress-based vowel loss. The combining forms of the directional clitics form a separate phonological word that retains at least one vowel, but reduces the second vowel.

(10) (a) ma   0-ku7-x   w-ii-7n-a   (*kub'* 'down' +
             REC   ABS3-   ERG1-carry-   *xi* 'away')
                      down-away   DEP$_{TV}$-ENC
             'I took it down.'

      (b) ma   0-ku7-tz   w-ii-7n-a   (*kub'* 'down' +
             REC   ABS3-down-   ERG1-carry-   *tzaj* 'toward')
                      toward   DEP$_{TV}$-ENC
             'I brought it down.'

K'iche' adds status suffixes to verbs and post-verbal directional clitics when they occur in the final position of a phonological phrase. The status suffixes delete or change form in non-final positions. The final position is also where K'iche' adds phrasal stress. Phrasal stress in K'iche' triggers the addition of most status suffixes. The K'iche' examples in (11) contrast the forms of the post-verbal clitic *kan-oq* 'remain' in non-final and final positions in the verb phrase. The clitic *kan* has lexical stress in (11a) and phrasal stress in (11b).

(11) (a) Non-final position
             k = 0-a-ya7   kan   chu-w-ee
             INC = ABS3-ERG2-give remain   at-ERG1-POSS
             'You will give it to me.'

      (b) Final position
             ch = 0-a-ya7   kan-oq
             IMP = ABS3-ERG2-give remain-ST
             'Give it.'

The historical relation between K'iche' and Mam informs the structural differences between the two languages and their effects on language development. K'iche' integrated the prefixes of its verb complex more tightly while increasing the prominence of the final syllable of the complex. The prosodic salience of syllable-final stress in K'iche' reduced its reliance on preverbal clitics and instead promoted the prosodic salience and use of the post-verbal clitics. In effect, the change to final syllable stress in K'iche' shifted the expression of direction from a weak syllable to a strong syllable by the change from preverbal directional clitic to post-verbal directional clitic. The number of preverbal clitics became reduced, while the number of post-verbal clitics increased in order to maintain a means of expressing direction for verbs that lack a directional component in their meaning. Romero (2012) shows that negation particles underwent a similar change in K'iche'.

The pieces of the verb complex became less metrically integrated in Mam with the result that the directional clitics retained metrical prominence unlike the case in K'iche'. The verb complex in Mam contains up to four prosodic words (i.e., the markers for aspect, absolutive person, directional clitic, and the main verb), which sets the stage for the expanded use of preverbal directional clitics in Mam and removed the need for the post-verbal clitics except in the case of imperative verbs.

This background informs the comparative approach to the acquisition of K'iche' and Mam. Pye (1980, 1983) established that phrasal stress was the primary determinant of morpheme production by K'iche' children. As the examples in (12) show, K'iche' children frequently omit morphemes that occur before the verb root and sometimes even omit the root itself, but produce morphemes that occur in the stressed position after the verb root. All of the morphemes are obligatory, which rules out input frequency as a determinant of morpheme use. The status suffixes on verbs are portmanteaux morphemes that express aspect, mood, transitivity and derivational status, and are therefore grammatically complex. Nevertheless, the status suffixes are among the first morphemes that K'iche' children produce.

(12) K'iche' children's production of status suffixes on verbs

(a)	ik.	TIY 2;1	(b)	nik e.	LIN 2;0
	= k = 0-wa7-ik.			= k = 0-suti-n-ik e:	
	INC = ABS3-eat-ST			INC = ABS3-turn-	
				AP-ST there	
	'It's eating.'			'It's turning there.'	

Based on the children's production of verb affixes in K'iche', we predict that prosody will guide children's use of directional clitics in both languages. In K'iche', because post-verbal clitics are stressed and preverbal clitics are not, we predict that the children will produce the post-verbal directional clitics before they produce the preverbal clitics. In Mam, where the preverbal clitics preserve their status as independent phonological words, we predict that the children will produce both the preverbal and post-verbal directional clitics. The preverbal directional clitics in Mam function as independent phonological words and resist vowel reduction. The post-verbal clitics in Mam follow the stressed syllable in the verb root.

We base these predictions solely on the differences in prosodic structure in K'iche' and Mam. Because input frequency is considered to be an important factor that directs children's morphological development, we will pay special attention to disentangling the effects of prosody and input frequency. As we will see in the next section, the use of directional clitics is more frequent in Mam than in K'iche'. The use of post-verbal directional clitics is more frequent than the use of the preverbal directional clitics in K'iche'. The directional clitics in Mam have two metrical advantages over their counterparts in K'iche': (1) they may be stressed, and (2) they follow the stressed verb syllable in imperative verbs. We analyze the effects of such micro-variation on language acquisition. Because K'iche' and Mam have similar phonologies, morphologies, syntax and discourse structures, not to mention common patterns of child rearing, we can be more confident in identifying the linguistic sources that account for the differences in the acquisition of directional clitics in K'iche' and Mam. **Table 3** contrasts the predictions from prosody and input frequency for the acquisition of the directional clitics in K'iche' and Mam.

SUBJECTS AND METHODS

We followed the same procedures in recording the Mam and K'iche' families. Pye made longitudinal audio recordings of the four K'iche' children in Zunil, Guatemala between 1977 and 1978 (Pye, 1980, 1991); he made longitudinal audio and video recordings of the three Mam children in San Ildefonso Ixtahuacán, Guatemala between 2005 and 2007 (Pye, 2017). Oral and informed consent was obtained from the parents of all participants in K'iche' and Mam following protocols approved by the human subjects committee of The University of Kansas. The recordings took place in and around the children's homes. Participants included the children, various members of their families, the K'iche' and Mam investigators, and visitors to the home. The mothers and siblings were generally present during

TABLE 3 | Contrasting predictions based on prosody and input frequency for the acquisition of directional clitics in K'iche' and Mam.

	Preverbal position	Post-verbal position
Prosody		
K'iche'		
Directional clitics	Late = aspect markers	Early = verb suffixes
Ergative person markers	Late = aspect markers	
Mam		
Directional clitics	Early = aspect markers	Early = imperative verb suffix
Ergative person markers	Later than directionals	
Processive clitic		Early = verb suffixes
Input frequency		
K'iche'		
Directional clitics	Later than aspect markers	Later than verb suffixes
Ergative person markers	Early = aspect markers	
Mam		
Directional clitics	Early = aspect markers	Early = imperative verb suffix
Ergative person markers	Early = aspect markers	
Processive clitic		Later than verb suffixes

the recordings, while the fathers only participated occasionally. The families live in rural villages, and the children spend most of their day within the family compound. The K'iche' and Mam investigators were native speakers of each language and interacted with the children to different degrees. The sessions included play with toys, sticks, plants and picture books.

The data were transcribed in the field by the K'iche' and Mam investigators; transcripts were annotated by the investigators with contextual and cultural notes. The K'iche' and Mam investigators added their interpretation of the children's utterances based on their knowledge of the adult language and culture, the children's developing phonology and grammar, and the discourse contexts. The transcriptions for both languages were made from the audio recordings.

We selected blocks of two to three 1-h sessions recorded at different ages for each child. **Table 4** shows the session numbers and corresponding ages for the K'iche' children, and **Table 5** shows the same information for the Mam children. The analyses of adult speech were made of 1-h recordings of two adults speaking to the K'iche' child TIY in her first session and two adults speaking to the Mam child WEN in her first session.

Table 4 provides the general language measures for the K'iche' language samples and **Table 5** provides the general language measures for the Mam language samples. The last column in each table shows the percentage of the total utterances for each speaker that contained verbs. We excluded the evidential verbs ('say') and the existential verbs ('be somewhere') from the intransitive verb counts because they are idiomatic expressions and are not inflected for aspect and absolutive agreement.

The number of verb types and tokens are similar across the K'iche' and Mam speakers. The adults produced a greater

TABLE 4 | Ages, number of utterances, and number and percent of verbs for K'iche' speakers.

Speaker	Age	Number of utterances	Intransitive verbs		Transitive verbs		Percent verbal
			Types	Tokens	Types	Tokens	
Mother	Adult	382	18	116	27	161	72.5
Adult2 (male)	Adult	211	14	62	23	101	77.3
TIY 1	2;1.17	732	9	24	11	23	6.4
TIY 2	2;7.21	844	33	85	22	117	23.9
TIY 3	2;10.5	1026	34	164	33	130	28.7
LIN	2;0	501	15	50	17	46	19.2
CHA 1	2;9.8	945	18	44	26	178	23.5
CHA 2	3;0.16	1197	43	126	48	232	29.9
CAR	3;1.25	963	30	107	30	140	25.6

TABLE 5 | Ages, number of utterances, and number and percent of verbs for Mam speakers.

Speaker	Age	Number of utterances	Intransitive verbs		Transitive verbs		Percent verbal
			Types	Tokens	Types	Tokens	
Mother	adult	770	31	125	29	190	40.9
Adult2 (female)	adult	113	9	36	16	32	60.2
WEN 1	1;9.2	1300	41	47	17	44	7.0
WEN 2	2;0.25	3023	31	203	27	399	19.9
WEN 3	2;6	1483	14	107	13	94	13.6
CRU 1	2;5.26	1665	22	87	14	175	15.7
CRU 2	2;11.20	3296	31	318	39	452	23.4
JOS 1	2;7	2213	49	288	25	251	24.4
JOS 2	2;11.10	3298	54	508	40	435	28.6

percentage of their utterances with verbs than the children. The children produced more exclamations and demonstrative utterances than the adults (Pye, 2017). The older children in the study produced a higher percentage of verbal utterances than the younger children, but they do not approach the frequency of verbal utterances produced by the adult speakers.

THE PRODUCTION OF DIRECTIONAL VERBS IN K'iche' AND Mam

We analyzed the child and adult use of the 12 directional verbs shown above in (2) in order to assess the children's ability to express the direction of motion and their frequency. Examples of the K'iche' children's use of intransitive directional verbs appear in (13).

(13) K'iche' children's directional verb utterances

    (a) TIY 1 (2;1)
       ek lon le'.
      = x = 0-b'e-ik   joron le'.
       CMP = ABS3-go-IND$_{IV}$ water there
       'The water went there.'

    (b) CAR (3;4)
       etik e tupala'.
      = x = 0-pet-ik   lee u-palaj.
       CMP = ABS3-come-IND$_{IV}$ there A3-face
       'Its face came there.'

Table 6 shows the number of tokens that each K'iche' speaker produced for the directional verbs and the percentage of their intransitive verbs that were directional verbs. The children produced a similar number of directional verb types and tokens as the adults. The directional verbs *b'ee* 'go,' *peet* 'come,' *el* 'go out,' *ok* 'go in' and *k'is* 'finish' were produced by most of the K'iche' speakers. The directional verbs constitute a relatively large percentage of the younger children's intransitive verb production. Older children and adults produce a wider range of intransitive verbs.

The Mam speakers produced a wider variety of directional verbs than the K'iche' speakers. Examples of the Mam children's use of directional verbs appear in (14). The example in (14c) includes an example with the directional clitic *xi'* 'go.'

(14) Mam children's directional verb utterances

    (a) WEN 1 (1;8.21)
       tzaj nej!
      = tzaj-a   nej
       come-ENC awhile
       'Come awhile!'

    (b) CRU 1 (2;5.12)
       bal chul.
      = tz-ul   jb'al.
       ABS3-arrive.here water
       'The water is arriving here.'

    (c) JOS 1 (2;6.17)
       ma jaji.
      = ma 0-jaaw-xi'.
       REC ABS3-go.up-away
       'It went up and away.'

Table 7 shows the number of tokens that each Mam speaker produced for each directional verb. The children generally produced similar numbers of directional verb types and tokens as the adults. The directional verbs *tzaaj* 'come,' *xi'* 'go,' *kub'* 'go down,' *eel* 'go out,' *ook* 'go in' and *aaj* 'return' were produced by most of the Mam speakers.

One analytical problem we had to confront was the frequent use of intransitive directional verbs as substitutes for transitive verbs. We found these substitutions in the speech of both the Mam adults and children. The Mam investigators used the presence of oblique agent phrases, as in (15a and b), to distinguish the omission of a transitive verb in a verb complex with a directional clitic from the use of a directional verb as a substitute for a transitive verb. Examples of the children's use of intransitive directional verbs as substitutes for transitive verbs appear in (15).

TABLE 6 | Directional verb token frequency in K'iche'.

Directional verb	Mother	Adult2	TIY1 2;1	TIY2 2;7	TIY3 2;10	LIN 2;0	CHA1 2;9	CHA2 3;0	CAR 3;1
'go'	11	6	8	22	16	15	13	34	21
'come'	25	2		5	7	8	2	13	5
'arrive here'		1		1	1				
'arrive there'									
'go down'					4			2	
'go up'			1	1				2	
'go out'	6		1	3	15	1	2	3	6
'go in'	1			7	1	1		3	
'remain'									
'return'									
'pass by'									
'finish'				8	2	2	2	1	2
Total use	43	9	10	47	46	27	19	58	34
Percent of intransitive verbs	37	14.5	41.7	55.3	28	54	43.2	46	31.8

TABLE 7 | Directional verb token frequency in Mam.

Directional verb	Mother	Adult2	WEN1 1;9	WEN2 2;0	WEN3 2;6	CRU1 2;5	CRU2 2;6	JOS1 2;7	JOS2 2;11
'go'	35	20	20	23	40	18	28	29	59
'come'	12	1	4	32	8		46	16	6
'arrive here'	3		1			4	2	9	3
'arrive there'					3		2	4	6
'go down'	1	4	4	6	5	10	18	24	55
'go up'	2			1	3	3	9	47	110
'go out'	7	2	3	3	1	6	18	14	22
'go in'	6	2		4	3	1	3	9	13
'remain'	4							2	2
'return'	1		1	6	7		10	1	4
'pass by'			1	1		1	3		
'finish'		2		1			14	11	8
Total use	71	31	34	77	70	43	153	166	288
Percent of intransitive verbs	56.8	86	72.3	37.9	65.4	49.4	48.1	57.6	56.7

(15) Mam children's use of intransitive directional verbs as substitutes for transitive verbs

   (a) WEN 2 (2;0.2)
      ku' pe tu'n?
     = *ma   pa   0-kub'   kape   t-u'n-a?*
      REC already ABS3-go.down coffee ERG2-by-ENC
      'Did you already pick the coffee?'
      (lit. 'Did the coffee already go down by you?')

   (b) CRU 1 (2;5.12)
      nech woona.
     = *nti'   n-0-el-tzaj   w-u'n-a.*
      NEG PROG-ABS3-go.out-come ERG1-by-ENC
      'I can't get it to come out.'
      (lit. 'It is not coming out by me.')

   (c) JOS 1 (2;6.17)
      kal kama paj?
     = *tqal   t-k'a'   ma   n-0-b'aj?*
      what ERG3-drink COMP PROG-ABS3-finish

'What is he drinking?'
(lit. 'What is his drink that is finishing?')

Although the Mam adults produced a greater proportion of directional verbs than the K'iche' adults, the children produced similar proportions of directional verbs in both languages. The children acquiring Mam produced directional verbs at levels that are similar to the adult levels of production, whereas the children acquiring K'iche' generally exceeded the adult use of directional verbs. We conclude that the K'iche' and Mam children have the linguistic ability to express simple motion events early in their language development.

THE PRODUCTION OF PREVERBAL DIRECTIONAL CLITICS IN K'iche' AND Mam

There is a marked difference between K'iche' and Mam speakers in their use of directional clitics. Adult K'iche' speakers rarely

produce verb complexes with preverbal directional clitics. TIY's mother produced preverbal directional clitics with 5 of 49 verb types. The verb complexes with directional clitics constitute 5.6% of her total verb production. The second K'iche' adult produced preverbal directional clitics with 1 of 48 verb types, or 1.1% of his total verb production. TIY's mother produced directional clitics most often with imperative forms of the verb 'look at.' The second K'iche' adult produced a directional clitic with just the verb *chap* 'catch' (16) His production of the directional clitic comprised half of his uses of this verb. His use of the preverbal directional clitic was in imperative form. The data indicate that verb complexes with preverbal directional clitics are rare in K'iche' speech to children.

(16) Adult production of K'iche' verb with a directional clitic.

k'oo chi jun kar jetaq ale le j = 0 a-chap-a.
exist other one fish over there it go.IMP = ERG2-catch-
                    ABS3   DEP$_{TV}$
'There is another fish over there, go catch it.'

The two youngest K'iche' children, TIY and LIN, did not produce verb complexes with preverbal directional clitics. TIY did not produce any utterances with interpretations that included preverbal directional clitics. LIN and CHA produced several utterances with preverbal directional clitic interpretations, but did not produce the actual directional clitics. Their examples in (17) contain the dependent suffix that motivates the directional clitic interpretation, but omit the preverbal directional clitic morpheme /–ee/ 'go.'

(17) Child omission of directional clitics in K'iche'

   (a) LIN (2;0)
       ma nutem.
     = *k = 0-ee in-k'am-a nu-teem*
      INC = ABS3-go ERG1-carry-DEP$_{TV}$ ERG1-chair
      'I'm going to carry my chair.'

   (b) CHA 2 (3;0.8)
       ma loq tem, felip.
     = *k = 0-ee in-k'am-a la-oq jun i-tem, felipe*
      INC = ABS3-go ERG1-carry- hither- one ERG5- Philip
                 DEP$_{TV}$ DEP$_{IV}$ chair,
      'I'm going to get your chair, Philip.'

The K'iche' children in our study begin producing verb complexes with preverbal directional clitics around the age of 3 years. CHA1 (2;9.8) produced an utterance with the suppletive /j-/ form of a preverbal directional clitic in an imperative verb complex (18a). The verb *b'i* 'say' is a derived transitive verb that has the status suffix /-ij/ in place of the dependent status suffix that occurs on root transitive verbs with directional clitics. The oldest K'iche' child, CAR (3;2), produced several verb complexes with preverbal directional clitics. His example in (18b) contains the directional clitic *ul* 'come' and his example in (18c) contains the suppletive /j-/ form of directional clitic in an imperative verb complex.

(18) K'iche' child utterances with directional clitics

   (a) jab'ij kanoq charech.   (CHA 1 2;9.8)
     = *j = 0-a-b'i-ij kan-oq chi-r-e-ch*
      go = ABS3-ERG2- stay-DEP$_{IV}$ at-ERG3-POS-STATUS
      say-DER
      'Go say it to her.'

   (b) ta lawila' le'!   (CAR 3;2.0)
     = *ta ch = 0-ul-aw-il-a' le'*
      EXCL IMP = ABS3-come-ERG2-see-DEP$_{TV}$ there
      'Come see there!'

   (c) To'n, jakutu chuwa le Cuz jela'!   (CAR 3;2.0)
     = *To'n, j = 0-a-k'ut-u chi-u-wa lee Cuz jela'*
      To'n, go = ABS3-go- at-ERG3-face the Cuz there!
          ERG2-show-DEP$_{TV}$
      'To'n, go show it to Cuz over there!'

The number of times the K'iche' speakers produced verbs with preverbal directional clitics are shown in **Table 8**. Percentages for verb types with directional clitics are proportional to the total number of verb types used by each speaker. Percentages for verb tokens with directional clitics are proportional to the number of tokens of the verb types used at least once with directionals. The 6 tokens with directional clitics that CAR produced constitute 17.1% of his use of the verbs he produced with directionals, but only constitute 2.4% of his total verb production.

In contrast with the rarity of the production of preverbal directional clitics in K'iche', Mam adults made frequent use of preverbal directional clitics in their speech to children. WEN's mother's production of verb complexes with directional clitics constituted 23% of her verbal utterances. The second Mam adult's use of verb complexes with directional clitics constituted 31% of her verbal utterances. WEN's mother used preverbal directional clitics with 20 of 54 different verb types. The second Mam adult used directional clitics with 13 of 22 different verb types.

The children acquiring Mam produced verb complexes with preverbal directional clitics in their earliest recordings. WEN's

TABLE 8 | Child and adult production of verb complexes with preverbal directional clitics in K'iche'.

	Verb types		Verb tokens	
	Number	**Percent**	**Number**	**Percent**
TIY's mother	5	10.2	15	5.6
Adult2	1	2.1	1	1.2
TIY1 2;1	0		0	
TIY2 2;7	0		0	
TIY3 2;10	0		0	
LIN 2;0	0		0	
CHA1 2;9	1	2.1	1	0.3
CHA2 3;0	0		0	
CAR 3;1	3	5	6	17.1

example in (19a) shows the use of the directional clitic *tzaj* 'hither' contracted to /tz/ in post-verbal position. CRU's example in (19b) shows the use of the directional clitic *jaw* 'up' preceding the transitive verb *q'i* 'carry' with the dependent suffix *-'n* required for transitive verbs with directional clitics. JOS's example in (19c) contains the directional clitic *kub'* 'down' preceding the intransitive verb *tan* 'sleep.'

(19) Mam children's utterances with directional clitics

(a) WEN 1 (1;8.21)
nench.
= *n-0-el-tzaj*
PROG-ABS3-go.out-hither
'She is going out toward something.'

(b) CRU 1 (2;5.12)
jaw kina ki.
= *0-jaw   q'i-'n-a   ki*
ABS3-up carry-DEP$_{TV}$-ENC see
'Look, they are picking you up.'

(c) JOS 1 (2;6.17)
ma ko tan ch'in.
= *ma 0-kub'   tan   ch'i.*
REC ABS3-down sleep little
'The little one went down to sleep.'

England (1983, p. 169) notes that the directional clitics shift to a position following the main verb in two contexts: (1) when the main verb is a directional verb, or (2) when the main verb is in the imperative mood [see example (5b) above]. The children's mastery of these shifts is especially impressive as shown in the following examples. In (20a) WEN tells the investigator to give something using an imperative verb with the directional clitic *tzaj* 'come.' In (20b) CRU comments that something came down using the directional verb *kub'* 'go down' and the directional clitic *tzaj* 'hither.' In (20c) JOS issued a demand using the directional clitic *xi* 'away.' We note that the children use the same contracted forms of the directional clitics that adults use when the directional clitics follow the main verb.

(20) Mam children's utterances with directional clitics in a following position

(a) WEN 1 (1;9.2)
aanxh!
= *0   q'a-n-tzaj-a*
ABS3 give-IMP$_{TV}$-hither-ENC
'Give it!'

(b) CRU 1 (2;5.12)
ota koch.
= *ot   0-kub'-tzaj.*
PAST ABS3-go.down-hither
'It came down.'

(c) JOS 1 (2;6.17)
ixh ti pelot!

= *0   q'i-n-xi   ti pelota*
ABS3 carry-IMP$_{TV}$-away the ball
'Take the ball!'

We also find evidence that the Mam children produced sequences of directional clitics with the verbs. WEN produced contrasting verb forms that contained one and two directional clitics. In (21), WEN used contrasting directional clitics with the verb *q'i* 'carry.' In (21a) WEN used the verb with the contracted form of the directional *-xi* 'away.' In (21b) she produced the same verb with the interpretation that has contracted forms of the directional clitics *-aj* 'return' and *-tzaj* 'hither.' In (22), JOS produced the verb *tz'aq* 'fall' with contracted forms of the directional clitics *el* 'out' and *xi* 'away.'

(21) WEN 2 (2;1;7) utterances with contrasting directional clitics

(a) inxh tee!
= *0q'i-n-x   jun t-ee*
ABS3 carry-IMP$_{TV}$-away one ERG2-POSS
'Take one of yours!'

(b) tanxht ni nejh!
= *0   q'i-n-aj-tz   jal nej*
ABS3 carry-IMP$_{TV}$-return-hither it   hurry
'Bring it back here, hurry!'

(22) JOS 1 (2;6.16) utterance with multiple directional clitics

kaxh nexh taka?
= *qax chin-el-xi   tz'aq-a*
what ABS1-out-away   fall-ENC
'What happens if I fall out?'

The quantitative results for the Mam speakers are shown in **Table 9**. Once again, the percentages for verb types with directional clitics relate to the total number of verb types used by each speaker. Percentages for verb tokens with directional clitics are relative to the number of tokens of the verb types used at least once with directionals.

Although the K'iche' children in the study could express direction by means of the intransitive verbs, they did not produce verb complexes with preverbal directional clitics until around the age of 2 years and 9 months. The initial production of preverbal directional clitics comes in the context of imperative verbs with the suppletive form of the verb *b'ee* 'go.' The children's ability to express direction by means of intransitive verbs shows that their inability to produce verb complexes with preverbal directional clitics is not due to a lack of knowledge of direction or directional verbs.

The story is very different for the children acquiring Mam in the study. Not only did they produce verb complexes with preverbal directional clitics early, they did so with a variety of verbs in declarative and imperative moods. Our youngest Mam children were already producing instances of directional clitics in their first recordings. The early production of preverbal directional clitics in Mam is evidence that the grammatical

TABLE 9 | Child and adult production of verb complexes with directional clitics in Mam.

	Verb types		Verb tokens	
	Number	**Percent**	**Number**	**Percent**
WEN's mother	20	37	107	22.9
Adult2	13	59	21	30.9
WEN1 1;9	8	25.8	17	17.9
WEN2 2;0	11	19	48	12.4
WEN3 2;6	10	37	24	33.3
CRU 2;5	16	31.3	31	12.2
CRU2 2;11	29	41.4	97	40.8
JOS1 2;7	44	59.5	223	62.1
JOS2 2;11	41	43.6	339	51.1

complexity of verb complexes with directional clitics does not explain their omission in the speech of the K'iche' children. We can, therefore, rule out cognitive constraints as a determining factor in the children's production of preverbal directional clitics.

The rarity of verb complexes with preverbal directional clitics in K'iche' might lead to a sampling error in that it might be necessary to record K'iche' children for longer periods of time in order to record the use of rare constructions like directional clitics. The children's examples in (17) are telling in this regard in that they show utterances that omit prefixes in the verb complex, but contain the dependent verb suffix that is evidence for the intention to use directional clitics. We conclude that while the production of directional clitics is relatively late in the K'iche' children's speech, they display an early awareness of the grammar of verb complexes with directional clitics. The children's use of the obligatory dependent verb suffixes in contexts of verbs with directional clitics in both languages is especially impressive.

THE PRODUCTION OF POST-VERBAL DIRECTIONAL CLITICS IN K'ICHE'

Adult K'iche' speakers produce more verbs with post-verbal directional clitics than verb complexes with preverbal directional clitics. The second K'iche' adult produced post-verbal directional clitics with nine verbs (*b'an* 'do,' *chap* 'grab,' *eqaj* 'carry on back,' *il* 'see,' *jururej* 'drag,' *k'am* 'carry in arms,' *k'ol* 'guard,' *tzijon* 'chat,' *ya'* 'put') in a 1-h session in which he produced a total of 13 intransitive verbs and 23 transitive verbs. The majority of uses are with verbs of physical transfer (*eqaj* 'carry on back,' *jururej* 'drag,' *k'am* 'carry in arms, *ya'* 'put'). Nine of his 20 post-verbal directional clitics occurred with the verb *k'am* 'carry' (23). He produced utterances with the verb *k'am* 15 times. We will use the adult production of post-verbal directional clitics as a baseline for evaluating the children's use of the post-verbal directional clitics.

(23) Second K'iche' adult's use of contrasting post-verbal directional clitics with the verb *k'am* 'carry.'

(a) *k = at-in-k'am   b'i-k.*
INC = ABS2-ERG2-carry thither-STATUS
'I will take you.'

(b) *pix   chi   k = 0-u-k'am-a   la-oq.*
tomato COMP INC = ABS3-ERG3- hither-STATUS
carry-DEP_{TV}
'It is tomatoes that he brings.'

The K'iche' children also produced verbs with post-verbal directional clitics, but their use was more restricted than the adults'. TIY only produced the directional *la-oq* 'hither' twice with the verb *k'am* 'carry.' She did not produce the verb, which we inferred from its context of use (24a). The 2-year-old boy LIN also omitted the verb in most of his utterances with directional particles. He produced the verb root in the example shown in (24b). LIN only produced directional particles with the verbs *k'am* 'carry' and *ya'* 'give, put.' As they grew older, the K'iche' children expanded the number of verbs that they produced with directional particles. Past two and a half years, TIY produced directional particles with five different verb types and CHA produced directional particles with 7 different verb types. One of CHA's utterances in shown in (24c). All of the children's productions contain the phrase-final form of the directional clitic containing a suffix.

(24) K'iche' children's use of directional verb particles

(a) le' loq le'.   TIY 1 (2;1.22)
= *le'   ch = 0-a-k'am-a   la-oq   lee are'*
that IMP = ABS3-ERG2- here-STATUS the thing
carry-DEP_{TV}
'That, bring it here.'

(b) am b'ik.   LIN (2;0)
= *k = 0-in-k'am   b'i-k*
INC = ABS3-ERG1-carry away-STATUS
'I'll take it away.'

(c) xel lok le xut. CHA 1 (2;9.16)
= *x = 0-el   la-oq   lee su't*
CMP = ABS3-leave here-STATUS the shawl
'The shawl came out.'

Because of the association between verbs and post-verbal directional clitics, we counted the number of times the speakers produced verbs with directional clitics as well as the number of times that the speakers produced the same verbs without post-verbal directional clitics to assess the child and adult production of post-verbal directional clitics. We then calculated the percent use of directional tokens for those verbs that speakers produced with post-verbal directional clitics. The results are shown in **Table 10**.

The results suggest that K'iche' children may produce more instances of directional clitics as they get older, though this pattern only holds strongly for TIY, and the oldest child (CAR) only produced four utterances with post-verbal directional clitics. The 2-year-old children produced post-verbal directional clitics even if they did not produce the verb together with the directional clitics. The adult speakers produced post-verbal directional clitics with a greater number of verb types than the children, but the children produced post-verbal directional clitics with similar

TABLE 10 | Production of post-verbal directional clitics in K'iche'.

Adult	Directional clitic use		Verbs used with directionals		Percent tokens
	Types	Tokens	Types	Tokens	
Mother – TIY	4	49	14	98	50
Adult2	3	19	8	57	33
TIY1 2;1	1	2	1	3	67
TIY2 2;7	3	12	5	100	12
TIY3 2;10	5	20	8	80	25
LIN 2;0	2	7	2	14	50
CHA1 2;9	3	13	7	73	18
CHA2 2;10	2	18	7	50	36
CAR 3;1	2	4	2	36	11

percentages of verb tokens as adults. We conclude that the 2-year-old K'iche' children used a limited number of post-verbal directional clitics (primarily the directional *la-oq* 'hither') in association with a limited number of verbs (primarily the verbs *k'am* 'carry' and *ya'* 'give, put'). Between 2 and 3-years-of-age they produced more types of post-verbal directional clitics with more types of verbs. The children's production of post-verbal directional clitics appeared to precede their production of preverbal directional clitics by several months.

THE PRODUCTION OF THE PROCESSIVE SUFFIX IN Mam

We also found evidence that Mam children produced instances of the processive verb suffix early in their development. Examples of the children's processive suffix use are shown in (25). As these examples show, we only found examples of children using the imperative form of the processive suffix. In (25a), WEN produced the imperative processive suffix with the verb *il* 'see.' This is one of the three Mam verbs that is not used with directional clitics. Most of children's examples were used with this verb. The example in (25c) shows the use of the processive suffix with the verb *q'ii* 'carry.' Both the verbs *il* 'see' and *q'ii* 'carry' are frequent in the speech of Mam adults and children, but speakers seldom add the processive suffix. The second adult speaker for Mam and the child CRU did not produce any tokens of the processive suffixes in their samples. **Table 11** shows the number of verbs that the Mam participants produced with the processive suffix as well as the percentage of the tokens of these verbs that had the suffix.

(25) Mam children's utterances with processive suffixes

(a) WEN 1 (1;8.21)
      lalxh!
   = *laa-7tz-a*
      look-PROC-ENC
      'Go look!'

(b) JOS 1 (2;7)
      ku nlata!

= *ku   n-laa-7tz-a*
   EXCL ERG1-look-PROC-ENC
   'I will go look!'

(c) JOS 2 (2;11.26)
      etz jun te tban!
   = *q'ii-7tz   jun t-ee   t-b'ank*
      carry-PROC one ERG3-POSS ERG2-bench
      'Go get one of your benches!'

COMPARATIVE ANALYSIS OF DIRECTIONAL ACQUISITION IN K'iche' AND Mam

K'iche' and Mam add directional clitics to movement and transfer verbs in order to specify the agent's direction of motion. The languages differ in that K'iche' favors the use of post-verbal directional clitics, while Mam favors the use of preverbal directional clitics. K'iche' only has three preverbal directional clitics, whereas Mam has 12 preverbal directional clitics. The difference in the number of preverbal directional clitics in K'iche' and Mam is associated with a marked difference in their prosodic features. The preverbal clitics in K'iche' are unstressed, whereas the preverbal clitics in Mam may be stressed, and do not undergo unstressed vowel deletion. The directional clitics in Mam move to a post-verbal position on imperative verbs due to the absence of a host morpheme. The post-verbal clitics in K'iche' have a status suffix that appears when the post-verbal clitics have phrase-final stress.

Pye (1980, 1983) established that phrasal stress was the primary determinant of morpheme production by K'iche' children. K'iche' children frequently omit morphemes that occur before the verb root, but produce morphemes that occur in the stressed position after the verb root. Based on the children's production of verb affixes in K'iche', we predicted that children acquiring K'iche' and Mam would produce directional clitics that have lexical stress, or that follow the verb. For K'iche', we predicted that the children would produce the post-verbal directional clitics before they produced the preverbal clitics. For Mam, we predicted that the children would produce both

TABLE 11 | Processive suffix use in Mam.

Adult	Processive use tokens	Verb use		Percent tokens
		Types	Tokens	
Mother – WEN	4	3	137	2.9
Adult2				No data
WEN 1 1;9	4	3	23	17.3
WEN 2 2;0	1	1	4	25
WEN 3 2;6				No data
CRU 1 2;5				No data
CRU 2 2;11				No data
JOS 1 2;7	2	1	12	16.7
JOS 2 2;11	6	2	30	20

the preverbal and post-verbal directional clitics as well as the processive verb suffix.

The results reported in the previous section support these predictions. Only the oldest K'iche' children, CHA and CAR, produced any preverbal directional clitics, whereas, even the youngest Mam children produced preverbal directional clitics. The Mam children produced post-verbal directional clitics on imperative verbs and intransitive, directional verbs in accordance with the adult grammar. All of the K'iche' children produced post-verbal directional clitics. We also found evidence that the K'iche' and Mam children follow the prosodic and grammatical constraints on the use of directional clitics in their languages. The K'iche' children added the status suffixes to post-verbal clitics in phrase-final position. The Mam children added the dependent status morpheme to transitive verbs that they produced with preverbal directional clitics. The Mam children also observed the constraints on unstressed vowels in their combined forms of directional clitics in both the preverbal and post-verbal positions. The forms and frequencies of directional clitics serve as distinctive grammatical markers of children's speech in K'iche' and Mam.

The children's production of directional clitics could be tied to their frequency in adult speech. The two K'iche' adults only produce preverbal directional clitics with 2 to 10% of verb types and 1 to 6% of verb tokens. The two Mam adults produce preverbal directional clitics with 37 to 59% of verb types and 22 to 30% of verb tokens. There is also a qualitative difference between K'iche' and Mam in the use of directional clitics. Mam has 12 preverbal directional clitics, whereas K'iche' only has three preverbal directional clitics. Mam allows for sequences of up to three preverbal directional clitics, whereas K'iche' only licenses the use of a single directional clitic in its verb complex.

The grammatical structures of K'iche' and Mam allow us to tease apart the effects of frequency and prosody by examining the acquisition of high frequency, unstressed morphemes and low frequency, stressed morphemes. The preconsonantal ergative person markers in **Table 1** provide ideal examples of high frequency, unstressed morphemes in K'iche' and Mam in that K'iche' and Mam have similar sets of ergative person markers and place them in the same position in the verb complex. The children omit the unstressed ergative agreement markers in both languages even though these inflections are obligatory in adult speech. K'iche' 2-year-old children produce preconsonantal ergative agreement markers in less than 20% of their obligatory contexts; Mam 2-year-olds produce preconsonantal ergative markers in a third of their obligatory contexts (Pye, 2017, p. 190).

We can also examine the acquisition of stressed, low frequency morphemes in K'iche' and Mam. As shown above in **Table 10**, the post-verbal directional clitics are somewhat infrequent in K'iche' in that they occur with half of the verb tokens in the mother's speech and in a third of the verb tokens in the investigator's speech. While the post-verbal directional clitics are not as rare as the preverbal directional clitics in adult speech, they are by no means ubiquitous in K'iche' speech to children. The directional particles can receive the primary stress for the verb phrase, and we found evidence that 2-year-old K'iche' children produce the post-verbal directional clitics in their speech.

We also showed that the processive suffixes are rarely produced in speech to Mam children. **Table 11** shows that the mother produced the processive suffixes in 3% of her verb tokens; the second Mam adult did not produce any processive suffixes in her speech. The processive suffixes follow the stressed syllable in the verb and are therefore as prosodically salient as the directional clitics that follow imperative and directional verbs. Despite their low input frequency we find evidence of their use in the early speech of Mam children.

Based on these results from an in-depth, multi-layered investigation of these seven children's early speech patterns, we propose that while a high input frequency can help children notice some inflectional features, prosody plays a primary role in determining which parts of a verb complex children produce. Two-year-old children acquiring K'iche' respond to the structural features of the language by producing the syllables in the verb complex with primary stress and thereby produce verb suffixes and post-verbal directional clitics. Two-year-old children acquiring Mam respond to its structural features by producing the metrically prominent syllables in the Mam verb complex and thereby produce both preverbal and post-verbal directional clitics. Their use of directional clitics in preverbal and post-verbal positions within the indicative and imperative verb complexes as well as with the intransitive directional verbs is especially striking.

CONCLUSION

We used the comparative method to identify the main factors at play in children's production of directional clitics in K'iche' and Mam. K'iche' and Mam inherited an Eastern Mayan verbal complex with markers for aspect, object, subject and verb status. Both languages add directional clitics to their verb template to specify the path of the agent. We argue that over the course of the past 3000 years, the prosodic structure of the verb complex took different paths in the Eastern Mayan languages. K'iche' shifted its primary lexical stress to the final syllable and added phrasal stress at the end of the verb phrase. Mam weakened vowels in unstressed syllables and developed a rule for adding stress to heavy syllables. The changes to the prosodic structure of the verb complex had dramatic effects on the use of the directional clitics. K'iche' speakers seldom produce directional clitics in preverbal position, whereas directional clitics have become a hallmark of Mam.

The historical changes to the prosodic structure in K'iche' and Mam also had consequences for the acquisition of the two languages. We showed that predictions derived from children's production of inflectional morphemes in K'iche' could be extended to children's production of directional clitics in K'iche' based on their prosodic features. We then extended the same predictions to children's production of directional clitics in Mam based on their prosodic features. We hypothesize that prosody directs children's production of verb complexes in the other Eastern Mayan languages as well. Language history determines which parts of the verb complex are prosodically salient.

Pye (1980, 1983) suggested that prosody could account for children's productions in other languages besides K'iche'. Other

researchers have since made similar suggestions to account for children's productions in various languages (Peters, 1983; Mithun, 1989; Demuth and Fee, 1995; Gerken, 1996; cf. Deen, 2005; Terry, 2010; Forshaw, 2016). It is important to remember that prosody is far from a unitary linguistic feature. It varies across languages as much as word order and morphological complexity (Evans and Levinson, 2009; Stassen, 2011). Even K'iche' and Mam differ in their deletion of vowels in unstressed syllables. It is therefore necessary to have a better understanding of prosodic realization in many 1000s of languages before claiming that prosody *per se* accounts for children's productions. This paper makes a start in this direction.

Orthography

All Mayan words are shown in the practical orthography developed by the Proyecto Lingüístico Francisco Marroquín (Kaufman, 1976). The orthographic symbols have their standard IPA values except: <b'> = /ɓ/, <7> = /ʔ/, <tz> = /ts/, <tx> = /tʂ/, <tx'> = /tʂ'/, <ch> = /tʃ/, <ch'> = /tʃ'/, <y> = /j/, <j> = /x/, <xh> = /ʃ/(Mam), <x> = /ʃ/(K'iche'), <x> = /ʂ/Mam.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The University of Kansas human subjects committee. Written informed consent from the participants'

legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

CP recorded and analyzed the K'iche' and Mam data, and wrote the first draft of the manuscript. BP organized the data and edited the manuscript.

FUNDING

ACKNOWLEDGMENTS

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The Narrative Past Inflection in Sesotho Child and Child-Directed Speech

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This study investigates a low-frequency verbal inflection called the "narrative past" in child and child-directed speech in the Bantu language Sesotho. Since the function of the Sesotho narrative past is not well-described, this study aimed to illuminate both function and acquisition trends in the Demuth Sesotho Corpus (Demuth, 1992). The narrative past form has been assumed to be under-specified for tense, comparable in function to the better-known Swahili *-ka-* inflection. The Swahili form, in turn, has been said to function in "clause chains" that are functionally and structurally similar to such chains in Papuan and other languages. We expected that, if the Sesotho narrative past is indeed functionally similar to Swahili *-ka-*, its distribution in child-directed speech and acquisition by children may pattern similarly to tense-less verb forms in non-Bantu clause chaining languages such as the Papuan language Nungon, where such verb forms can comprise over 20% of all verb tokens in child-directed and child speech at age 3;3. This study thus examined the conversational interactions of four children acquiring Sesotho in a village setting, aged 2;1–4;7. All 492 tokens of the narrative past form were coded for syntactic and discourse categories. Results show that the Sesotho narrative past generally occurs in much "looser" discourse chains than the clause chains of languages like Nungon; for Sesotho, other turns or elements can intervene between narrative past-framed mentions of previously-introduced topics. Further, the Sesotho narrative past has very low frequency in both child and child-directed speech, representing <3% of all verb tokens for both registers. There is possible evidence that one of the target children uses the Sesotho narrative past in increasing proportions as his linguistic sophistication increases, but there is no significant corresponding proportional increase in child-directed speech. Thus, in function and distribution, in both child-directed and child speech, the Sesotho narrative past form differs greatly from tense-less forms in more canonical clause chaining languages.

Keywords: clause chaining, acquisition, narrative tenses, Sesotho, Bantu

INTRODUCTION

Bantu languages are famous for their many verbal inflections. In particular, many Bantu languages boast multiple nuanced distinctions within the past and future tenses (Nurse, 2003, 2008; Botne and Kershner, 2008; Nurse and Devos, 2019), with, in some cases, a "Near Future," "Middle Future," and "Remote Future" tense with (presumed) application to different sections of a timeline. But the actual functions of these different tenses are often under-described, in both pedagogical

grammars and academic literature. Corpus-based studies of verb inflection functions are rare (Crane, 2011, 2015; Sarvasy, 2016; Persohn, 2017). Even a small case study in corpus-based investigation of tense can reveal that seemingly straightforward labels such as "Near Future tense" fall short of encompassing the range of functions of a verbal inflection. For instance, Sarvasy (2016) showed through a small corpus study that the Near Future tense form (but not the Middle or Remote Future tense forms) in the northeastern Bantu language Logoori (Bantu, Guthrie code: JE41) has extended functions as a general future tense. The few corpus studies examined thus support the need for rich empirical documentation of the functions of Bantu "tense" inflections; such documentation could confirm the proposition by Botne and Kershner (2008) that a drastically different schema may be necessary for understanding the semantics of "tense" inflections in Bantu languages.

To make the situation even more complex, many Bantu languages have verbal inflections that look like tense-aspect categories in their morphophonology, but which do not introduce temporal contrasts (Welmers, 1973). These are often called dependent tenses or subjunctives (especially for Southern Bantu languages, cf. Doke, 1927; Cole, 1955; Doke and Mofokeng, 1957; Guma, 1971; Posthumus, 1991). The so-called "narrative tenses" form part of this group and typically indicate the continuation of a macro-event with sub-events or a contextually-connected sequence of events, like the sub-events of a typical story or a narrative description of steps taken toward an outcome (e.g., *I planted the maize, then I watered it, then I…*). While these are commonly referred to as tenses, they differ from other tense inflections in that they do not independently dictate a temporal setting for an occurrence, but simply indicate continuity of a previously established temporal context. They thus diverge from the cross-linguistically accepted notion of "tense" as in Comrie (1985), but will be referred to as "tenses" here for compatibility with the Bantuist literature.

Nurse (2008, p. 120–123) describes narrative tenses across Bantu languages as having a number of generalizable properties. Formally, narrative tense forms can be marked through a morpheme in the usual tense slot which is semantically and functionally empty, through an additional pre-verbal morpheme that may derive from a conjunction "and," through a particular tonal melody, or, alternatively, through a zero morpheme in the usual tense slot. Functionally, they typically occur in a sequence of one or more verbs in the narrative form following a single initial non-narrative tense-marked overtly (or implied) on the first verb. The first verb, inflected for a more temporally-specific tense, introduces the temporal reference or broader time frame for the entire sequence. The narrative tense verbs in such a sequence thus serve as the predicates of clauses with overt external arguments.

While narrative tenses are most typically found in past temporal contexts and often described as past tenses in the literature for specific Bantu languages, Nurse claims that this distribution is discourse-related, rather than due a semantic "past" feature of these forms. Within the past time frame, the narrative category can be analyzed as reducing or eliminating distinctions made between time periods in the past. In Nurse's

view, narrative tenses inherently convey sequentiality and relate to foregrounded, not backgrounded, situations, in Hopper's (1979) sense, where foreground information moves the main event line forward (Payne, 1992), and background information does not.

Swahili (Bantu, Guthrie code: G42) has a narrative tense morpheme *-ka-* which is typically sequential and used for past tense contexts (though see Contini Morava, 1989; Shirtz and Payne, 2015). This form is normally used for foregrounded events (Nurse, 2008) and contrasts with *-ki-*, which is used for backgrounded information, and *ku-*, which is used for non-sequential events that take place in the same general timeframe. Swahili examples illustrating the use of *-ka-* and *ku-* are in (1) and (2).

(1) a. wa-li-ku-nyw-a   na   **ku**-l-a[1]
        SM2-PST-ST-drink-FV and INF-eat-FV
        "They drank and ate" (non-sequential)
     b. wa-li-ku-nyw-a   wa-**ka**-l-a
        SM2-PST-ST-drink-FV SM2-CONS-eat-FV
        "They drank and ate" (sequential)
        (Swahili, Nurse, 2008, p. 121)

(2) basi wa-**ka**-tumia   zile   pesa
     then SM2-CONS-use   DEM10   10money
     za   kuni   wa-li-zo-kuwa wa-me-weka
     10of 10firewood   SM2-PST-RM10-be SM2-PRF-put

     wa-**ka**-tumia   wa-**ka**-tumia   mpaka
     SM2-CONS-use   SM2-CONS-use   until
     zi-**ka**-malizika
     SM10-CONS-be.used.up
     "And so they <u>spent</u> the firewood money which they had put aside, they <u>spent</u> and <u>spent</u> until it was used up"
     (Swahili, Nurse, 2008, p. 122, from Maw, 1969, p. 17)

Cross-linguistically, a similar phenomenon to narrative tense sequences in Bantu languages is known as the "clause chain" (Longacre, 1985, 2007; Dooley, 2010, inter alia). Clause chains are sequences of clauses with verbal predicates that are under-marked for tense, mood, and sometimes subject person/number and other categories, preceded or followed by a single clause with verbal predicate with full tense, mood, and subject marking. As with the Bantu narrative tenses, clause chains in other languages tend to be used to relate a series of foregrounded events. Clause chains are found in hundreds of languages in diverse language

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[1]**Abbreviations used in glosses:** 1, 2, 3, 4, 5, etc., noun class; 1SG, 2PL, etc., person and number; A, a-marker (when appearing in combined tenses or negative forms not in NP); APPL, applicative; BA, auxiliary; BE, auxiliary; BT, baby talk; CAUS, causative; CHI, target child; CONS, consecutive; COP, copula; DEM, demonstrative; DJ, disjoint; DS, different subject; FOC, focus; FV, final vowel; HAB, habitual; HES, hesitation; HLA, auxiliary; IMP, imperative; INF, infinitive; INT, interjection; LOC, locative; MV, medial verb; NE, form (past continuous); NEG, negative; NP, narrative past; NOC, nocturnal; OCC, occasional; OM, object marker (followed by noun class number or 1/2 person); PERF, perfective; PFR, perfect; POSS, possessive; POT, potential; PREP, preposition; PST, past; PRO, pronoun; S, singular (for first and second person subject/object markers); SG, singular; SM, subject marker (followed by noun class number or 1/2 person); SS, same subject; ST, stem marker; STAT, stative; TAM, tense aspect mood; WH, wh-clitic.

families around the world; most particularly, in Amazonia, New Guinea, North America, and a cluster of language families from Turkey and the Caucasus through Central Asia and to the Asian Pacific coast (cf. cross-linguistic overviews in Bickel, 2010; Dooley, 2010). Most languages with clause chaining have verb-final constituent order within clauses, and in many it is the last clause in a clause chain that has full tense or mood marking. In contrast, the Bantu narrative tenses are similar to the minority of clause chaining languages in which it is the first clause of the chain, not the last, that has full tense marking. In fact, the Swahili -ka- inflection is cited in much literature on clause chaining as the prime example of this less-common clause chain ordering (Haspelmath, 1995; Longacre, 2007; Dooley, 2010).

Clause chains in many other languages, such as some of the Papuan languages of New Guinea, require strict adjacency of clauses within the chain. Backgrounded material can occur within clauses in the chain, but the clauses in the chain must occur one after the other. While multi-speaker constructed clause chains are attested in conversation between adults and between adults and children in the Papuan language Nungon (Sarvasy, 2015, 2017), these are generally limited in length to two turns. With the exception of the special case of a parent prompting a child to repeat a clause chain, clause by clause, as in the Nungon child speech corpus (Sarvasy, 2019b), the vast majority of clause chains in Nungon conversation begin and end within a single turn by a single speaker. A typical Nungon clause chain is in (3); while this comes from a monolog narrative, its length and structure are well-attested in conversation as well.

related events and actions is almost guaranteed to involve clause chain structures.

Bantu narrative tense "chains" differ from clause chains in these other languages in several ways. First, as noted above, the Bantu chains begin with the clause that gives full tense specification for the rest of the chain, while in most other languages, that clause falls at the very end of the chain (Longacre, 2007). Second, in many other clause chaining languages, the verbal predicates in clauses that lack tense specification can lack subject inflection and other morphological characteristic of fully-inflected verbs. These forms are often called "converbs" or "medial verbs" (Delancey, 1991; Haspelmath, 1995; Longacre, 2007; Amha, 2010; Dooley, 2010, inter alia). In Bantu languages, however, verbs inflected for narrative tense bear obligatory subject prefixes just like other verbs; and rather than the absence of a morphological "slot" for tense, there can be a morpheme in this slot that does not function to demarcate specific temporal context. Further, while the distribution of clause chains in Nungon and Korafe is predictable in narratives, Bantu narrative tense sequences have less predictable distribution in narratives (shown for Logoori by Sarvasy, 2019a), and much lower frequency overall than in Papuan languages like Nungon, or possibly other clause chaining languages.

Beyond their ordering, associated morphology, and corpus distributions, Bantu chains of narrative tense verbs seem to represent a much looser chain type, if they are to be considered chains, than clause chains in languages like Nungon. In Bantu languages, unlike in the Nungon example in (3), once the

(3) ku-nga   bök   opmou-in, hi-nga   it-da-ya,
     SG.O.place-MV.SS house SMALL-LOC put-MV.SS be-1DU.DS-MV
     ir-a   monggom-no-n   tuo-nga,   bök   amino   goni-nga,
     be-MV.SS dead.leaves-3SG.POSS-LOC tie.above-MV.SS house bed-3SG.POSS dig-MV.SS
     wondo   eepdi hundi-nga   it-na-ya,
     DIST.LOC fire   kindle-MV.SS be-1PL.DS-MV
     Sirewen, e,   Riringgi op-no=ho,
     name   HES   name   husband-3SG.POSS=FOC
     worok, ongo-nga ningat   yoo-nga   ep-bo-k.
     thus   go-MV.SS 1NSG.O.escort NSG.O.take-MV.SS come-RP-3SG
     "Taking him to a small hut, we two putting him there, being there, hanging (him) in the dead foliage, digging the hut's foundation, we (three or more) being there kindling the fire, Sirewen, eh, Riringgi's husband had, thus, going on, escorting us (there), came." (Nungon, Sarvasy adult corpus).

In (3), each clause ends in a verb that bears no tense morpheme and only inflects for its own subject person/number when the subject of the following clause is anticipated to differ from the subject of the present clause. There is a unified prosodic contour to the utterance, with relatively stable pitch until the last verb of the chain, which features a marked fall in pitch. Analysis of a subset of 1742 clause chains in Sarvasy's corpus of Nungon adult narratives revealed that clause chains have extremely consistent distributions in the narrative genre, such that a Nungon single-speaker narrative text of 13:20 min in length can be reliably expected to include between 120 and 150 clause chains. This fits with reports from other Papuan languages, notably Korafe (Farr, 1999), where, as in Nungon, discussion of sequences of

temporal context has been established, subsequent clauses framed in the narrative tense can occur in separate prosodic groups. The narrative tense can also be freely used by other speakers continuing to speak within the same context. In fact, according to Nurse (2008, p. 120), such a chain can even be discontinuous, with use of the narrative tense "suspended and then deliberately reintroduced by the speaker to stress continuity."

One of the aims of the present study was therefore to evaluate the form, functions, and distribution of the narrative tense form in the Bantu language Sesotho, which is relatively well-described within the family, and for which a large corpus of natural speech exists. This corpus (Demuth, 1992) comprises 98 h of child-peer and child-caregiver/family member interactions for four main

target children. It thus enables us to pursue a second major question: how does the narrative tense form pattern in child speech and child-directed speech in Sesotho?

Little is known about the acquisition of clause chaining sentence structures in languages that have them. Initial results indicate, however, that children acquiring the Papuan language Nungon are exposed to frequent clause chains in child-directed speech from early in their language development, and that they produce a range of short two-clause chains well before age 3, as in (4), by the child Towet Oe, acquiring Nungon in a village context:

(4) bauk   ho-nga   ngoma buu   ongo-wa
    sweet.potato cook-MV.SS   thus   airplane.BT go-IMP.1SG
    buu.
    airplane.BT
    "Cooking sweet potato, then, let me go on the plane,
    the plane" (age 2;5)

The tense-less verb forms that serve as predicates of all but the final clause in a Nungon clause chain are called, following the Papuanist tradition (traced to Pilhofer, 1933), "medial" verbs.

A case study of Nungon verb acquisition (reported in Sarvasy, 2019b) showed that medial verbs consistently represent between 14 and 31% of all verb tokens in adult speech directed at one child, aged 2;1–3;3. By age 3;3, the child herself was producing medial verbs in similar proportions to her parents. These results are visualized in **Table 1**.

As seen in **Table 1**, the child's relative explosion in verb tokens around age 3;0 corresponds to an increase in the proportion of all verb tokens that are medial verbs. By 3;1 and beyond, the child's proportion of medial verb tokens falls within the adult range of 14.73–30.84% of all verb tokens. This can be taken to indicate that the child now produces clause chains with a distribution similar to that in her parents' child-directed speech in the same period.

TABLE 1 | Percent medial verb distribution of all verbs in child speech and parental child-directed speech in a Nungon (Papuan) case study (cf. Sarvasy, 2019b, p. 1080, 1081, 1085).

Child's age	Child's total verbs	Child (%)	Parents (%)
2;1	26	0.00	18.27
2;2	37	0.00	16.60
2;3	78	0.00	18.18
2;4	54	3.70	20.53
2;5	97	7.22	22.88
2;6	77	2.60	14.73
2;7	57	1.75	21.68
2;8	79	2.53	16.09
2;9	92	1.09	19.88
2;10	87	3.45	22.39
2;11	66	10.61	20.74
3;0	205	7.32	30.84
3;1	256	19.53	28.92
3;2	188	15.43	22.98
3;3	324	22.53	22.39

Given the functional and distributional differences between narrative tenses in some Bantu languages and medial or other non-tensed forms in more typical clause chaining languages, the present study aimed to evaluate the acquisition patterns of the Sesotho narrative past in the broader context of clause chaining languages, including Nungon. We expected that, given the apparent differences in adult distributions between Bantu narrative tense chains and clause chains in languages like Nungon, children may show later acquisition of the narrative past form in Sesotho than in Nungon, and lower proportions of this form among all verb uses.

THE SESOTHO NARRATIVE TENSE

Sesotho is a Bantu language (Guthrie code: S33) with about 13.5 million speakers in South Africa and Lesotho (Eberhard et al., 2019). It has official status in South Africa and Lesotho and is used in education and media in both countries. Major reference works on Sesotho structure include Doke and Mofokeng (1957), Guma (1971), and Du Plessis and Visser (1995). Sesotho morphosyntactic acquisition has been documented in several studies (e.g., Demuth, 1987, 1989, 1992, 1995; Demuth et al., 2005, 2009, 2010). The only existing Sesotho natural speech corpus is the Demuth Sesotho Corpus (Demuth, 1992), henceforth DSC, which is the data source for the present study.

Sesotho has a complex TAM and negation system, even when compared to other Bantu languages (Gowlett, 2003). There are several past and future tense forms, a number of aspectual markers which can be combined in numerous ways, and also auxiliaries or deficient verbs that can appear before a lexical main verb that add a number of additional temporal, aspectual or modality related distinctions (Doke and Mofokeng, 1957; Gowlett, 2003, p. 631–636). While Sesotho is fairly well-documented in general, its TAM system is under-described, especially in terms of: (i) a detailed description and analysis of the functions of, and morphosyntactic and semantic restrictions on, most of its TAM morphemes (but see Morolong, 1978), (ii) the tone patterns[2] associated with the various TAM categories (though see Khoali, 1991 for tonal patterns of various types of clauses), and (iii) discussion of the conjoint/disjoint system (though see Letšeng, 1995). The conjoint/disjoint distinction is widespread across Bantu languages, including Sesotho, where the present tense has two variants: a conjoint and a disjoint form. The use of the conjoint/disjoint form depends on whether a verb is in clause-final position and is sensitive to focal properties of the material following the verb, the details of which vary significantly across languages (an up-to-date, cross-linguistic overview of this phenomenon is provided in van der Wal and Hyman, 2016). Most commonly across Bantu, conjoint/disjoint distinctions are marked for the present and perfective verb forms

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[2]Bantu languages typically have different tonal patterns for each tense, aspect or mood which determine the tone of the subject marker and tonal melody of the verb stem. Apart from this, TAM distinctions may also be segmentally/morphologically marked in prefix and or suffix slots.

(for example, Sesotho morphologically marks only the present disjoint with -a- in prefix position and the present conjoint with a zero morpheme).

Sesotho has a tendency to stack TAM markers, often by adding auxiliaries which show subject agreement, but several prefixes attached to a single verb are also possible. The auxiliaries with subject agreement can be seen in example (5):

(5) ʊ́-nè   á-kʼè   à-lál-ì   á-ìthúʔ-à
     SM1-PST SM1-OCC SM1-NOC-HAB SM1-study-FV
     "He used occasionally to spend the night studying"
     (Gowlett, 2003, p. 635)

The Southern Bantu languages of the Nguni and Sotho-Tswana groups, including Sesotho, have a narrative past form which is marked with -a- in the prefix position (Posthumus, 1991). Posthumus analyses this form as describing sequential or consecutive events. For Sesotho, the narrative past tense is described only in passing in Jacottet (1912), Doke and Mofokeng (1957), and Ferreira (1964). Gowlett (2003) only notes that what he calls the past and future "consecutives" should not be confused with the narrative. Khoali (1991, p. 262) refers to a different tense as the "participial narrative past."

The Sesotho narrative past is referred to as "past subjunctive" in Doke and Mofokeng (1957). In their terminology, this relates to this tense's being a dependent tense—i.e., one which needs another tense to set the initial time reference—not to any irrealis-type meaning. Chaphole proposes calling the form a "past narrative" instead of past subjunctive (Chaphole, 1988, p. 140), but mostly lists forms modified by additional auxiliaries or conjunctions, with only one example of the unmodified narrative past tense. Other sources do not engage with the function or meaning of the narrative past at all. It uses a prefix -a which is affixed after the subject marker and coalesces with the vowel of the subject marker. The final vowel is -a. The form and basic discourse use of the Sesotho narrative past are shown in (6).

(6) ke-fihl-ile   hae   ka-besa,
     SM1S-arrive-PERF home   SM1S.NP-light_fire
     ka-fiela,   ka-pheha
     SM1S.NP-sweep   SM1S.NP-cook
     "I arrived home, made the fire, swept, and cooked"
     (Guma, 1971, p. 185, cited in Posthumus, 1991, p. 92)

Sesotho has at least two other TAM categories marked with an a-prefix: the remote past and the present disjoint. In addition, a-prefixes are used with the subject markers for noun class 1 (for some tenses) and 6, and the object marker for class 6, all of which can appear adjacent to one another. This makes it somewhat challenging to confirm that the form has been identified accurately in a written transcription, especially given that vowel length and tone marking is absent from most of the literature and not marked in the DSC (though the sound files are linked and available in the CHILDES data exchange system, and TalkBank: see footnote 3 below). Moreover, the examples from Southern African languages in the linguistic literature, when

published in Southern African books or journals, are typically not glossed.

The tones are not properly described in any of the sources listed above (though see comments on tone in Doke and Mofokeng, 1957, p. 236). There does seem to be agreement that this form has a short vowel (unlike the remote past, which has a long vowel with the same vowel quality in the same position). Letšeng (1995, p. 135–7) labels this tense as *séquentiel positive en -a* "positive sequential with –a" and lists tonally-distinct conjoint and disjoint forms. Based on Letšeng's descriptions, we can conclude that verbs in the narrative past have the following tonal melody: if the verb root has a lexical high tone, this tone spreads to the following syllable, but only if the verb stem is trisyllabic or if the verb is followed by an object (Letšeng, 1995, p. 135–7). This kind of tone spreading is commonly found across Bantu languages (see also Demuth, 1993).

Most sources treat this tense as not having a conjoint or disjoint distinction, if such a pattern is mentioned at all. Creissels (2016) discusses the implications of tonal conjoint/disjoint patterns, beyond morphological conjoint and disjoints forms, in Sotho-Tswana, and we refer the interested reader to this source.

The annotational system used in the DSC accepts that the narrative past can be directly negated, as in (7).

(7) ha-wa-a-nk-a?
     NEG-SM2S.NP-OM6-take-FV
     "Didn't you take them?"
     (Chi, H62, DSCH 020800.ab 968500_970137)[3,4]

Such a negative form of the narrative past is mentioned as a rarer alternative form to the -nga- negative for Zulu in Posthumus (1991, p. 93), and Letšeng (1995) gives no negative form for the Sesotho narrative past. Doke and Mofokeng (1957) note that there is no negated equivalent of this tense or the tense that they refer to as the subjunctive perfect, but that a negative form of the auxiliary *ka*, shown in (8), can be used with a verb marked for the narrative past. They do not discuss the semantics of this form.

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[3]Examples taken from the Demuth Sesotho Corpus (DSC), are marked for child speech (Chi) and/or adult speech (Ad), and given a unique identifier from our dataset. In examples illustrating interactions between multiple speakers we include the speaker labels from the Demuth Corpus. Their source in the original Corpus is indicated as follows: DSC, followed by H for the Hlobohang corpus, L for the Litlhare corpus, or T for the TseboNeuoe corpus, followed by the file name and timestamp of the utterance. The full corpus, including audio files, is accessible and downloadable via the Childes TalkBank website: https://childes.talkbank.org/access/Other/Sesotho/Demuth.html. doi: 10.21415/T57P4N.

[4]Glosses for data from the DSC are our own, based on the morphological tags and English gloss in the transcripts. Glosses for examples taken from other sources have been added by us where none were provided in the source, or modified for consistency.

There are two different orthographies for Sesotho: a Lesotho and a South African one, neither of which marks tone or vowel length. These have changed over time, and most linguistic sources use a modified version of one of them (e.g., the DSC uses a modified version of Lesotho orthography). The main change is the indication of morpheme boundaries of verbal prefixes, which both orthographies treat as words. Sources focused on tone tend to use IPA transcriptions and tone marking, without including an orthographic representation. Here we kept the spelling/IPA conventions used in each source but adjusted the indications of morpheme boundaries as needed.

(8)   ha-ke-a-ka   ka-rek-a
      NEG-SM1S-A-be.able   SM1S-A-buy-FV
      "I did not buy" (Doke and Mofokeng, 1957, p. 267)

Morolong (1978, p. 29) has examples of a form, shown in (9), that is similar to that glossed as the negative narrative past in the DSC, but she never discusses the narrative past itself or what this negative form is. Malete (2003, p. 29) also lists this form, which he refers to as the negative perfect. Doke and Mofokeng (1957, p. 203) list a negative perfect/past with the same morphological structure and note that there is no coalescence between the prefix and the vowel of the subject marker. This means there is a difference in segmental structure to the form included in the DSC, which has coalescence of the -a- prefix with the vowel of the subject marker with the pattern ha-SM.a-root-a. This suggests that the form in (9) is not a use of the narrative past, but rather two consecutive main clauses.

(9)   ha-ke-a-dul-a   setulong   ke-dul-a   fatse
      NEG-SM1S-DJ-sit-FV   7chair.LOC   SM1S-sit-FV   down
      "I am not sitting on a chair, I am sitting down"
      (Morolong, 1978, p. 28)

Doke and Mofokeng (1957, p. 237) further note a number of contexts in which an apparently narrative past-marked verb form can be used: after the auxiliaries -hla (10a), -ile (10b), -ka, and -ke; after the potential tenses; after commands or requests including their respective negative forms; and after certain conjunctions. They also claim that the auxiliary construction in (10b) is the most common way of expressing the past tense in Sesotho (Doke and Mofokeng, 1957, p. 266). The translations given in Doke and Mofokeng (1957) for these combined forms make clear that these verbal complexes are not semantically or pragmatically functioning as narrative past forms. Morolong (1978, p. 49) analyses the auxiliary construction in (10b) as the "remote past" and shows that it cannot be used with adverbials such as "today" or "this morning." In the original DSC annotation system, these constructions are coded as past, not narrative past. We follow the DSC schema here and treat the narrative past-like form in these constructions as distinct from the narrative past form elsewhere.

(10) a. n-ka-hla   ka-tl-a
          SM1S-POT-HLA   SM1S-A-come-FV
          "I may come" (Doke and Mofokeng, 1957, p. 237)
      b. ke-ile   ka-rek-a
          SM1S-PST   SM1S-A-buy-FV
          "I bought" (Morolong, 1978, p. 49)

A small number of tokens analyzed as narrative past in the DSC include the auxiliary ba or be (11); Doke and Mofokeng (1957, p. 238) also mention a "subsequential" prefix nt'o that can be used with the narrative past. There are no examples of the latter in the DSC and too few examples of the forms

with ba or be to attempt to offer an analysis of them here[5].

(11)   Transcript: a ka ba tsamaya.
       Target: ka-ba-tsamay-a
                    SM1S.NP-BA-leave-FV
       "And then I walked away"
       (Chi, L49, DSCL 020400.cd 545100_548146)

With this background in mind, we turn to the present study.

METHODS

The data were taken from the Demuth Sesotho Corpus (DSC; Demuth, 1992), a longitudinal speech corpus of 98 h of Sesotho naturalistic child and child-directed speech recorded in a village setting, transcribed, and annotated. More information on the DSC is available in CHILDES (MacWhinney, 2000). The corpus includes spontaneous daily interactions between four target children and their mothers and other family members in and around the children's homes, which were all located in a single small rural community in Lesotho. Interactions were audio-recorded in 3–4 h sessions monthly over about one year in 1980–1982. The target children were: Litlhare (female, 2;1–3;2), Hlobohang (male, 2;1–3;0), 'Neuoe (female, 2;4–3;3), and Tsebo (female, 3;8–4;7). The DSC is divided into three sub-corpora, one each for Litlhare and Hlobohang, and one with transcripts that include both Tsebo and 'Neuoe, cousins living in the same household. The data were annotated by native Sesotho speakers together with Demuth, following CHAT formatting, and searched using CLAN tools (MacWhinney, 2000). For each utterance, three additional coding tiers were added: %gls to give the morpheme boundaries within the Sesotho, %xcod for morpheme-by-morpheme glosses, and %eng for a free English translation. Situational context is occasionally noted in a fourth tier, %sit. For this study, we had access to the original audio recordings (digitized) and the coded transcriptions, which are all freely downloadable from CHILDES. As there were no video recordings of the interactions, it was sometimes difficult to determine the exact nature of the interactions and thus a challenge to establish the linguistic context. This also means that discussion of discourse functions in the present study was based largely on clues in the linguistic record and the notes on situational context when available.

Throughout the DSC, the narrative past was coded as t^np (meaning, tense = "np") in the %xcod tier. For the present study, all transcripts were searched using the CLAN search function for t^np in the %xcod tier. These were then compiled into a single.cha file for each sub-corpus. A total of 492 tokens were found: 137 in the transcripts for Hlobohang, 156 for Litlhare, and 199 for the combined TseboNeuoe sub-corpus. The resulting 492 tokens contain a range of lexical verbs, including both intransitive and transitive verbs in derived and underived forms, and a range of semantic classes. These are

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The DSC includes a transcription line and an adult equivalent line for each utterance. Where these were identical we only included one line. Where there are significant differences, we included a line labeled "transcript" and a line labeled "target."

[5]These appear only once in each of the Hlobohang and Litlhare sub-corpora, and three times in the Tsebo/'Neuoe sub-corpus, which is the only sub-corpus where be appears with the narrative past, as shown in (11).

partially illustrated in the examples in the first Results section, including: intransitives (11), transitives with (12b/13c) and without objects (10b), lexical ditransitives (14a), applicatives (27a), causatives (17b), passives (16a), and statives (19c). We then annotated the tokens for several additional features to explore syntactic and discourse-related functions and distribution of the form.

For each token, an additional coding tier was added to the .cha files. Each was then coded for the presence of absence of 27 morphosyntactic and discourse features (listed in the **Appendix**). These features were selected based on their relevance for encoding information structure[6] and phrasing in other Bantu languages (c.f. Buell et al., 2011a, and articles/chapters in Buell et al., 2011b; van der Wal and Hyman, 2016) but excluding phonological indicators such as tone and other prosodic information, such penultimate lengthening, which are not marked in the DSC. The aim of this additional coding was to obtain parameters for the morphosyntactic and pragmatic functions of the narrative past, including focus marking or phrasing and, potentially, marking the status of objects that appear with t^np forms as arguments/topics.

RESULTS: SYNTACTIC AND DISCOURSE FUNCTIONS OF THE NARRATIVE PAST

The narrative past form appears in 1.07% of all verb tokens for all speakers in the entire DSC. Each sub-corpus differs somewhat in the overall frequency of the narrative past form across child and adult speakers: the Litlhare sub-corpus is the lowest with 0.85% of all verb tokens in the narrative past form, while the figure is 0.98% in the Hlobohang sub-corpus and 1.47% in the TseboNeuoe sub-corpus.

Many of the 27 codes showed no clear distributional patterns that might be related to functions of the narrative past. There was no clear relationship between WH-questions, for instance, and use of the narrative past form vs. other verbal inflections. Two of the criteria we coded, however, do show striking patterns, and are discussed here: "topic chains" (single or multi-speaker and topic continuity, in the following section), and object marking (in the subsequent section).

Sesotho Narrative Past Loose Discourse Chains

In this section, we give an overview of how the Sesotho narrative past form occurs in discourse, looking at the types of chains, temporal use and setting of the temporal reference frame, topic continuity, sequential and non-sequential event use, its use in foregrounded or backgrounded events and co-occurrences with negation. In the end, almost all tokens in the corpora for Hlobohang and Tsebo and 'Neuoe were analyzed

as occurring within "discourse chains." In these chains, the narrative past form is used to refer to a broad "discourse topic" (simply put, something discussed in conversation) that was already introduced using a different tense form in the same utterance or earlier. The "discourse chain" concept stems from the literature on clause chaining in Swahili, where clause chains are expected to begin with an overt scene-setting verb that occurs no more than 1–2 clauses before the "narrative tense." In fact, we originally used this as our coding criterion for discourse chains, resulting in the marking of 84–94% of all narrative past tokens in the three corpora, with the lowest percentage in the Litlhare sub-corpus. But when we turned to examine the narrative past tokens that had not been coded as occurring within discourse chains under the original criteria, we found that, with very few exceptions, these also could actually be considered to occur within discourse chains, with the original mention of the discourse topic even earlier than two clauses before.

A more close-range discourse chain is illustrated in (12), where the first utterance (12a) uses the perfective form, and the second utterance (12b) uses the narrative past; here the context is two children playing with two objects, placing one (referred to by the class 9 subject marker in 12a) inside the other—a boot—and opening and closing the boot (referred to by the class 5 object marker in 12b) repeatedly.

(12) a. CHI: Transcript: e ba e ite.
                 Target: e-baleh-il-e
                              SM9-run_away-PERF
         "It ran away"
     b. CHI: Transcript: a le kwala.
                 Target: ka-le-kwal-a
                              SM1S.NP-OM5-close-FV
         "I closed it"
         (Chi, H28, DSCH 020400.cd 1064426_1069771)

Often, discourse topic continuity spans multiple speakers, as in (13) and (17).

In (13), the context is various types of food, including biscuits, being given to a person.

(13) a. MMS: a-di-j-a?
                 SM1.NP-OM10-eat-FV
         "She ate them?" (L9)
     Both speakers express agreement several times.
     b. CHI: Transcript: aja   ikutsekuts.
                 Target: o-j-a   di-kuskus
                              SM1-eat-FV   10-biscuit
         "She's eating the biscuits"
     c. MMS: a-j-a   ma-biskuse?
                 SM1.NP-eat-FV 6-biscuit
         "She ate biscuits?"
         (Ad/Chi, L9/10, DSCL 020200.ab
          2391600_2393260)

In (14), 14b is clearly a reaction and response by 7-year-old MOL to the request made by CHI in 14a, even though this is not a chain of topic continuity.

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[6]We coded for a number of conjoint/disjoint-related distributional properties: the verb appearing in final or non-final position, wh-phrases after the verb, and the presence of objects or adjuncts, none of which showed any clear pattern associated with conjoint or disjoint properties, and therefore we agree with the sources which claim that there is no morphological distinction.

(14) a. CHI: Transcript: okomphe khakhaba bololo.
            Target: ako   u-m-ph-e
                         INT   SM2S-OM1S-give-PERF
            kharafu   Mololo
            9spade   1Mololo
            "Please give me the spade Mololo"
      b. MOL: wa-pot-a.
            SM2S.NP-rave-FV
            "You are crazy"
            (Chi, H54, DSCH 020600.cd 1012000_1014061)

Examples (15) and (16) show additional narrative past sequences involving just one speaker, while (17) and (18) show other multi-speaker discourse chains.

(15) a. Hlobohang   u-ken-e   ka   mo-koti-ng.
            1Hlobohang   SM2S-enter-PERF PREP   3-hole-LOC
            "Hlobohang, you enter into the hole"
      b. Transcript: a etsa nkane.
            Target: wa-ets-a   nqane
                         SM2S.NP-do-FV   LOC
            "You did it over there"
            (Chi, H9, DSCH 020200.cd 1106500_1111525)

(16) a. Transcript: a kaduwa.
            Target: la-kwal-uw-a
                         SM5.NP-close-PASS-FV
            "It's closed"
      b. Transcript: a bulela.
            Target: ke-a-bul-el-a
                         SM1S-open-APPL-FV
            "I open (it)"
      c. Transcript: a kwaduwa.
            Target: la-kwal-uw-a
                         SM5.NP-close-PASS-FV
            "It's closed"
            (Chi, H26/27, DSCH 020400.cd 1028101_1030981)

In the example in (17), three different speakers—one adult (JUL) and two children (CHI and NEU—i.e., Tsebo and 'Neuoe)—use the narrative past with both sequential and non-sequential information. The sequence is immediately preceded by a verb form in the present conjoint tense (17a), but takes place in the context of the grandmother asking the children a series of questions about events which took place in the past, using a mixture of past- and present-inflected verbs.

(17) a. JUL: jwale   u-ets-a   jwang?
            now   SM2S-do-FV   how
            "Then you did what?"
      b. CHI: ka-mo-robats-a   hape.
            SM1S.NP-OM1-sleep.CAUS-FV   again
            "And then I put her to sleep again"
      c. NEU: ka-be   ke-kalam-a   koloi.
            SM1S.NP-BE   SM1S-ride-FV   9car
            "Then I rode the car"
            Situation: All laugh.

      d. JUL: chee   modimo   ka-kalam-a[7]   koloi.
            INT   3god   SM1S.NP-ride-FV   9car
            "Oh God! I rode the car!"
            (Ad/Chi, T29-31, DSCT 031000.cd 3758848_
            3766700)

In (18), two children, 5-year-old NAM and his younger sister Litlhare (CHI here) use the narrative past form in one longer sequence on the same, uninterrupted topic (here, the speakers are eating corn mush and talking about porridge, corn and peas, all of which are in noun class 9/10, but it is not entirely clear from the transcript whether "it" refers to one of these or a different object).

(18) a. NAM: Transcript: ena ila sala.
            Target: ena   e-ile   ya-sal-a
                         DEM9   SM9-PST   SM9.A-remain-FV
            "This one, it stayed"
      b. CHI: Transcript: e chala.
            Target: ya-sal-a
                         SM9.NP-remain-FV
            "It remains behind"
      c. NAM: Transcript: yena ile ya sala itse.
            Target: yona   e-ile   ya-sal-a
                         PRO9   SM9-PST   SM9-remain-FV
            e-its-e
            SM9-say-PERF
            "This one, it stayed like this, in fact"
      d. CHI: Transcript: e shala ejeeh e shalane.
            Target: e-sal-a   e-j-a
                         SM9-remain-FV   SM9-eat-FV
            e-sal-a
            SM9-remain-FV
            "It remains behind and eats, it stays behind"
      e. NAM: Transcript: ya sala yona itse.
            Target: ya-sal-a   yona
                         SM9.NP-remain-FV PRO9
            e-its-e
            SM9-say-PERF
            "It stayed this like this"
      f. CHI: Transcript: a sala itse.
            Target: ya-sal-a   e-its-e
                         SM9.NP-remain-FV   SM9-say-PERF
            "It remains like this" (Chi, L16/17/18, DSCL
            020200.ab 3340790_3343893)

Persohn (2017) examines the two narrative tenses in Nyakyusa (Bantu, Guthrie code: M31) based on single-speaker narratives (such as traditional stories) and some elicitation of ungrammatical patterns, showing that in Nyakyusa the narrative tense can only be used in events which extend the main narrative. This kind of pattern is found in much but not all of our data. For example, in (19), the narrative past form is used for what seem to be the main events, not for describing background events. This may indicate that Sesotho differs from Nyakyusa in this respect.

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[7]This is a case of an adult using a baby talk form. The adult form is *palama*.

(19) a. NAM: nna   ke-a-tseb-a   khale khale.
                PRO1S SM1S-know-FV long.ago
                "Me, I know long long ago!"

      b. NAM: nna   ke-a-tseb-a   e-ne
                PRO1S   SM1S-DJ-know-FV   SM9-NE
                e-fe   e-fok-uw-e
                SM9-which SM9-blow-PASS-PERF
                ke   mo-ya.
                COP   3-wind
                "Me I know that one, it was blown by wind"

      c. NAM: yaba   ya-rob-eh-a.
                CONJ SM9.NP-break-STAT-FV
                "And then it broke"

      d. CHI: Transcript: nkhale khale fata.
                Target: khale khale e-ne   e-fefotse
                      long.ago   SM9-NE SM9-blow.about.PERF
                "Long time ago it was blown away"

      e. CHI: Transcript: ke yane chale kwane.
                Target: ke   yane   e-sal-a   kwana
                            COP DEM9 SM9-remain-FV LOC
                "It's over there, it remains behind"

      f. MMS: eng?
                what
                "What?"

      g. NAM: ya-rob-eh-a.
                SM9.NP-break-STAT-FV
                "It got broken" (Chi, L12/13, DSCL 020200.ab
                3316800_3318519)

In contrast, in (20), the narrative past is used for backgrounded information: the "thing that passed," rather than the main event ("entering"). But the exchange in (20) forms part of a series of comments made by the two children while playing, not a very clearly structured conversation. The DSC does not include single-speaker narratives of the type analyzed by Persohn (2017), so any conclusions about differences between Sesotho and Nyakyusa are tentative.

(20) a. MOL: ache ke-bon-a   ntho   ena   feela.
                INT SM1S-see-FV 9THING DEM9 only
                "Hey! I see this thing only"

      b. CHI: ya-chobel-a   kwa ntho   ya-fet-a.
                SM9.NP-hide-FV LOC 9thing SM9.NP-pass-FV
                "It entered, there, that thing that passed" (Chi,
                H24/25, DSCH 020400.cd 979562_988206)

Another type of discourse chain found in the DSC occurs in a multi-speaker narrative, where several speakers are narrating the same event, often with the parents (such as MHL in example 21, who is Hlobohang's mother) asking prompting questions. An example of this is shown in (21). This is only part of a longer sequence of 14 narrative past forms that serve to narrate the same macro-event (a trip that the conversation participants took together).

(21) a. MHL: u-ne   u-tsamay-a   le   ho-kae   ha
                SM2S-NE   SM2S-leave-FV CONJ   17-where if
                u-y-a   ha   Kweneo?
                SM2S-go-FV LOC   Kweneo
                "Which way did you take when you went to
                Kweneo?"

      b. CHI: u-ne   u-tsamay-a   le   nna.
                SM2S-NE SM2S-leave-FV   and PRO1S
                "You were walking with me"

      c. MHL: e   ra-tsamay-a   le   ho-kae?
                INT   SM1P.NP-leave-FV and 17-where
                "Yes, which way did we take?"

      d. MHL: ya ba
                CONJ
                "Then"

      e. CHI: hape ra-tsel-a   ka   mane
                again SM1P.NP-cross-FV LOC there
                ka   noke-ng   ka   kwana.
                LOC 9river-LOC   LOC LOC
                "Then we also crossed over there, at the stream,
                over there"

      f. CHI: ka   kwana.
                LOC LOC
                "Far away"

      g. MHL: ra-fet-a   ho   kae?
                SM1P.NP-pass-FV LOC where
                "Then where did we pass?" (Ad/Chi, H66-68,
                DSCH 3538900_3540380)

Crane (2015, p. 2) describes the use of switching between narrative and inflected forms in Totela (Bantu, Guthrie code: K41) as marking a change in the subject or topic within a discourse that can split a narrative into smaller events or mark a shift in viewpoint. In discourse, this might be used to shift back to an earlier topic. Indeed, this sometimes seems to be true of the DSC as well. In examples (22) and (23), speakers use the Sesotho narrative past to resume a disrupted topic: "buying candy" in (22) and "getting off the chair" in (23).

(22) a. MEM: le-tla-rek-a   di-pompong le   eng?
                SM2P-FUT-buy-FV 10-candy   and what
                "You will buy candies and what?"

      b. MOL: e-a-hlah-a   koloi!
                SM9-DJ-appear-FV 9car
                "It appears, the car!"

      c. MEM: n-kebe   ka-u-f-a   chelete
                SM1S-POT.NEG SM1S-OM2S-give-FV 9money
                ha   u-han-a
                if   SM2S-refuse-FV
                ho-bu-a   tjee.
                INF-speak-FV INT
                "I won't give you any money when you refuse
                to talk like this"

      d. MEM: wa-rek-a   di-pompong le   eng?
                SM2S.NP-buy-FV 10-candy   and what
                "You bought candies and what?" (Ad/Chi, H6,
                DSCH 020200.ab 1891024_1894786)

(23) a. MMS: u-ile   wa-ba   wa-theoh-a   hodima
             SM2S-PST SM2S-BA SM2S-descend-FV LOC
             se-tulo?
             7-chair
             "Did you end up getting off the stool?"

     b. CHI: Transcript: a pala kait.
             Target: ke-bapal-a   di-karete
                          SM1S-play-FV   10-card
             "I am playing cards"
             Utterance repeated.

     c. MMS: u-ile   wa-ba   wa-theoh-a
             SM2S-PST   SM2S-BA   SM2S-descend-FV
             hodima   se-tulo
             LOC   7-chair
             wa-bon-a   mo-tswalle wa-hao
             SM2S-NP-see-FV 3-friend   3POSS-2SG
             ale   hole le   wena?
             DEM3   LOC and   PRO2S
             "Did you end up getting off the stool? To see your
             friend far away from you?" (Ad/Chi, L6, DSCL
             020100.ef 3867965_3870995)

A small number of tokens glossed as narrative past in the
DSC were not translated as being in the past tense by the
original annotators. In some cases, the context had clear non-
past reference. In example (24), mother and child are picking
small stones out of dried peas, preparing them for a meal. In
(25), and in the wider context from which this example was
taken, there is a mixture of present and past reference. Here
the narrative past-marked verb is preceded only by present tense
forms and followed by a perfect/perfective form. In both contexts,
sequentiality is seemingly relevant. This supports Nurse's (2008)
claim that these forms are not actually specified for tense,
but that a past reading is prevalent due to the nature of the
discourse environment in which these forms are used, as both
traditional stories and personal narratives overwhelmingly use
the past tense.

(24) a. mme   sheb-a   ke-kheth-a   ke-ents-e
        1mother look.IMP SM1S-choose-FV SM1S-do-PERF
        jwang,
        how
        "Mom, look at how I pick,"

     b. ka-thol-a   ma-jwe.
        SM1S-NP-find-FV   6-stone
        "I find stones" (Chi, T20, DSCT 031000.ab 3513943_
        3516235)

(25) a. Transcript: a fihla a kola.
        Target: o-a-fihl-a   o-a-kol-a
                     SM1-DJ-arrive-FV SM1-DJ-gather_locust-FV
        "He arrives and grabs"

     b. Transcript: a fihla e nka a e akhela mona.
        Target: o-a-fihl-a   a-e-nk-a
                     SM1-DJ-arrive-FV   SM1.NP-OM9-take-FV
                     a-e-akhel-a   mona
                     SM1.NP-OM9-throw-FV LOC
        "He arrived and took it and threw it there"
        (Chi, H64/H65, DSCH 020800.cd
        (1276368_1284607)

However, in at least some examples in the DSC, the narrative past,
rather than any other past inflection, seems to serve to introduce
past tense reference, as in (26).

(26) a. CHI: Transcript: e   mba   ma.
             Target: e   ke   mpa
                          INT   COP   9belly
             "Yes, this is stomach"

     b. CHI: mme   bon-a   nna   ka-fihl-a.
             1mother see-FV.IMP PRO1S SM1S-NP-arrive-FV
             "Mom, look, me, I arrived"

     c. MMS: wa-fihl-a?
             SM2S-NP-arrive-FV
             "You arrived?"

     d. CHI: m.
             INT
             "Yes"

     e. MMS: u-tsw-a   kae?
             SM2S-come.from-FV   where
             "Where did you come from?" (Ad/Chi, L42/43,
             DSCL 020400.ab 3350200_3351420)

The narrative tense can also be the only form in a discourse
context that is interpreted as having past reference. But in (27)
there is additional visual/situational context.

(27) a. ke-kwal-l-e-ng?
        SM1S-close-APPL-FV-WH
        "Why should I shut it?"
        Situation: Girl closes door.

     b. ka-kwal-a.
        SM1S.NP-close-FV
        "I shut it" (Chi, L137, DSCL 030200.ab
        4057791_4061964)

With a few tokens, there were no overt verbs that clearly
serve to initiate a discourse chain context for the narrative
past form. However, in (28), there is earlier non-verbal
context for the chain. This kind of pattern is pointed out
in Nurse (2008) for narrative tenses in Bantu languages
in general.

(28) Context: Mololo plays with torch, shines it at wall.
     Hlobohang   ha-wa-khan-ts-a
     1Hlobohang   NEG-SM2S-NP-shine-CAUS-FV
     kumbakumba   wena.
     9tape_recorder PRO2S
     "Hlobohang! You didn't light up the tape recorder, you"
     (Chi, H57, DSCH 020700.ab 1659942_1668360)

The Sesotho narrative past can have sequential interpretations
(29), or additive interpretations as in (30), where additional
information is provided to the topic discussed that is not
sequential. For instance, (30) provides more detail on how an
object went missing.

(29) ka-fihl-a   ka-ken-a   mane.
     SM1S.NP-arrive-FV SM1S.NP-enter-FV LOC
     "I came and entered in there" (Chi, T37/T38, DSCT
     031000.cd 4961543_4962078)

(30) 'Neuoe   o-ile   a-e-nk-a
     1'Neuoe   SM1-PST   SM1-OM9-take-FV
     a-e-akhel-l-a   mane
     SM1.NP-OM9-throw-APPL-FV LOC
     jareteng   mane.
     9garden.LOC   LOC.
     "'Neuoe took it and threw it there, in the garden over there" (Chi, T46, DSCT 040000.ab 1032050_1035372)

Unlike the patterns found in languages with more typical clause chain markers, in the DSC there is often just a single narrative past token per utterance, rather than a chain of narrative past and/or narrative past and other forms. Most tokens appear in sentences or utterances where the narrative past-marked form is the only verb, but narrative past-marked verbs also do occur before or after another verb marked with the narrative past in a single utterance, as in (31), or a verb in a different TAM form, as in (32).

(31) jona   ba-kwena   ngwana wa mo-tho
     INT   2-crocodile_clan 1child   1of 1-person
     a-batl-a   a-ew-a.
     SM1.NP-want-FV SM1.NP-fall-FV
     "Hey Bakwena, the child of a person nearly fell" (Ad, L152/L153, DSCL 030200.cd 3675382_3679058)

(32) helang ka-batl-a   ke-w-el-a
     INT   SM1S.NP-want-FV SM1S-fall-APPL-FV
     hodima kumbakumba.
     LOC   9tape_recorder
     "My goodness, I almost fell on top of the boombox" (Chi, T44, DSCT 031000.e 1844947.1858368)

In (31) and (32), the inflected form of the verb meaning "want" is used to express that something nearly happened, not volition.

The narrative past also occurs in corrective or confirmative questions, as in (33). Many tokens in the DSC are repetitions or near-repetitions by the same speaker repeating themselves or another speaker repeating what the first said, which can take the form of statements or questions.

(33) a. CHI: Transcript: nkatenti
           Target: o-nk-a   penti.
                       SM1-take-FV   9panty
           "He's taking the panty"
     b. MMS: a-nk-a   penti?
           SM1.NP-take-FV 9panty
           "He took the panty?" (Ad/Chi, L11, DSCL 020200.ab 2686000_2687239)

As discussed in the Introduction, there is some disagreement in the literature about the function of the negative narrative past form. Negative narrative past forms constitute a relatively large subset of the narrative past tokens in the corpus. The highest percentage of negative narrative past forms is in the TseboNeuoe sub-corpus with ~25%, 17% in the Litlhare sub-corpus and 12% in the Hlobohang sub-corpus (see following sections for more information on sub-corpora). In the DSC, lexical verbs

introduced in the narrative past can be subsequently negated in the same stretch of discourse using either narrative past forms or non-narrative past forms. For example, a follow-up question to a statement in the narrative past in (34a) uses the negated form of a different tense in (34b), which is immediately followed by another token of the narrative past in (34c).

(34) a. MHL: wa-bon-a   mang?
           SM2S.NP-see-FV who
           "Who did you see?"
     b. MEM: ha-u-sa-bon-a   nkhono   Maphoka
           NEG-SM2S-NEG-see-FV 1grandmother 1Maphoka
           ntate   Makoso
           1father   1Makoso
           bo-mangwane   wa-hao?
           2a-aunt   1.POSS-2S
           "Didn't you see grandmother Maphoka, father Makoso and your aunt's people?"
     c. CHI: Transcript: ha keta ka bona ntate Makoso.
           Target: ha   ke-qet-a
                when   SM1S-finish-FV
                ka-bon-a   ntate   Makoso
                SM1S.NP-see-FV 1father   1Makoso
           "When I finish, I saw father Makoso" (Ad/Chi, H77/78, DSCH020800.cd 3692482_3700985)

In (35), the negative form of the narrative past is used to negate the affirmative narrative past sentence in (35a).

(35) a. MMS: oo   jwale   wa-f-a   Mamello.
           INT   now   SM2S.NP-give-FV 1Mamello
           "Oh then you gave (it) to Mamello"
     b. CHI: Transcript: ere nthe?
           Target: u-re   ntho   ee
                    SM2S-say 9thing DEM9
           "Are you saying this thing?"
     c. MMS: e.
           INT
           "Yes"
     d. CHI: Transcript: ha fula ha u fa.
           Target: ha-a-u-f-a
                 NEG-SM1.NP-OM2S-give-FV
           "She didn't give (it) to you" (Ad/Chi, L8, DSCL 020200.ab 2344868_2348769)

The data and discussion in this section show that the Sesotho narrative past is used in different kinds of chains and allows considerable flexibility, especially compared to clause chaining languages like Nungon, and possibly even compared to other Bantu languages, such as Nyakyusa, in terms of how it is introduced and how it interacts with surrounding discourse. Elicitation-based future research might narrow this somewhat and more comparative data would be helpful for shedding more light on how narrative tenses are similar or different in their use across the Bantu languages.

Object Marking With the Narrative Past Form

As in other Bantu languages, Sesotho verbs can mark the person/number or noun class of an object on the verb. Either of the two objects of a ditransitive verb can be marked on the verb, but only one object marker is allowed on a verb (Morolong and Hyman, 1977). Unlike object marking in Bantu languages like Swahili or Sambaa (Riedel, 2009), Sesotho object marking is not obligatorily when a co-indexed lexical object is present. The object marker is typically used, pronoun-like, to replace a lexical object that was introduced in the preceding discourse. An example of Sesotho object marking is shown in (36), where the object marker is indicated in boldface.

An unanticipated finding of our study is that object marking is very prevalent among the narrative past tokens, and object marking occurs in higher proportions of narrative past tokens than of all verb tokens for all three sub-corpora and most speakers[8].

(36) ka-**e**-otl-a.
      SM1S.NP-OM9-beat-FV
      "(Then) I hit it" (Chi, H45/46, DSCH 020600ab 3184773_
      3193821)

Results for object marker frequencies are summarized in **Table 2**. Here, the percentage of all verb tokens that have an object marker, and the percentage of all narrative past tokens that have an object marker, are compared for: (a) individual speakers in the DSC with more than 3 narrative past tokens, and (b) all speakers in each sub-corpus, including those who produce 3 or fewer narrative past tokens.

The percentage of narrative past tokens with an object marker is generally higher than the percentage of all verb tokens with object marking, except in the case of three speakers: MMS (Litlhare's mother), MEM (Hlobohang's grandmother), and JUL (Tsebo's grandmother). We ran two Mann–Whitney tests to explore the significance of these differences. In the first test, we compared the two proportions in **Table 2** for only the individual speakers with more than 3 narrative past tokens overall. A two-tailed Mann–Whitney test run at a 0.05 significance level resulted in a U-value of 36, z-score of 2.05, significant at $p < 0.05$ ($p = 0.04036$). In the second two-tailed Mann–Whitney test, we again used the individual speaker percentages of object marking on narrative past tokens as one sample, but for the second sample, we included percentages of all verb tokens with object marking for all speakers with at least one verb token across all three corpora (hence, a much larger sample). In this test, the difference in percentages of object marking for all verb tokens

TABLE 2 | Proportions of all verb tokens and of narrative past tokens with object markers.

Speaker (sub-corpus)	Percent OM (of total verbs)	Percent OM (of total NP)
CHI (Litlhare)	18.92% (7,660)	37.10% (62)
MMS (Litlhare)	17.19% (4,276)	16.67% (36)
NAM (Litlhare)	19.84% (3,019)	21.95% (41)
CHI (Hlobohang)	23.16% (5,221)	38.18% (55)
MEM (Hlobohang)	16.46% (2,698)	11.11% (18)
MHL (Hlobohang)	19.78% (1,274)	41.67% (12)
MOL (Hlobohang)	21.11% (3,226)	41.46% (41)
CHI (TseboNeuoe)	21.56% (4,945)	29.17% (96)
HLE (TseboNeuoe)	20.53% (1,763)	38.10% (21)
JUL (TseboNeuoe)	14.47% (1,244)	14.29% (7)
MAR (TseboNeuoe)	18.02% (2,864)	51.61% (31)
NEU (TseboNeuoe)	20.97% (1,865)	23.08% (26)
All speakers (Litlhare)	18.41% (18,292)	30.77% (156)
All speakers (Hlobohang)	20.52% (13,998)	35.04% (137)
All speakers (TseboNeuoe)	19.62% (13,536)	32.16% (199)

vs. narrative past tokens was significant at $p < 0.01$ ($U = 202.5$, $z = -3.04$, $p = 0.00236$).

At present, we can only speculate about the possible reasons for this finding. Although DSC verbs are not coded for transitivity, narrative past tokens in the corpus tended to occur with a mix of both transitive and intransitive verb roots. Further, based on the literature and our reading of the DSC, we have no reason to expect that a greater proportion of narrative past tokens than of all verb tokens be transitive. Rather, we suggest that there may be a difference between transitive narrative past tokens and other transitive verb tokens in discourse use, resulting in the higher use of object marking with the narrative past. For instance, it could be the case that lexical objects are omitted more frequently with verbs in the narrative past form, possibly due to their previous introduction with verbs in other inflections. Object marking in languages with similar patterns to Sesotho has been argued to indicate the topic status (in the information-structural sense of topic of a clause; cf. Bresnan and McHombo, 1987; Demuth and Johnson, 1989). In a clause chaining context, we would expect more objects to be topics/discourse-old than in other types of discourse settings. The higher prevalence of object marking with the Sesotho narrative past could thus be related to these discourse differences.

RESULTS: ACQUISITION AND CHILD-DIRECTED SPEECH

The use of narrative past forms as a function of all main verbs used was calculated for both the target children and for the adults and older children interacting with them. As in the preceding section, only speakers with more than three narrative past forms overall were included. These are binned below in **Figures 1**–**3** into an earlier and later age range per

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[8]In our coding system, object markers were also coded for referring to animate or inanimate objects, since animacy has been shown to play a role in Sesotho object syntax in terms of word order in double object applicative constructions, though not for object markers per see: cf. (Morolong and Hyman, 1977; Demuth et al., 2005). We considered object markers referring to class 1/2 or first or second person as animate. This would capture most human nouns (mostly in class 1/2) but exclude non-human animals (mostly in class 5/6 and 9/10) and humans in classes 5/6, 7/8, and 9/10. No systematic pattern emerged, with percentages of object markers referring to animates varying from 27 to 64% across the three corpora.

target child. Overall, the narrative past was used with between 0.75 and 2.5% of all verb tokens produced by adults and older children across the three corpora. Hlobohang showed a possible developmentally-related increase to within the adult and older child percentage range, though this was not statistically significant, probably due to the overall low number of items. Litlhare used fewer narrative past forms than the other children, with slightly older 'Neuoe using adult-like proportions, and the eldest, Tsebo, using slightly greater proportions than 'Neuoe. **Figure 1** shows the proportions for the Hlobohang sub-corpus, **Figure 2** shows these for the Litlhare sub-corpus, and **Figure 3** shows them for the TseboNeuoe sub-corpus. In all the figures, the total number of narrative past tokens is given above each bar.

In **Figure 1**, all speakers except for Hlobohang's 7-year-old cousin (MOL) show increases in their proportions of narrative past tokens between the first time period and the second. It could be that his grandmother and mother display fine-tuning effects (Soderstrom, 2007), tracking Hlobohang's developmentally-related increase in narrative past use. Alternatively, it could be that there was a slight increase in the proportion of discourse contexts for narrative past use in the later samples.

First, to investigate the significance of differences between narrative past proportional use in the two age ranges, we ran Mann-Whitney tests for each speaker on transcript-by-transcript proportions for the two periods. The results were not significant for any speaker (Hlobohang, $U = 46.5$, $z = 1.16937$, $p = 0.242$; MEM, $U = 35$, $z = −0.2717$, $p = 0.78716$; MHL, $U = 43$, $z = −0.45584$, $p = 0.64552$, MOL, $U =$, $z = 0.03077$, $p = 0.97606$). We then ran a Kendall tau correlation test for the pairs Hlobohang-MEM and Hlobohang-MHL to evaluate the possibility of a correlation between the child's apparent increase and those of the adults. Neither was significant, with $tau = 0.22377$, $p = 0.27312$ for the child-grandmother (MEM) pair, and $tau = 0.26318$, $p = 0.20398$ for the child-mother (MHL) pair.

Figure 2 offers no hint of a developmental increase for Litlhare in the proportional use of the narrative past, and neither her mother nor 5-year-old brother mirror her proportion of use across sessions. Mann–Whitney test results yield no significance in the differences in proportions of narrative past use across the two age ranges for any of the three speakers here (for Litlhare, $U = 60$, $z = −0.27908$, $p = 0.77948$; for her mother, MMS, $U = 23$, $z = 1.56354$, $p = 0.11876$; for her brother, NAM, $U = 35$, $z = 1.37315$, $p = 0.17068$).

Litlhare has been previously shown to be linguistically less advanced than Hlobohang: talking a lot, but not using as many complex grammatical structures such as relative clauses (Demuth, 1995). Her pattern of narrative past use may be similarly less advanced that that of some of her peers, or it is possible that the discourse contexts for the use of the narrative past were simply not sampled during the later recordings.

The final two target children, Tsebo and cousin 'Neuoe, were recorded during interactions between themselves and with Tsebo's grandmother, whereas interactions with Tsebo's 5-year-old brother and mother were primarily with Tsebo alone. Their data is shown together in **Figure 3**, where only Tsebo shows a slight (non-significant) increase over time in her proportion of narrative past use. Here, the age ranges refer to Tsebo's ages, not 'Neuoe.

Mann–Whitney tests on the age-related differences in proportions of narrative past use all showed no significant differences for the speakers in the TseboNeuoe sub-corpus: for Tsebo, $U = 63$, $z = −0.09303$, $p = 0.92828$; for her brother (HLE), $U = 32.5$, $z = −0.9798$, $p = 0.32708$; for her grandmother (JUL), $U = 21$, $z = 0.32275$, $p = 0.74896$; for her mother (MAR), $U = 34.5$, $z = −1.56928$, $p = 0.11642$; for her cousin, 'Neuoe, $U = 46$, $z = 0.59855$, $p = 0.5485$.

In sum, this first-pass, descriptive analysis of Sesotho narrative past use by toddlers and their older siblings and caregivers shows that: (1) There is remarkably little variation across speakers in the proportion of narrative past tokens as a function of all verb tokens used, with an overall mean of 1.07%; (2) Both of the younger target children use the narrative past form before the age of 2;6; (3) None of the target children show proportions of narrative past tokens that diverge dramatically from those of adults and older children.

Thus, despite the few descriptions in the Sesotho linguistic literature, the narrative past form is used with high consistency across speakers, from adults to very young children. Interestingly, its relatively low frequency in adult speech does not appear to delay its acquisition, at least in the proportion of overall use.

CONCLUSION

This has been the first investigation into the Sesotho narrative past form in adult or child speech. Our findings show that the Sesotho narrative past patterns differently in its distributions and morphosyntactic behavior from more canonical clause chaining forms in other languages, including Bantu languages like Swahili.

The Sesotho narrative past form is a low-frequency form in the DSC, occurring in 1.07% of all verb tokens used. It is generally used by one or more speakers in a loosely-defined chain of utterances on the same topic, which can be sequential or not, including either foregrounded or backgrounded information. Its function in supporting the continuity of a discourse topic may be supported by the higher frequency of object markers found with this form. The form shows no apparent conjoint-nor disjoint-related marking. While past tense context for the narrative past form is by far the most prevalent in the present corpus, some tokens in non-past contexts confirm Nurse's (2008) proposal that past tense reference is not an obligatory feature of Bantu narrative "tenses." For Sesotho, this could mean that a different label for the form would be more appropriate. Surprisingly, tokens of the narrative past form in this Sesotho corpus mostly occur in isolation rather than in the connected chains that appear to be more characteristic of the -ka- form in Swahili and of clause chains cross-linguistically. This might be influenced by the conversational and child-centered nature of the DSC, which does not typically feature longer narratives by a single speaker. Future research will have to ascertain whether the Sesotho narrative past form patterns differently in adult narratives compared to everyday interactions with young children.
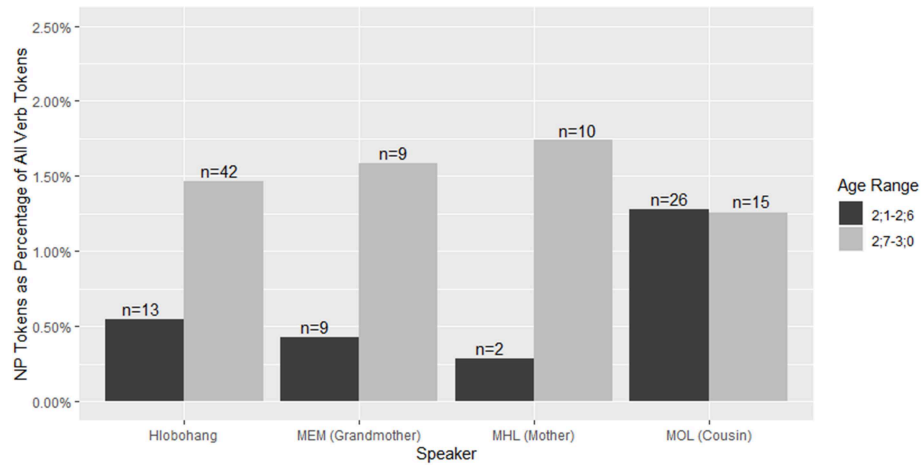
FIGURE 1 | Percentage of narrative past tokens of all verb tokens in the Hlobohang sub-corpus.
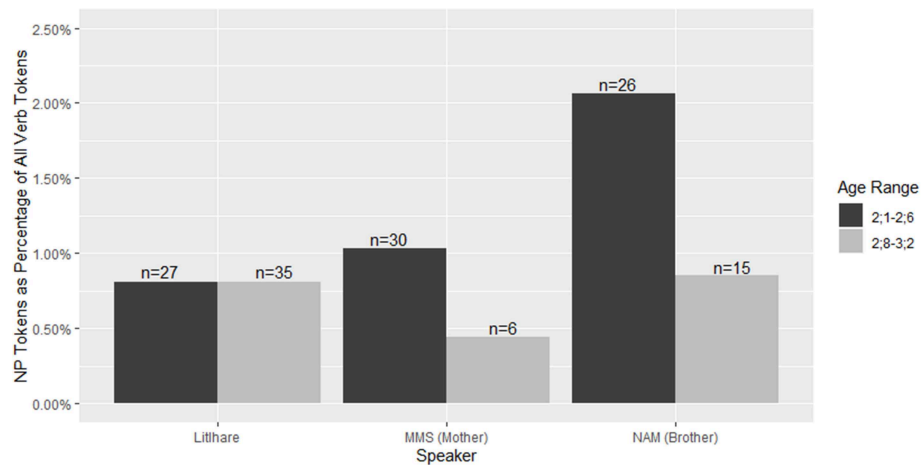
FIGURE 2 | Percentage of narrative past tokens of all verb tokens in the Litlhare sub-corpus.
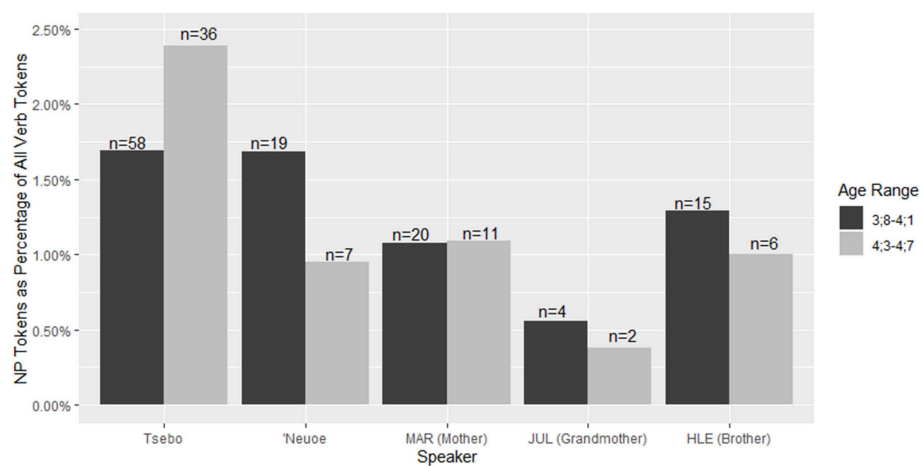
FIGURE 3 | Percentage of narrative past tokens of all verb tokens in the TseboNeuoe sub-corpus.

The older children and adults in the DSC generally exhibited narrative past use of between 0.75 and 2.5% of all verb uses. The two older target children, 'Neuoe (2;4–3,3) and Tsebo (3;7–4;7), both had proportions within the older child/adult range. For the two younger children, only Hlobohang showed a (non-significant) increase in use of the narrative past as he approached 3 years. Given the relative low frequency of the narrative past in the input these children hear, it is interesting that children appear to acquire this form and use from such a young age. But this is not an isolated case: the passive also occurs in about 2% of the input Sesotho-speaking children hear (Demuth and Kline, 2006; Kline and Demuth, 2010), and yet children use the passive productively in spontaneous speech by 2;8 years (Demuth, 1989), and in experiments showing comprehension, production and generalization to novel verbs by the age of 3 (Demuth et al., 2010). These (low-SES) children also show sophisticated uses of null noun class prefixes under appropriate phonological, syntactic and discourse conditions by the age of 2;6–3 (Demuth et al., 2009), as well as early sensitivity (age 4) to animacy restrictions on double-object applicative constructions that rarely occur in the input they hear (only 2 instances of non-pronominalized ditransitive applicatives in the 98 h of speech occur in the DSC; Demuth et al., 2005). Their use of flexible word order for discourse purposes is also well-underway by the age of 3 (cf. Demuth, 1987). Thus, these pre-literate children appear to be highly-tuned to multiple levels of linguistic structure from a very early age, using appropriate forms in appropriate discourse contexts. Taken together, the narrative past results presented here are perhaps not surprising. They also highlight the impressive learning mechanisms underlying these children's early language development.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

HS and KR conceptualized and wrote the paper. KR coded and analyzed the Sesotho data. HS did the figures and statistical analysis. KD consulted on the analysis and statistics, and contributed to writing.

FUNDING

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APPENDIX: CODING USED FOR ANALYSIS OF NARRATIVE PAST TOKENS

Ad, Adult (narrative past form used by adult speaker)

Adv, adverbial follows narrative past form

Ba, narrative past form with *ba* copula

Chain, Clear chain (the sentence explicitly links to previous context). Whenever the general topic (rather than specific subjects or objects) was continued from the previous or earlier utterances.

Ch-cor, Child-correct (narrative past form used by non-adult speaker) without significant deviations between transcript and target lines

Ch-incor, Child-incorrect (narrative past form used by non-adult speaker) with significant deviations between transcript and target lines

CorFoc, corrective focus anywhere in sentence

FocEl, focal element present: e.g. even, only, just

FV, final verb, i.e. nothing follows narrative past form

LexObj, narrative past verb is followed by lexical object/noun phrase

Mul Nar, the sentence forms part of an extended narrative chain with multiple speakers

Neg, form glossed as narrative past is negated

NFV, non-final verb

Non-Chain, Unclear chain (the sentence does not explicitly link to previous context)

ObjDrop, narrative past form has object which is dropped without object marking

OM-an, narrative past form has object marking for inanimate object

OM+an, narrative past form has object marking for animate object

PR/PA/FUT, temporal context in past/present/future

+TAM, narrative past form with other TAM

Q-non-wh, yes/no question

Q unclear, a question of unclear status

RD, right dislocated elements after narrative past form

Rep, repeated utterance

Rel, narrative past form is a relative clause

Sg Nar, the sentence forms part of a narrative chain with a single speaker

Top, topicalized elements anywhere in sentence with narrative past form

Wh-Q, there is a wh-word/clitic following the narrative past form-marked verb.

Acquisition and Development of Verb/Predicate Chaining in Hebrew

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The study considers development and use of verb/predicate chaining constructions by Hebrew speakers from early childhood to adolescence, based on analysis of authentic conversational and narrative corpora. Three types of constructions are analyzed, ordered hierarchically by degree of cohesivity and obligatoriness of chaining: (1) monoclausal complex predicates (the "extended predicates" of traditional Hebrew grammars); (2) coreferential interclausal predicate chaining; and (3) discursively motivated topic chaining. Relevant typological features of Modern Hebrew are reviewed as accounting for the absence of canonical clause chaining in the language (the paucity of non-finite constructions in everyday usage, absence of an uninflected basic form of verbs, lack of auxiliary verbs, and monolexemic verb-internal complexity). Monoclausal verb chaining emerges early in the speech of toddlers in interaction with their caretakers, whereas predicate chaining by coordination across clauses occurs only later, and chunking of such constructions at the service of discourse connectivity is found only from school-age. Non-finite subordination emerges as an advanced form of clause combining, in contrast to straightforward subordination with the multifunctional subordinator *še* 'that'. Two main conclusions follow from the study: First, the innovative hierarchy defined here for different degrees of verb/predicate linkage mirrors developmental phases in child language; and, second, monoclausal chains of finite verbs or verbal operators followed by infinitival complements are grammatically obligatory, and are common from an early age, whereas bi- and multi-clausal predicate chaining represents an optional rhetorical choice on the part of a given speaker–writer in a particular communicative context.

Keywords: caretaker input, discourse connectivity, extended predicates, Hebrew, infinitives, monoclausal constructions, predicate-chaining, verb-chaining

1 INTRODUCTION

The study considers acquisition and development of verb and predicate chaining in Modern Hebrew (henceforth MH). Concern is with developing strategies in the formation of two types of constructions: verb chaining in monoclausal complex predicates and predicate chaining in bi- and multi-clause constructions. The goal of the paper is to demonstrate how use of these constructions changes from early pre-school age to adolescence and adulthood in light of general principles underlying the authors' conception of language acquisition in general. First, development in knowledge and use of complex predicates and clause linkage in Hebrew is analyzed in relation to their functions in discourse rather than as isolated grammatical constructions (Berman, 2016a). Second, development is interpreted in light of a phase-based view of development of knowledge of language and other cognitive domains (Karmiloff-Smith, 1986, 1992), as applied

to Hebrew morpho-syntax for early child language (Berman, 1986; Lustigman, 2016a) and later language development (Berman, 2004). In this perspective, analogous developmental processes are recurrent across different domains at different times in a child's linguistic history, in contrast to the over-arching, domain-general Piagetian view of "stage". In the case in point here, this means that acquiring knowledge and use of what is labeled below as verb/predicate chaining in Hebrew proceeds from initial pre-grammatical emergence, via piecemeal structure-based knowledge, to integrated, discourse-appropriate mastery at periods which may differ from the same children's command of, say, inflectional morphology or syntactic subordination in Hebrew. Consequently, even though basic grammatical properties of the target language may be in place by 3 or 5 years of age, language development reflects a lengthy route into adolescence and beyond (Tolchinsky, 2004; Nippold, 2007). A further factor impinging on development, one at the core of the present volume, is the early and profound impact of the typology of the ambient language on the process of acquisition (Choi and Bowerman, 1991; Slobin, 1997; Berman, 2016b).

The language of concern here is the "General Israeli" sociolect (Blanc, 1968; Henkin, 2020) of Hebrew, a Semitic language that was formerly mainly a written means of religious and liturgical study in the Jewish diaspora. Revived since the late 1900s as a means of everyday spoken intercourse, MH serves today as the first language of fourth and fifth generations of children born in Israel and as the primary language of the majority of citizens and residents of the country (Grossman and Reshef, 2020).

The paper is organized as follows: We first outline typological properties of MH relevant to the topic of verb/predicate chaining (§2), then provide details of the analytical framework applied in the study, including predictions based on this analysis (§3), proceeding to description of the database (§4), results of analysis (§5), and a concluding discussion (§6).

2 RELEVANT FEATURES OF MH MORPHO-SYNTAX

The properties of MH surveyed under this heading concern features of the language that mitigate against it being a canonically "clause chaining" language. That is, non-finite clauses in Hebrew are either coordinated with or subordinate to a finite clause, but the language lacks a third category of what is termed "co-subordination" or "asymmetric coordination" (see, further §3 below). Relevant features of MH noted here include: its lack of simplex verb forms (§2.1), verb-internal lexemic complexity (§2.2); lack of auxiliaries and light verbs (§2.3); paucity of non-finite constructions (§2.4); and the asymmetry of person inflection on verbs (§2.5). These for the most part are typologically shared with other Semitic languages (Goldenberger, 2013), while at the same time reflecting current developments in MH usage (Berman, 2020).

2.1 Lack of "Basic" Verb Forms
Hebrew verb forms encode a great deal of information verb-internally by means of rich inflectional and derivational

morphology. Importantly, the language lacks simplex, uninflected verb forms corresponding to, say, English, *eat, dance, think, enjoy* (Berman, 1977; Lustigman, 2012). As a result, from early on children, like speakers in general, must select some inflected form of any verb they choose to use.

A favored "pre-grammatical" alternative selected by Hebrew-acquiring toddlers when they first start using verbs – at the phase of "emergence," lasting for one to several months – takes the form of skeletal "bare verbs," or inflectionally unmarked stems (Berman and Armon-Lotem, 1996; Lustigman, 2013). For example a 2-year-old responds to her mother's suggestion *ulay te-cayr-i li lecan* 'Maybe FUT.2-draw-SG.F to.me clown = maybe you'll draw a clown for me' by saying *ken, bó-i cayer lecan* 'Yes, come:IMP-SG.F draw:STEM clown = Yes, come draw a clown[1]'. The child's utterance is ungrammatical since she uses a juvenile, uninflected "bare verb" stem in the form *cayer* 'draw'. This child-generated truncated verb form is opaque in isolation, since it could be interpreted as standing for any unmarked irrealis form of the verb – Infinitive *le-cayer* 'to draw,' masculine singular Imperative (hence unmarked) Imperative *cayer* 'draw!', or Future 1st person plural *ne-cayer* 'we'll = let's draw'. Only the context, rather than the verb form by itself, makes it clear that the child meant the latter, in response to her mother's suggestion that she draw a clown[2].

This initial, short-lived but robust phase in early verb acquisition is followed by partial use of inflected verbs, typically in one of the two most neutral verb forms in the language: (i) invariable *infinitives* marked only be prefixal *lV-* (e.g., *li-gmor* 'to-finish' in the sense of imperative 'stop!, finish! – compared with more highly inflected forms of the same verb lexeme like *gamár-ti* 'finish.PAST-1SG = I ('ve) finished,' *ni-gmor* 'FUT.1PL-finish = we'll finish'; or (ii) present-tense *benoni* 'intermediate' form verbs that are marked for gender (e.g., *roce/roca* 'want:M/F' depending on whether the speaker is a boy or girl) and number (*ani roce* 'I want'/*hem rocim* 'they want') but not for person (Lustigman, 2013). By age 3–4 years, typically -developing children have overall command of inflectional distinctions for number (singular/plural), gender (feminine/masculine/feminine), person (1st, 2nd, 3rd); tense (present, past, future); and mood (declarative, imperative) (Berman, 1986).

2.2 Verb-Internal Monolexemic Complexity
In addition to the inflections noted in §2.1, all (although not only) verbs in MH are constructed by means of the "root-and-pattern" morphology of Semitic languages (Amberber, 2010; Goldenberger, 2013, pp. 115–118). In Hebrew, these take the

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[1] Hebrew forms are given in broad phonemic transcription, with stressed syllables marked by an accent aigu in the atypical cases of non-final word stress. Coding categories follow the Leipzig conventions of Comrie et al. (2015). Consonantal roots are represented by their abstract historical values, including so-called gutturals like *alef* and *ayin* still represented in the orthography, but not realized in current pronunciation.

[2] These details on acquisition are provided here, since they are not considered relevant to the later acquisition of verb chaining detailed in §5.1 below.

form of the *binyan* 'building = conjugation, construction' system of 7 verb patterns or prosodic templates, in the form of affixal stems combined with abstract consonantal roots (e.g., Berman, 1993; Ravid et al., 2016). As a result, verb-derivation in MH involves valence-changing alternations that might be expressed analytically in other languages. These includes contrasts of voice – active, passive (both syntactic and adjectival), and middle – which are expressed morphologically, by changes in *binyan*. For example, the abstract historical root *p-t-h* is the basis, in five different *binyan* forms, for the following verb lexemes: *patax* 'open.TR,' *niftax* 'open.INTR = be/get opened,' *pitéax* 'develop.TR,' *putax* 'be-developed:PASS,' *hitpatéax* 'get-developed = develop:INTR; or, from the root *h-p-k*: *hafax* 'turn, change.TR'/*nehefax* 'be changed, become,' *hithapex* 'turn upside down.INTR[3]'.

The derivational system of *binyan* verb patterns thus encodes several categories that may be expressed compositionally in other languages. For example, causatives that can be expressed with verbs like *make, faire, hacer* in European languages are typically formed by means of a morphologically derived form of a more basic verb or adjective in the *hif'il* pattern (e.g., *le-hardim* 'make-go-to sleep' = 'put to sleep' from the root *r-d-m*, *le-haaciv* 'make unhappy' from the root *?-c-b*). Relatedly, use of intransitive, middle-voice morphology serves in place of inchoative 'helping verbs' like *get, become, turn* (e.g., *le-hitkonen* 'get ready,' *le-hitbayeš* 'be ashamed,' or *le-hizaher* 'take care, be careful,' *le-hitaka* 'get stuck'). While sometimes included in the category of "complex predicates" (Alsina et al., 1997, pp. 1–47), particularly those analyzed as "merger constructions" (Baker and Harvey, 2010), these lie outside the present analysis, since the moment speakers use a verb in Hebrew, it must necessarily be made up of both a root and pattern combination, as shown from the very first verbs used by Hebrew-speaking toddlers noted in the preceding section (and see, too, Lustigman, 2012, 2016a). Since consonantal roots are unpronounceable, non-linear elements, and all verbs must have an associated morphological pattern, root plus affixal pattern complexes (phonologically constituting prosodic templates) represent unitary verb *lexemes* in the language.

2.3 Lack of Auxiliary and Light Verbs

A feature of MH that mitigates against clause-internal verb chaining is its almost entire lack of auxiliary verbs corresponding to, say, *be, have, do* in Standard Average European (SAE). For present purposes, auxiliaries are narrowly defined as a category of paradigmatically related closed class items that serve for grammatical expression of Tense, Mood, and/or Aspect, as well as Voice (Berman, 1980). A single exception in MH is the multi-functional construction consisting of past tense 'be' followed by a *benoni* 'intermediate' form participle (see §2.4 below). This serves in current usage to express both habitual past tense as in (1) and 'unreal' conditional mood as in (2),

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where a square bracket] indicates clause boundary and verbs are in bold. However, as shown below, the contrast between the complex *was/were + Participle* extended form and the simplex inflected form of the verb to express past tense is optional, and stylistically rather than grammatically required (Berman, 2001).

(1) Habitual Past [= haya 'was/were' + *benoni* Participle]
   [Opening to narrative of a 12-year-old middle-school boy]
   *ze **haya** lifney šana] ve yeladim ba-kita šeli **hayu osim***
   it was   before year] and kid:PL in.the-class my were doing:PL foolery
   hayu mitkašrim   *le-anašim ha-bayta ve ze.]*
   were contacting:PL   to-people the-home and this.
   *yeled exad **xašav***]   *še ani **hitkašarti** el-av . . .*
   boy one thought   that **I** contacted:1SG to-him. . .
   'It was a year ago, and the kids in my class were doing crazy things, were calling people at home and so on. One kid thought that I (had) called him . . . '

In MH, the habitual past often, though not obligatorily, occurs in the background setting of these personal experience accounts. It is generally optional, alternating with simple past in both such contexts and in general reference to past time in Hebrew (Berman, 2001). In contrast, conditional clauses like the constructed example in (2) require use of auxiliary *haya* 'be.PST + *benoni* participial construction.

(2) *lu **hayíti** **yodáat**]   **hayíti** **ozéret**   le-xa*
   if was:1SG know:SG.F   was:1SG helping:F to-you
   'If I knew / had known, I would help / would have helped you'

Together with a general lack of auxiliary verbs in favor of monolexemic root-plus-pattern verb formation (§2.2), Hebrew makes relatively infrequent use of light verbs, in contrast to a Semitic language like Amharic, which has complex verbs such as those meaning 'say' or 'do' along with "morphological encoding of transitivity through the use of various derivational prefixes" (Amberber, 2010). In current Hebrew, certainly in more normative usage, monolexemic verbs are generally preferred to lexically complex constructions. Compare, with verbs in four different *binyan* patterns, *le-hitkaléàx* 'to-shower (oneself)' rather than *la-asot mikláxat* 'to-do, make (a) shower,' *le-harcot* 'to-lecture' rather than *la-tet harcaa* 'to-give (a) lecture,' *li-ršom* 'to-note (down)' rather than *la-káxat rešimot* 'to-take notes,' *le-tayel* 'to-travel' rather than *la-cet le-tiyul* 'go-for (a) trip'.

2.4 Non-finite Verbs

Modern Hebrew lacks several of the constructions dealt with in the present volume, including (i) monoclausal *serial verbs*, characterized by Aikhenvald (2018) as monoclausal sequences

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[3]Since, as noted in the previous section, Hebrew verbs lack a "basic" uninflected form, verbs are listed here in their morphologically least-marked form of past tense, 3rd person, masculine singular.

of verbs that co-occur without an overt marker of coordination, subordination, or syntactic dependency of any sort; and (ii) inter-clausal *converbs*, where a non-finite verb form in the first clause is followed by a finite verb form in the second (Haspelmath and König(eds), 1995; Bickel, 1998). Rather, MH relies extensively for verb and predicate chaining, on the syntactically pervasive and multifunctional **infinitives** corresponding to forms with English 'to' or Romance suffixes like *-er, -ir, -ar* – as detailed in Section "Database" below.

Hebrew has two other types of non-finite verb forms defined, following Givón (1990, Chapter 19) as verbs that cannot be used in an independent clause. They thus in some ways correspond to converbs, since they also "take their temporal specification from the tense of the main clause" (Aksu-Koç, 1994, p. 346), but both are obligatory inflected. These are *Gerunds*, as in (3a) and *benoni* 'Intermediate' *Participles*, as in (4a), with each having different syntactic functions: Gerunds occur in adverbial clauses of attendant circumstances, and Participles in "small clauses" as complements of verbs of perception. Both function as dependent clauses, and correspond to finite subordinate clauses like those in the constructed examples in (3b) and (4b).

(3) (a) [from an adult's discussion of interpersonal conflict]
  be-yošv-énu   *ke-xaverim be-vaada-t*
  in-sit:GER-POSS.1PL as-members in-committee-GEN
  ha-mišne,]
  the-secondary,
  nexsáf*-nu*   *le...*
  expose:**PST**.PASS-1PL to...]
  'While serving as members of the sub-committee, we were exposed to...'
 (b) ***kše-yašáv-nu***   *ke-xaverim be-vaadat ha-mišne,*
  when-sat:PST-1PL as-members in-committee the-sub,
  nexsáf-nu   *le...*
  expose:PST.PASS-1PL to...
  'When we served as members of the sub-committee, we were-exposed to...

(4) (a) [From a 9-year-old's picture-book narrative]
  hu raa mišpáxa-t cfarde-im keílu ***mitxab-im***
  he saw family-GEN frog-PL like **hiding-PL**
  beyáxad
  together'
  'He saw a family of frogs like hiding together'
 (b) *hu raa mišpáxa-t cfarde-im še-keílu* ***hitxab-u***
  he saw family-GEN frog-PL that-like **hid-PL**
  beyaxad
  together
  'He saw a family of frogs that like were hiding together'

The non-finite gerundives in (3a) and (4a) differ from infinitives since they are obligatorily inflected for agreement of person and/or number, and they can, as shown by the constructed versions in (3b) and (4b), be paraphrased by a finite clause subordinated by a conjunction such as *kše-* 'like that = when, while' or *še-* 'that'. That is, unlike infinitives, they

serve only in inter-clausal, not in mono-clausal constructions. Besides, these two major non-finite forms of classical Hebrew – Gerundive *šem ha-póal* 'verbal noun' and Participial *benoni* 'intermediate' – are today largely confined to formal, elevated or literary usage (Dubnov, 2015; Berman, 2018c). And indeed, across our spoken corpora, from early childhood to graduate student adult usage (§4), non-finite Gerunds and Participles were few and far between – the former largely replaced by finite subordinate clauses as in (3b), the latter by Infinitives. Since neither construction is relevant to the topic of predicate chaining, they are not further considered here. They do, however, highlight (i) the paucity of non-finite verb constructions in MH in contrast to its classical antecedents and (ii) the key role played by infinitives in verb and predicate chaining, as detailed in Section "Framework of Analysis" below.

2.5 Asymmetry of Person-Marking

Modern Hebrew can be characterized as "a partial Pro-drop language" due to the asymmetry of where inflectional marking of Person is optional or obligatory on verbs marked for Tense. Thus, verbs are inflected for person in past tense (by suffixes) and in future tense (by prefixes) in 1st and 2nd but not 3rd person, and not on verbs in the *benoni* present tense (Berman, 1990). For example, overt pronouns like *ani* 'I,' *atem* 'you.PL' are optional in 1st or 2nd person clauses in past or future tense (e.g., *ani nahág-ti lvad* 'I drive:PST-1SG alone' and *nahág-ti lvad* 'drive:PST-1SG alone' both mean 'I drove alone'; while *atem ti-nhag-u lvad* 'you:PL-drive:FUT-PL alone' and *ti-nhag-u lvad* both mean 'you'll drive alone'). Analyses show that overt subject pronouns with person-marked verbs are superfluous except in specific discourse contexts (Ariel, 2000; Polak-Yitzhaki, 2006). In contrast, clauses with verbs in present tense or in 3rd person, which are inflectionally marked for number and gender but not for person, require an explicit pronoun as subject. Compare present tense ***ani*** *noheg/et lvad* '**I** drive:M/F alone,' ***at*** *nohéget lvad* '**you:SG.F** drive alone,' ***ata*** *noheg lvad* '**you:SG.M** drive alone'; and 3rd person ***hu*** *nahag/***hem*** nahagu lvad* '**he/they** drove alone' – where the overt subject is obligatory in isolated clauses. As noted further below, this alternation of optional versus obligatory subject pronouns plays an important role in inter-clausal coordination.

In sum, the features of MH usage surveyed above – obligatory verb-internal inflectional and derivational complexity (§2.1 and §2.2), paucity of auxiliaries and light verbs (§2.3) and of non-finite verbs (§2.4), and the partial requirement of overt subject pronouns in isolated clauses (§2.5) – combine with its lack of monoclausal serial verbs and of inter-clausal converbs to explain why Hebrew fails to constitute a canonically "clause chaining" language. As a result, the coding categories delineated in the next section for MH differ from those of more typical clause chaining languages including ones characterized for child language in this volume (for example, Choi on Korean, Ogel-Balaban and Aksu-Koç on Turkish) and see, too, Sarvasy (2019) on the Papuan language of Nungon.

Against this background, the next section outlines the novel analytical framework adopted for the present study of MH, taking

into account different levels of structural complexity in specifying coding categories for verb and predicate linkage.

3 FRAMEWORK OF ANALYSIS

The basic unit of analysis, in keeping with the theme of this volume, is the **"clause,"** defined as a "unified predication . . . that expresses a single situation (activity, event, state)" and which includes finite and non-finite verbs, together with its associated arguments and adjuncts (Berman and Slobin, 1994, pp. 660–662). This unit has been effectively applied across different languages, text types, and age-groups, including the narrative database detailed for Hebrew in Section "Database" below (and see, too, for English and Hebrew, Nir-Sagiv, 2008, pp. 48–54). And it accords well with Aikhenvald's (2018) definition of monoclausal constructions as "describing what is conceptualized as a single event".

The study differentiates between mono-clausal **multi-verb complex predicates** and inter-clausal (bi- and multi-clausal) **clause combining** constructions. Although, as noted, Hebrew is not a typical clause-chaining language, these two constructions are labeled here, for the sake of consistency with the general topic of this Research Topic, as (mono-clausal) "verb chaining" and (bi- or multi-clausal) "predicate chaining" respectively. Verb chaining is characterized for Hebrew by cases where a tensed verb or verbal operator combines with one or more non-finite forms (most typically infinitive) within a single clause, while predicate chaining involves more than a single clause, typically combined by coordination (similarly to, say, English *'pedestrians need to pay attention]* *and not cross at a red light]*,' where] stands for clause boundary). Constructions analyzed in the present study share the following features: (i) Co-reference of the grammatical subject or discursive topic of all the verbs in the chain and (ii) the initial element is marked for tense or mood, and the following non-finite complement(s) inherits the temporal interpretation of this initial element in the main clause. The study thus focuses on non-finite chaining, and excludes from consideration cases of finite subordination (complements, adverbials, and relative clauses) where both the main and dependent clauses are marked for tense. Relevant constructions are defined below along a continuum of three levels of **depth of dependency,"** ranked by developmental, structural, and/or discursive complexity from (i) the most dependently interwoven monoclausal extended predicates, to (ii) bi- or multi-clausal predicate chaining, followed by the rhetorical option of (iii) discursive topic chaining. This innovative analysis both draws on and departs from earlier studies of two types of syntactic constructions: the mono-clausal "extended predicates" of Hebrew grammars (Berman, 2018b; Lustigman, in press; and see references in footnote 7 below) and "clause combining" complex syntax in Hebrew and English (Berman and Lustigman, 2014; Berman, 2018a).

A key distinction here is that between verb chaining and predicate chaining constructions, as follows. **Verb chaining** (§3.1) applies in monoclausal constructions where a verb, termed the "trigger," is grammatically finite (marked inflectionally for tense or mood) and semantically encodes modal, aspectual, or evaluative content, and it is complemented by one or more non-finite, typically infinitival, verbs (e.g., *roce/hitxil/ya-adif* **le-hišaer ba-bayit** 'wants/began/will-prefer **to-stay at.the-home,**' analogously to English *he needs/began to/would prefer to stay at home*). The term "complement" applies in this context to one or more non-finite (infinitive) verbs following the finite trigger in the boundaries of a single clause, rather than in the more usual sense of "sentence complementation" (e.g., Noonan, 2007).[4] The constructions are analyzed here as constituting the major (in fact, the only) instance of "complex predicates" in MH, in contrast to the varied types of constructions discussed for different languages in Alsina et al. (1997).

Predicate chaining (§3.2 and §3.3) involves bi- or multi-clausal constructions, typically combined by coordination. These may be triggered by non-finite verbs in the conjunct clause; for example, compare the present-tense modal verb *crixim* 'must, have to.PL' in the first clause followed by the (non-finite) infinitives *la-sim* 'INF-input' in the same clause and *la-xcot* 'INF-cross' in the second clause of the following coordinated construction: *holxey-régel* **crixim la-sim** lev] **ve lo la-xcot** be-or adom 'pedestrians need to-pay attention] and not to-cross at a red light,' where] stands for clause boundary, as in (§3.2.1 and §3.3.1). Alternatively, finite clauses, whether coordinated or subordinated, can also constitute instances of predicate chaining, on condition that they involve same-subject deletion rather than pronominalization of the shared subject in the chain of clauses – e.g., *hu lo sam lev] ve xaca be-or adom* 'he didn't pay attention] and crossed at a red light' (§3.2.2 and §3.3.2).

Constructions defined as manifesting verb or predicate "chaining" and so constituting the coding categories for analysis were selected to meet the following criteria: (i) Co-reference of the grammatical subject or discursive topic of all the verbs in the chain; (ii) the initial element – defined in surface terms as the first verb in a chain – is marked for tense or mood; and (iii) the following verb or verbs in the chain share the same temporal interpretation – whether in the same clause (§3.1), or across different clauses (§3.2 and §3.3). These constraints mean that, with the exception of same-subject deletion in finite coordinated or subordinated clauses (§3.2.2 and §3.3.2), the constructions analyzed below involve non-finite verb forms which, for spoken Hebrew, are largely in the form of Infinitives (§2.4 above).

Results presented in §4 below encompass both mono-clausal contexts, as the primary instance of "complex predicates" in Hebrew (§3.1) as well as in bi-and multi-clausal constructions (§3.2 and §3.3). This motivates the decision to include infinitives, as "deranked" non-finite forms that typically do not take an overt subject (Croft, 2001; Givón, 1990). Besides, concern with constructions including non-finite verbs highlights a largely neglected topic in first language acquisition, with the occasional exception of studies of young preschool children (e.g., Bloom et al., 1984, 1989; Vasilyeva et al., 2008) and for L2 in Döpke (2000) and Akinçi and Jisa (2001). On the other hand, studies of school-age and adolescent students show that non-finite

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[4]The term "complement" is thus used in the broad sense of Cristofaro (2008) proposal that "there are a number of meanings associated with particular combinations of complement-taking predicates and complementation patterns".

subordination increases markedly from adolescence on, as in Berman's (2003) analysis of English and Hebrew narratives, Jisa (2000, 2004), studies of French L1 texts, and Kupersmitt's work comparing temporality in English, Hebrew, and Spanish.

Grammatically, such constructions manifest a tightly bound type of combining, since in them, the subject and tense of the subordinate clause are totally dependent on the main clause (Van Valin and LaPolla, 1997). In discourse-embedded terms, non-finite chaining represents a particularly tightly cohesive type of "syntactic packaging" or "discursive chunking" of texts, due to what Givón (2009) terms their "semantic integration" (and see, too, Cristofaro, 2003, pp. 117–122, cross-linguistic analysis of the functions of non-finiteness).[5] Relatedly, Popa (2008) emphasizes the important role of what she terms "theme ellipsis" (of verbless and non-finite clauses) in the information structure and overall organization of English texts, while Maiá (2010) defines non-finite clauses as contributing to the "structural compactness" of different types of texts she analyzed in English.

Relevant constructions are defined below along a continuum of three levels of "**depth of dependency**," ranked by structural, and/or discursive complexity from the most obligatory and inter-dependent monoclausal complex predicates (§3.1) via bi- or multi-clausal predicate chaining (§3.2), and on to the rhetorical option of discursive topic chaining (§3.3). The section concludes with formulation of relevant developmental predictions (§3.4). The study differentiates between mono-clausal **multi-verb complex predicates** and inter-clausal (bi- and multi-clausal) **clause combining** constructions. Although, as will be evident from the description in (§1.2 and §1.3) and analyses in (§4.2 and §4.3), Hebrew is not a typical clause chaining language, these two constructions are labeled here, for the sake of consistency with the general topic of this Research Topic, as (mono-clausal) "verb chaining" and (bi- or multi-clausal) "predicate chaining" respectively. Verb chaining is characterized for Hebrew (§1.1) by cases where a tensed verb or verbal operator combines with one or more non-finite forms (most typically infinitive), while predicate chaining (§1.1–§1.3) involves more than a single clause, typically combined by coordination (similarly to, say, English '*pedestrians need to pay attention*] *and not cross at a red light],*' where] stands for clause boundary). Constructions analyzed in the present study share the following features: (i) Co-reference of the grammatical subject or discursive topic of all the verbs in the chain and (ii) the initial element is marked for tense or mood, and the following non-finite complement(s) inherits the temporal interpretation of this initial element in the main clause. The study thus focuses on non-finite chaining, and excludes from consideration cases of finite subordination (complements, adverbials, and relative clauses) where both the main and dependent clauses are marked for tense. Relevant constructions

are defined below along a continuum of three levels of "**depth of dependency**," ranked by developmental, structural, and/or discursive complexity from (i) the most dependently interwoven monoclausal extended predicates, to (ii) bi- or multi-clausal predicate chaining, followed by the rhetorical option of (iii) discursive topic chaining. This innovative analysis both draws on and departs from earlier studies of two types of syntactic constructions: the mono-clausal "extended predicates" of Hebrew grammars (Berman, 2018c; Lustigman, in press) and "clause combining" complex syntax in Hebrew and English (Berman and Lustigman, 2014; Berman, 2018a). These are, as noted, labeled respectively (mono-clausal) verb chaining and (bi- or multi-clausal) predicate chaining for the sake of consistency with the type of constructions focused on in other chapters in this Research Topic.

3.1 Mono-Clausal Complex Predicates

The first level concerns what Givón (2009, 128–136) refers to as "complex verb phrases". In Hebrew, these take the form of mono-clausal complex predicate constructions consisting of a tensed verb or operator (semantically modal, aspectual, or evaluative) followed by a single infinitive (§3.1.1) or by two or more infinitives (§3.1.2).

3.1.1 Single Trigger

Two constructions are considered under this heading: a finite verb or verbal operator followed (i) by an infinitive and (ii) directives consisting of an imperative verb meaning 'come, go' followed by a verb in the infinitive or inflected for future tense/imperative mood. The first of these constructions, a key facet of Hebrew syntax at different ages, registers, and text-types is illustrated in by utterances produced by a 2-year-old girl in (5a) and a graduate student woman in (5b).

(5)   (a)   ***roca***   ***le-cayer***   *et*   *ha-kélev*
        want:F   **INF-draw**   ACC   the-dog
        'I want to draw the dog'
  (b)   ***nitan***   ***le-sayem***   *et*   *ze*   *maher*
        given   **INF-end**   ACC   it   quick
        'You/one can end it quickly'

The expressions bolded in (5) illustrate constructions traditionally termed *nasu murxav* literally 'predicate widened = extended predicate' in Hebrew grammars (Lustigman, in press). These take the form of tense-marked, finite verbs or verbal operators followed by a non-finite verb, and they constitute **the** means par excellence for elaborating VP constructions in a language lacking in auxiliary verbs and other multi-lexemic means of verb expansion (see §2.3 above). As illustrated in (5), they take the form of (at least) two verbal elements, the first a verb or verbal operator inflected for tense or mood followed by one or more non-finite verbs, typically in the infinitive. Semantically, the initial item, here termed the "trigger," is generally modal (e.g., *want to, have to, need to, ought to*), aspectual (e.g., in the equivalents of *be going to, start to, go on, stop*), or expresses evaluative *cum* attitudinal

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[5]This does not apply in a true clause chaining language like Turkish, which relies on use of converbs for non-finite subordination (Aksu-Koç, 1994, p. 346–347; Berman and Slobin, 1994, pp. 548–552). An analogous situation arises with respect to the relative tightness of packaging represented by same-subject deletion in coordination in languages like English and Hebrew, where it is optional, compared with, say, Italian or Spanish, where it is obligatory (see, further, §3.2 and §3.3) below.

content such as *(dis)like, prefer, avoid.*[6] Morphologically, the trigger is not necessarily a canonic verb, but may be part of a defective or suppletive verbal paradigm (e.g., *carix* 'should, have to,' *yaxol* 'can, be able to'), or they may be adjectives [e.g., *muxrax* 'must, be-bound-to,' *mutar* 'allowed to,' *efšar* '(it's) possible'], or even nouns (*xaval* 'it's a pity,' *atid* 'future = is soon to').

The complement verb in monoclausal complex predicates is invariably in the infinitive, the most pervasive and multifunctional non-finite form in everyday usage (§2.4 above). Hebrew **infinitives** consist of an initial *lV-* 'to' prefixed to a verb stem, varying only in the vowel of the prefixal syllable, which depends on morphophonological factors such as verb template or stem-initial consonant – compare ***li-gmor*** '**to**-finish,' ***le-daber*** '**to**-talk,' ***la-xšov*** '**to**-think' (Berman, 2018c).[7] And it accords with the general trend in Hebrew for repeating prepositions under coordination (e.g., *hem mityaxasim ba-maamar **le-**vaayot polítiyot ve **la-**efšarut šel reforma* 'They refer in the article **to**-political problems and **to.the**-chances of reform'). Structurally, Hebrew modal/aspectual verbs do not undergo processes of grammaticization analogous to forms like English *wanna, hafta, gotta, gonna*. Rather, the prefixal *lV-* infinitive marker is fused, not with the preceding "trigger" but with its associated verb stem in Hebrew, reflecting its status as inflectional rather than clitic.

A second type of monoclausal complex predicate construction takes the form of an inflected trigger verb expressing "lative" aspect, defined as "moving/changing location in order to do something" (Berman and Slobin, 1994, p. 117). These constructions are analogous to what Vasilyeva et al. (2008) term "serial verb constructions" (e.g., *go get it, come get it*) in their analysis of the speech of young English-speaking children, coded by them as "one-clause sentences".[8] In Hebrew, the triggers in such constructions are restricted to the two basic motion verbs meaning 'come' and 'go,' invariably in Imperative mood [e.g., *bo(i)* 'come:IMP.2SG.M(F)' or *lex* 'go:IMP.2SG.M']; and the dependent complement verb may be in the infinitive or in one of two other irrealis mood forms in the language, Future Tense and Imperative Mood (Berman, 2015). These options are illustrated in (6), with (6a) from a university lecturer to his class, (6b) and (6c) from a mother to her 2-year old daughter (in 2nd person feminine), and an aunt to her 2-year-old nephew (in 2nd person masculine).

(6) (a) <u>Imperative</u>: ***bóu***   ***le-hipageš*** *šuv*
                              come:IMP.2PL.M INF-**meet** again

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[6]Hebrew grammarians treat the 'extended predicate' as a mixed bag of constructions, including both (modal) *asuy la-lexet* '(is) likely to-go,' *alul la-lexet* '(is) liable to-go,' *carix la-lexet* 'must, has to-go,' *hitkaven la-lexet* 'meant to-go,' and (aspectual) *omed la-lexet* 'stands = is about to-go,' *hitxil la-lexet* 'start to-go ∼ walk,' *atid la-lexet* '(is) future = due to-go,' constructed from a tensed verb or modal operator followed by an infinitive as well as the auxiliary *haya* 'was' + participle construction noted in §2.3 above (Blau, 1966; Azar, 1977; Cadqa, 1987).

[7]As in some other languages, the infinitival marker is the same as the bound preposition meaning 'to,' standing for dative case as well as direction toward.

[8]We avoid use of the term "sentence" since speakers – let alone young children – connot be credited with a clear sense of what constitutes a "sentence" in their language. Rather, the term "utterance" is used for the unit of young children's speech output, many of which do not necessarily constitute "clauses" as specified in the present context (see, too, Dromi and Berman, 1986).

ba-šavua ha-ba
in.the-week the-next
'Let's meet again next week'

(b) <u>Future</u>:   *az **bói***   *raq* ***nabit***
                    so **come:IMP.2SGF** only **will.look:1PL**
                    ba-tmunot
                    in.the-pictures.
                    'So come we'll just look at the pictures'
                    bo   ***noxal***   *dani*
                    come:IMP.2SG.M will.eat:1PL yogurt
                    ba-salon
                    in.the-living.room
                    'Let's eat yogurt in the living room'

(c) <u>Imperative</u>: ***léxi***   ***tevaqši***   *me-aba*
                    go:IMP.2SG.F will.ask:2SGF from-daddy
                    še-yadlik   *et*
                    that-will.turn.on:3SG.M ACC
                    ha-mazgan
                    the-air.conditioner
                    'Go ask Daddy to turn on the airconditioner'
                    bo tešev   *kan* *še-ani*
                    come sit:IMP.2SG.M here that-I
                    uxal   *li-rot*
                    will.be.able INF-see
                    'Come sit here so that I can see'

These imperative triggers function pragmatically as "directives" urging the interlocutor to perform an action (if the following verb is in 2nd person) or to cooperate in a given action (if the verb is in 1st person plural, analogously to English *let's*), so are common in early child language input and output. Unlike "extended predicates" with modal, aspectual, or evaluative trigger verbs, these constructions are confined lexically to two basic lative verbs, and are limited discursively to interactive, typically informal, casual conversational contexts, like the equivalent English "let's".

In sum, complex predicates in the form of what are termed "extended predicates" in traditional Hebrew studies were identified as the major instance of monoclausal verb combining in MH, as highly productive and generally applicable across types of discourse. Such constructions manifest relations of bound dependency between the initial modulating element (modal, aspectual, or evaluative) and its associated non-finite complement. They are a key facet of MH grammar, constituting **the** means *par excellence* of elaborating VPs in Hebrew and, as shown below (§5.1), are early acquired and widely used in child as well as adult language.

3.1.2 Mono-Clausal Infinitive Chaining

A major means of elaborating extended predicates is by **chaining infinitives**, as in (constructed) sequences like *hu xašav **le-hatxil la-avod** šam* 'he thought **to-begin to-work** there = he contemplated starting to work there,' *hem nisu **le-hamšix la-azor le-tapel** bo* 'they tried **to-continue to-help to-look.after** him = they tried to go on helping to treat him'. In such constructions, the first infinitive functions as both a trigger and

a complement element inside more complex and elaborated, verb-phrase constructions. Nonetheless, these are still analyzed as mono-clausal since only the final infinitival element *la-avod* 'to-work' or *le-tapel* 'to-treat' encodes the conceptual content of the clause, modified by the other, infinitival, elements that precede it. These intra-clausal infinitive chaining constructions meet the three criteria specified earlier for mono-clausal verb chaining, with a high level of inter-verb dependency, since modal, aspectual, and evaluative verbs or verbal operators both semantically and grammatically require a complementary element. These turn out to occur only late in acquisition, rarely with more than two infinitival triggers to a single "main verb" (§5.1).

3.2 Inter-Clausal Predicate Chaining

The next category of analysis involves various types of **inter-clausal** chaining of predicates, starting with an intermediate construction that has some but not all of the features of mon-clausal chaining (§3.2.1), followed by bi-clausal and multi-clausal non-finite coordinated (§3.2.2), and finite constructions constructions (§3.2.3).

3.2.1 Intermediate Constructions

Constructions lying between mono-clausal complex predicates and inter-clausal predicate chaining take the surface form of {(NP) V PREP-PRO/N] V-Inf}, representing an intermediate level of Main Clause + Non-finite Complement clauses. On the one hand, like the monoclausal constructions discussed above, the second, complement verb is fully dependent, since its clause cannot stand alone. On the other hand, the subject or topic of the verb of the introductory clause refers to the (typically pronominal) **object** and not the subject of the following infinitive, so that semantically the construction can be interpreted as referring to two distinct situations. This is illustrated by examples from a 2-year-old in (7a) and her mother in (7b), as follows: (7a) **you** will allow/**I** will play, (7b) **Mommy** doesn't allow/**you** must not touch.

(7) (a) **titni   li   le-saxek** ba-bacek
       give:IMP.2SG.F to.me INF-play in.the-dough
       'Let me play with the dough'
    (b) *mesukan, lo la-gáat*, **ima   lo marša**
       dangerous, not INF-touch, Mommy not allow:SG.F
       lax   la-gáat
       you:SG.F INF-touch.
       'It's dangerous, don't touch it, Mommy doesn't allow you to touch it'

These constructions typically express requests, orders, and prohibitions (e.g., *amar lo la-azov* 'told (to) him to-leave,' *bikeš mi-menu la-azov* 'asked of-him to-leave' *asar al-av la-azov* 'forbade on-him to-leave,' and so differ in semantic content and pragmatic function from monoclausal complex predicates. In Hebrew, they also serve to express causation, corresponding to forms which in English forms may take an unmarked or an infinitival form of the complement verb (e.g., **let** *him go~ allow him to go*; **mak**e *him go~ force him to go*; **have** *him go~ cause him*

to go). In Hebrew, as expected, the complement verb is infinitival rather than a bare stem, although semantically, in both languages, such constructions express similar notions: Permission: *ten li la-léxet* 'give me = let me to-go,' *tarše lo la-léxet* 'allow him to-go'; Prohibition: *asur lexa la-léxet* '(it's) forbidden to.you (= for you) to-go'; Causation: *garam lánu la-léxet* 'caused us to-go,' *hevi otánu la-léxet* 'brought = led us to-go'-; Compulsion: *ilec otam la-léxet* 'compelled them to-go,' *hixriax otánu la-léxet* 'forced us to-go'; or Requesting: *bikeš miména la-léxet* 'asked from her to-go'.

Moreover, in Hebrew these constructions in most cases alternate with **finite** tense-marked subordinate clauses, as in the constructed examples in (8).

(8) (a) *hu amar   **li]** še   hem yelxu
       he say:PST.3SG.M **to.me]** **that** they will.go
       'He told me they would go'[9]
    (b) *hem bikšu   **mi-itánu]** še   naazor
       they ask:PST.3PL **from-us]** **that** will.help:1PL
       'They asked of us to help'

These constructions, as noted, are typically triggered by *verba dicendi* such as *say, tell, ask* which alternate with non-finite complement clauses, which can also take same-subject reference (e.g., *amar-ti lo] še elex]* 'told-1SG him] that 1SG'-will.go' = 'I told him that I would go']). In contrast, cognitive verbs (like *know, think, understand,* etc.) tend to require finite complements, and involve a change to a modal or aspectual sense when used in monoclausal constructions. Compare *yodea li-sxot* 'know (how) to = be able to swim'/*yodea] še hem soxim* 'knows] that they swim'; *xošev la-azov* 'thinks to-leave = thinks of leaving, plans to leave'/*xošev]* *še hem azvu* 'thinks] that they left'. Thus, while semantically, canonical mono-clausal verb chains in Hebrew express modal, aspectual, or evaluative modifications of the main lexical verb, the constructions noted here that employ speech act and mental state-related trigger verbs imply different participants, hence distinct situations. These constructions are mentioned here for purposes of cross-linguistic comparison, but are not noted as a special level of development in the findings delineated in Section "Findings" below.

3.2.2 Inter-Clausal Predicate Chaining by Coordination

Like other Semitic languages, MH makes wide use of *parataxis* as a means of combining parallel or equivalent constructions (see, for Hebrew, Bar-Lev, 1986; Nir and Berman, 2010, and for Arabic, Kaplan, 1966; Johnstone, 1987; Ostler, 1987, 1988). Concern here is with coordination (Haspelmath, 2007) as a means of **inter-clausal syntactic chaining**. Consider, first, coordination of **non-finite** verbs by chaining of two or more "extended predicates" with the basic coordinating conjunction *ve* 'and' (Berman, 1996) as illustrated in (9) below.

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[9] If the complement clause in (8a) had the same surface form as that of the main clause *hu amar li] še-hu yelex* 'he told me] that he would go,' reference is ambiguous, since the second *hu* 'he' of going could be either coreferential with the *hu* of telling or refer to two different boys or men. On the other hand, if the subject pronoun is deleted in the subordinate clause *hu amar li] še- yelex* 'he told me] that-0 would go,' the two clauses are necessasrily coreferential (see, further, §3.2.3).

(9) (a) [Mother to her 2-year-old daughter]
         carix li-šon   *al*   *ha-mita]*
         must INF-sleep on the-bed]
         ve *lo* **le-cayer** *aléha be-kapot ha-ragláyim*
         and not **INF-draw** on.it with-palms the-feet
         'You're supposed to sleep in your bed and not to draw
         (pictures) on it with your feet'

    (b) [7-year-old's picture-based account]
         hu ***raca li-tfos***   *et*   *ha-ciporim]* ***ve le-exol***
         he **want INF-catch** ACC the-birds] **and to-eat**
         otam
         them
         'He wanted to catch the birds and eat them'

The examples in (10) illustrate more sophisticated and
elaborate predicating chains of internally complex clauses in
(10a) and of more than two clauses in (10b).

    (10) (a) [A woman's account of interpersonal conflict]
              hi *mištadelét kama*   *še* *yoter*
              she tries   how.much that more
              la-asot   *ra'aš,]*
              INF-make noise]
              ve **le-hafgin**   *et* *kol* *ha-yexolot*
              and **INF-demonstrate** ACC all   the-abilities
              ha-muzikáliyot ha-lo muclaxot šela
              the-musical   the-not successful of.her
              'She tries as hard as she can to make a noise and to
              demonstrate all her unsuccessful musical talents'

        (b) [A 9-year-old boy talking about difficulties in class]
              ha-more *carix* **la-azor** *lo]* ***ve*** **le-hasbir**
              the-teacher must **INF-help** him] **and** **INF-explain**
              lo] . . .
              to.him]. . .
              la-more   *asur*   **li-cok** *al yeladim]*
              to.the-teacher forbidden **INF-yell** at kids]
              ve *le-* . . .] **le-haxzik** *otam]* ***ve*** **la-káxat** *otam*
              and INF. . . **INF-hold** them] **and** **INF-take** them
              la-mnahel . . .
              to.the-principal. . .
              'The teacher has to help him and explain to him. The
              teacher shouldn't yell at kids and keep them in and
              take them to the principle'.

As the examples in (9) and (10) show, unlike their English
counterparts, the chaining of infinitives necessarily involves
repetition of the bound infinitival marker *le-* or *li-* which is
inseparable from its verb stem.

The main type of non-finite **subordinate clause** combining
in Hebrew (except for Gerunds which, as noted in §2.4 above,
are highly formal and not relevant to child language) occurs
with adverbials of purpose. Uniquely to such constructions, the
two clauses may but need not be marked by an overt lexical
connector, as in (11a) to (11c), from the "frog-story" sample of
picturebook narratives, from children aged 5 and 9 years and
from an adult respectively.

    (11) (a) *hu* *tipes*   *al* *ha-ec]* **le-xapes**   *et*

He climbed up the-tree] **INF-look.for** ACC
ha-cfardéa
the-frog

    (b) *hu* *tipes*   *al ha-ec]*   ***kdey le-xapes***   *et*
         he climbed up the-tree]   **so.as INF-look.for** ACC
         ha-cfardéa
         the-frog

    (c) *hu* *tipes*   *al ha-ec]*   ***al mnat le-xapes***
         he climbed up the-tree]   **in order INF-look.for**
         et ha-cfardéa
         ACC the-frog[10]

Another type of bi-clausal predicate chaining is by **finite**
coordination. In the present context, this is confined to cases of
same-subject deletion in the conjunct clause or clauses. Hebrew
(like English and French, but unlike Spanish or Italian) allows
pronominalization of the coreferential subject of coordinated
clauses, so that subject ellipsis can be viewed here as a cohesive
type of clause combining or packaging, as in (12) from two
grade-school children.

    (12) (a) [9-year-old-boy's "frog story" picture book account]
              ha-yéled tipes   *al ha-ec]* *ve*   *kara*
              the-boy   climbed on the-tree] and **0** called
              la-cfardéa
              for.the-frog

        (b) [9-year-old girl's personal experience account]
              axoti   *lakxa li*   *et*   *ha-táblet]*
              my.sister took my ACC the-tablet]
              ve   *serva*   *le-haxzir*   *li*
              and **0** refused INF-give.back to.me
              'My sister took my i-pad and refused to give it back
              to me'.

Predicate chaining by means of same-subject coordinate and
(one type of adverbial) constructions, both non-finite and finite,
is an important feature of MH syntax, one which develops toward
late preschool age, as detailed in Section "Inter-clausal Predicate
Chaining" below.

3.3 Predicate Chaining as a Means of Discourse Connectivity

The final level of verb-predicate chaining considered here
occurs in extended discourse, as a facet of what we termed
"syntactic packaging" (Berman and Slobin, 1994, pp. 13–15)
or "clause packaging" (Berman and Nir-Sagiv, 2009) in earlier
analyses of narrative texts. Reference here is to chaining of
chunks of three or more clauses where only the first makes
overt (pronominal or lexical) mention of the topic-subject, and
the following are joined by coordination and/or subjectless

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[10]Non-finite adverbial subordination in Hebrew typically occurs with a preposition
followed by *še* 'that' (compare *exarnu* **biglal** *ha-géšem* 'we-were late because-of-the-
rain' ∼ *exarnu* **biglal** *še yarad géšem* 'we-were late because came-down rain = it
rained'). A few prepositions, however, in addition to those marking purpose as in
(11a) to (11c) can precede non-finite subordinate clauses, in which case they are
followed by infinitives, not by participles, as in the following example from a high
school student: *nisíti le-hasbir la]* **bli li-fgóa ba** 'I tried to-explain to her] without
to-offend her = without offending her'.

subordinate clauses. This section is divided between multi-clausal non-finite predicate chaining (§3.3.1) supplemented by chaining of finite coordination in some cases co-occurring with subordinated clauses (§3.3.2). Functionally, these constructions serve the purpose of "topic continuity in discourse" as defined, including examples from Modern Hebrew, by Givón (1983).

3.3.1 Non-finite Coordinated Chains

One kind of discursive chunking takes the form of an initial extended predicate in the form of a tensed trigger + infinitival complement going beyond the canonically bi-clausal "extended predicate" construction to include several infinitival predicates marked by overt coordinating conjunctions, as in (10b) above, with more elaborate examples in (13) and (14).

(13) [From a 10-year-old talking about "problems between people" (Reilly et al., 2002)]

(i) *asur* **le-haatik** *yéled* *mi-yéled*
forbidden **INF-copy** child to-child

(ii) ***gam*** *lo* ***la-tet*** ***le-haatik***
also not **INF-allow** **INF-copy**

(iii) ***lo*** ***la-xlom*** *be-mivxanim*
not **INF-dream** in-tests

(iv) ***éla*** ***la-asot*** *et* *ze . . .*
but **INF-do** ACC it . . .

(v) *keílu* *ata* *ose* *mivxan*
as.if you are.doing test
'It's not allowed to (= you shouldn't) copy one kid from the next, also not to let (others) copy, not to dream during tests, but to do it as if you were doing an exam'.

The excerpt in (13) is an extended and varied example of discursive predicate chaining by coordination of five different clauses. These are introduced by a main clause in the form of a present-tense copular clause with a modal + infinitival complement in (13-i), with the last clause in the generic present in (13-v). Instead of the repetitive, basic *ve* 'and', this boy strings his clauses together either by using the additive particle *gam* 'also, too, as well' in (13-iii) and the sophisticated adversative *éla* 'but' in the exclusive sense of German *sondern* rather than the basic contrastive conjunction *aval* 'but' in (13-iv).

Similar, tightly bound chunks with highly varied chaining of non-finite clauses occurred primarily in adult texts in our sample, as further illustrated in Section "Findings" on Results.

In another, yet more tightly packaged type of non-finite complement (and occasionally also adverbial) predicate chaining, the coordinating conjunction occurs at the beginning and end of the chunk, with **no overt marker** of the relation between the intermediate clauses, indicated by the zero in the example in (14) excerpted from a talk given by a university graduate student, on the topic of interpersonal conflict.

(14) (i) *meod* *meod* *xašuv* **le-lamed** *otánu*
very very important **INF-teach** us

(ii) ***ve*** ***gam*** *kol* *exad* *beécem* **li-lmod** *beacmo*
and also each one in.fact **INF-learn** by.himself

(iii) ***le-hakšiv*** *la-xaver* *šelo,*

0 INF-**listen** to.the-companion his,

(iv) *le-nasot* *la-xšov* *ex* *ha-xaver* *xošev,*
0 INF-**try** INF-**think** how the-companion thinks,

(v) *le-nasot* *le-havin* *me-efo* *hu* *magia,*
0 INF-**try** INF-**understand** from-where he coming,

(vi) ***ve*** ***az*** *ulay* **le-haclíax** **le-šader**
and then maybe INF-**manage** INF-**communicate**
be-oto *gal,*
on-same wavelength

(vii) ***ve*** ***li-mnóa*** *hamon* *beayot* *benenu.*
and INF-**prevent** many problems between.us.
'It is very very important to teach us and also for each one in fact to learn by himself to listen to his companion, to try to think how the companion thinks, to try to understand where he's coming from, and then maybe to manage to communicate on the same wavelength and to prevent lots of problems between us'.

In (14), the speaker chains no fewer than seven coordinated clauses in a single "syntactic package," marking this relation initially by *ve gam* 'and also' in (14ii), and concluding with a clause-initial *ve az* 'and then,' followed by *ve* 'and' in (14vi) and (14vii). The intermediate clauses are chained without overt marking in (14iii) to (14v), with a repeated clause-internal trigger *le-nasot* 'to-try to . . .' in (14-v) and (14v). This, like other examples from mature speakers in Section 5 below, manifests a high level of inter-clausal dependency at the service of discursive cohesivity.

3.3.2 Finite Clause Combining

Predicate chaining of same-subject **finite** clauses in MH may be seen as lying between coordination and subordination although, as noted earlier, unlike canonical clause chaining languages, Hebrew lacks a third category of non-finite clauses that are neither coordinated with nor subordinate to the finite clause. In terms of the hierarchical schema of different degrees of clause linkage proposed here for MH, the clauses in same-subject finite coordinations are more loosely combined then those in the preceding levels of predicate chaining, since the two (or more) coordinated clauses, like those in (15), can be analyzed as independent of one another syntactically as well as semantically. The examples in (15) are from adult conversational interactions, (15a) with a lexical subject followed by an overt 3rd person pronoun in present tense, the second (15b) with an inflected verb in 1st person past tense.

(15) (a) *hayom* *Sharon* *oréxet* *et* *mkomon* *Ramat Gan*]
today Sharon edit:F ACC local.paper Ramat Gan]
ve ***hi*** *gam* *lomédet* *xaci* *matkónet*
and she also study:F half time
ba-univérsita
at.the-university
'Today Sharon edits [~is editor of] the Ramat Gan local paper and she also studies half-time at the university'

(b) ***ani*** *gár-ti* *be-Tel Aviv* *ad* *sof* *ha-šišit*]
I live-**1SG** in-Tel Aviv till end the-10th.grade]

ve   az   avár-ti   dira   le-Hercliya[11]
and   then **0** moved-1SG apartment to-Herzlia
'I lived in Tel Aviv till the end of 10th grade and then moved to Herzlia'

The excerpt in (16) below illustrates a case of clauses packaged together syntactically that fits more closely into the hierarchy of predicate chaining as defined so far for MH, since it opens with two non-finite correlative coordinated clauses (joined by *o. . . o* 'or . . . or' in the sense of 'either . . . or').

(16) (i) ata   carix   o   *le-hitnacel*
          you:SG.M   must   or INF-**apologize**

  (ii) *o   la-xšov*
        or   INF-**think**

  (iii) *ex   še   ta-ase   et   ze   ba-atid*
         how   that 2SG.M-**do:FUT** ACC it in.the-future

  (iv) *kdey   še   te-šaper*
        in.order that 2SG.M-**improve:FUT**

  (v) *ex   še   ata   xaš*
       how   that you:2SG.M feel
       'You have to either apologize or think how you will act in the future so as to improve how you feel'

The example in (16) includes five clauses in a single clause package [defined as "a text-embedded unit of two or more clauses connected by abstract linkage relations that are typically but not necessarily identified by overt lexical markers and/or syntactic criteria" (Berman and Nir-Sagiv, 2009); and see, further, footnote 13 below]. The syntactic "package" in (16) contains mixed correlatively coordinated infinitives in (16i) and (16ii) followed by three subordinate clauses with finite verbs, which share generic-reference 2nd person future tense in singular number and masculine gender (Berman, 2005). Given that all the clauses meet the criterion of same-subject ellipsis without an overt pronoun except in the initial clause in (16i) and the concluding clause in (16v), with overt masculine singular *ata* 'you,' this string of clauses is analyzed as an instance of predicate chaining in Hebrew, combining both non-finite clauses in (16i) and (16ii) with finite future-tense verbs in (16iii) and (16iv). The fact that the package concludes with what we characterize as a "non-chained" clause with an overt pronoun *ata* 'you,' obligatory with the present tense verb in (16v), like 3rd person *hi* 'she' in (15a), fails to meet our criterion of "null-subject" dependent clauses, reflecting the asymmetry of verbs obligatorily inflected for person in past and future, compared with non-person inflected present tense in MH, as described in §2.5 above.

3.3.3 Topic Chaining by Juxtaposition

Under this heading, reference is to the most highly fused or integrated type of predicate chaining packages we found in our database for MH: Instances where strings of coordinated clauses are chained together in juxtaposition, without an overt coordinating conjunction like *ve* 'and,' *aval* 'but,' *o* 'or.'

Consider, first, the personal-experience account of a man asked to tell about an experience he had encountered with violence, in (17): Topic-switching and overt pronouns are marked by underlining. in (17vii) and "clause packages" (Nir-Sagiv, 2008; Berman and Nir-Sagiv, 2009) are indicated by double brackets]] and by a period in the free translation following (17xi).[12]

(17) (i) ***rác-ti*   le-éver   ha-nearim,***
          ran-1SG   toward   the-young.boys

  (ii) ***tafás-ti*   exad   me-hem,***
        caught-1SG one   of-them,

  (iii) *ve   **hitxál-ti**   la-xbot bo.*
         and **started-1SG** INF-hit him.

  (iv) *be-yad   axat   **tafás-ti**   et   ha-xulca šelo*
        with-hand one   **caught-1SG** ACC the-shirt his

  (v) *u- (= ve)   be-yad   šniya   **xaváteti**   bo*
       and   with-hand second **hit-1SG**   him
       ba-parcuf.
       in.the-face.

  (vi) *kaxa   **avár-ti**   me   ha-rišon*
        that's.how **moved-1SG** from the-first
        la-šeni   ve   la-šliši.]]
        to-second and to.the-third.]]

  (vii) <u>*ha-revi'i   še   ba-xavura*</u> **lakax** *éven gdola*
         <u>the-fourth   that   in.the-gang</u> **took** stone big

  (viii) *ve   **zarak**   le-evri.*
          and **threw**   at-me.
          *hu   **paga**   li   ba-cavar   me-axor.*]]
          he   **hit**   me   at.the-neck from-behind.]]

  (ix) <u>*ani*</u> **hitalaf-ti**   *le-kama dakot,*
        <u>I</u>   **fainted-1SG**   for-few minutes,

  (x) ***hitacbán-ti***   *al-av,*
       got.mad-1SG   at-him,

  (xi) ***hipál-ti***   *oto   la-ricpa,*
        threw-1SG   him   to.the-ground,

  (xii) ***tafás-ti***   *oto,*
         grabbed-1SG him,

  (xiii) *ve   **amár-ti**   lo*
          and **said-1SG**   to.him

  (xiv) *še   im   <u>hu</u>   od   paam   yacik   li,*
         that if   <u>he</u>   another time   bother:FUT me,

  (xv) <u>*ani*</u> **ešbor**   *lo   et   ha-parcuf.*]]
        <u>I</u>   smash:FUT.1SG to.him ACC the-face.]]

  (xvi) *yoter   <u>hu</u>   lo   hicik li.*
         more   <u>he</u>   not   bothered me.[13]
         'I ran toward the youngsters, caught hold of one of them, and started to hit him. With one hand (I) grabbed his shirt, and with the other hit him in the

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face. And in that way I shifted from the first to the second and the third. The fourth in the gang took a big stone and threw it at me. He hit me in the back of my neck. I passed out for a few minutes, got mad at him, threw him to the ground, caught hold of him, and told him that if he every troubled me again, I'd break up his face. He didn't trouble me any more'.

The text in (17) illustrates chaining of finite person-inflected verbs with or without overt surface pronominal or nominal marking of the grammatical subject, where mention of such a subject typically indicates topic shifting or contrastive emphasis.

An even more extreme instance of **topic chaining** by finite coordination is represented by the last example in (18) below, an excerpt from the picture-book narration elicited from a woman in her 20 s, where the past-tense verbs are marked by the plural suffix -*u* (Berman and Neeman, 1994, p. 324) and a double bracket]] indicates the end of a shared-topic chain. Here, as in general in Hebrew, topic switching is marked by a change in overt subject noun or noun phrase, often but not necessarily by tense-shifting between past and present tense.

(18) [Adult picturebook "frog-story" account]
  (i) *ba-bóker* <u>*ha-yéled ve ha-kélev*</u> **hitorer-u**
      in.the-morning <u>the-boy and the-dog</u> **woke.up-3PL**
  (ii) *ve* **ra-u**
       and **saw-3PL**
  (iii) *še* <u>*ha-cfardéa neelma*</u>!]]
        that <u>the-frog disappeared:3SG.F</u>!]]
  (iv) *hitxíl-u* *le-xapes ba-xéder*,
       began-3PL INF-search in.the-room,
  (v) *herím-u* *et ha-mita*,
      lifted-3PL ACC the-bed,
  (vi) *herím-u* *et ha-mnora*,
       lifted-3PL ACC the-lamp,
  (vii) *hezíz-u* *et ha-xalon*,
        moved-3PL ACC the-window,
  (viii) *xips-u* *mitáxat ha-naaláyim, btox*
         searched-3PL under the-shoes, in
         ha-garbáyim,
         the-socks,
  (ix) *lo* **ma-u** *šum davar*.
       not **found-3PL** not (a) thing.
  (x) *patx-u* *et ha-xalon*,
      opened-3PL ACC the-window,
  (xi) *caak-u* *baxuc*,]]
       yelled-3PL outside,]]
  (xii) <u>*ha-kélev*</u> *navax*.
        <u>the-dog</u> barked.
  (xiii) *šum davar, en cfardea, en naalayim*.]]
         not (a) thing, no frog, no shoes[14].]]
  (xiv) *himšíx-u* *le-xapes*,
        continued-3PL INF-search,
  (xiv) *histovev-u* *kcat misaviv la-bayit*,
        wandered-3PL some around to.the-house,

  (xv) *ve* *lo* **moc-im.**]]
       and not **find.PRS-PL.M**]]
  (xvi) *yac-u* *haxúca*.
        went-3PL outside.
  (xvii) *hitraxak-u* *kcat me-ha-báyit*,
         distanced-3PL little from-the-house,
  (xviii) *ve* **hitxíl-u** *li-cok be-kivun ha-ya'ar*.]]
          and **began-3PL** inf-shout in-direction the-forest.]]
  (xix) <u>*ha-yéled*</u> *caak*,
        <u>the-boy</u> yelled,
  (xx) <u>*ha-kélev*</u> *navax*,
       <u>the-dog</u> barked,
  (xxi) *ve* *en* *kol,* *ve* *en* *one*.]]
        and no sound, and no reply.]]
  (xxii) *himšíx-u* *le-xapes,*
         continued-3PL INF-search,
  (xxiii) *himšíx-u* *le-histovev* *btox ha-ya'ar*,
          continued-3PL INF-wander.around in the-forest,
  (xxiv) *tips-u* *al ha-ecim*.
         climbed-3PL on the-trees.
  (xxv) *šaalu* *xayot*
        asked-3PL animals
  (xxvi) *še-***pagš-u** *ba-dérex*,]]
         that-**met-3PL** on.the-way,]]
  (xxvii) *lo* **mo-im** *et ha-cfardea*
          not **find. PRS-PL.M** ACC the-frog
          'In the morning the boy and his dog woke-up and saw that the frog had disapapeared. They began to search in the room, lifted the bed, lifted the lamp, opened the window, looked under the shoes, inside the socks, didn't find anything, opened the window, yelled outside. The dog barked. Nothing, no frog, no shoes. They continued to search, walked a bit around the house, and didn't find (it). Went outside, moved away from the house, and started to yell in the direction of the forest. The boy yelled, the dog barked, and no voice and no reply. They continued to wander around in the forest, searched in the trees, asked animals that they met on the way, don't find the frog'.

The text in (18) reflects this particular narrator's personal propensity for use of the rhetorical device of **repetition**, both lexical and grammatical (Berman, 1988). It also reflects other quite general typological features of Hebrew. One is a relatively high-register device for topic-maintenance by the shared past-tense plural suffix switching to a full lexical noun when the topic changes from boy plus dog to boy or dog alone or frog. This reflects an efficient means of indicating switch-reference in Hebrew narrative discourse, even though the language lacks a specific morphological exponent for this purpose.

3.4 Predictions

The analytical framework delineated in Sections "Mono-Clausal Complex Predicates" to "Predicate Chaining as a Means of Discourse Connectivity" above, yields the following predictions:

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[14]Hebrew present tense existential and copular clauses typically lack an overt lexical verb, justifying classifying (18xiii) as a separate clause.

- Development will reflect structural complexity, shifting from early pre-school mono-clauseal non-finite + finite verb constructions (§3.1), via school-age inter-clausal chaining (§3.2), to extended chunks of discourse-motivated topic chaining from adolescence and beyond (§3.3).
- Development at the first level of mono-clausal structural complexity will reveal increased age-related lexico-semantic specification in the types of verbs and verbal operators serving as "triggers," as follows: modal > aspectual > evaluative.
- The finite triggers in non-finite verb and predicate chaining will increase with age in variety, semantic specificity, and level of usage.
- Development at each level of structural complexity will reveal increased verb/predicate embedding in the number of verbs and/or predicates chained together within as well as between clauses.
- Linkage of finite (coordinated and subordinated) clauses by (optional) deletion rather than pronominalization of the subject/topic shared across the chain will develop late.
- Extended topic chaining, with juxtaposed clauses unmarked by a connective conjunction, will occur only in mature text-construction.

4 DATABASE

As detailed in **Table 1**, the database of spoken Hebrew analyzed in this study consists of two types of corpora: (1) interactive conversations of adults with toddlers (**Table 1A**) and (2) different types of monologic narrative accounts of children from preschool via school-age and adolescence (**Table 1B**). On the reasons for reference to "utterances" as the basic units of toddlers' speech compared with "clauses" for extended narrative texts, see footnote 7 above (and see, further, Dromi and Berman, 1986).

The first set of data listed in **Table 1A** consists of longitudinal recordings of three toddlers between 1.6 and 3.0 years in interaction with an adult (Lustigman, 2016a,b). The longitudinal samples are taken from the child language database of the Berman lab at Tel Aviv University, a subset of which is available in the Berman corpus on CHILDES[15]. The children were audio-recorded for a total 1 h per week in their home environment, in everyday interaction with their caregivers. Investigators were university-educated family members (the mother in the case of the two girls, Lior and Hagar, and a paternal aunt in the case of the boy, Leor). These samples provide a richly contextualized data that reflect how relevant verb/predicate chaining constructions are used in everyday speech directed at children, on the one hand, and how and when these constructions emerge in children's speech, on the other. The longitudinal corpora are supported by reference to cross-sectional data based on single sessions of adult-child interchanges from 80 children, 20 per year-group from ages 1–5 years (Dromi and Berman, 1986).

These interactive data were supplemented, as shown in **Table 1B**, by extended texts in the form of oral narratives of children between ages 3 years to adolescence, native speakers of Hebrew from middle-class families with no known language or learning disorders, in each case including comparable groups of university educated adults. Sample sizes are given here for these cross-sectional data in terms of total number of clauses per age-group, where a "clause" corresponds to a unified predication, as defined at the outset of Section "Framework of Analysis" above. The narrative corpora were derived from three separate studies, as follows. The first set (i) derives from stories based on the "frogstory" picture book consisting of a booklet of 25 pictures without words depicting the adventures of a boy and his dog in search of their lost frog, which participants were asked to recount while looking at the pictures. Data analyzed here cover 12 children at each of the ages of 3, 4, 5, and 9 years, and a group of 12 college-educated adults. Average number of clauses per age-group ranged from 35 to 46 among the preschoolers aged 3–5, 58–60 at school age 9, and 70 among adults (Berman and Neeman, 1994). The second set (ii) consists of personal-experience narratives of 12 children at each of the ages 3, 5, 7, and 9, and a comparable group of university-educated adults, who were asked to recount to a family member or friend an experience in which they had quarreled or had a fight with someone. This design yielded largely interactive adult-child interchanges among the 3-year-olds as against monologic narrative texts produced by older children and adults. The texts elicited varied greatly in size between children and adults, with number of clauses per text among the two extreme age-groups (3-year-olds yielding 4–21 clauses per session, averaging 13.8 clauses in all and the 12 adult accounts ranging from 13 to 80 clauses, averaging 35.2 clauses across the group, while the older children (kindergarten 5–6 year-olds and school children aged 7–8 and 9–10 years varying far less, averaging between 9.3 and 9.8 clauses per narrative (Berman, 1995, 2001). A third set of narratives (iii) were elicited from 20 adults plus 20 school-going participants at each of three age groups (9–10 years, 12–13 years, and 16–17 years), who were first shown a short wordless video clip demonstrating young people in different situations of conflict – moral, social, and physical – and then asked to tell a story about an incident where they themselves had been involved in interpersonal conflict. In this data-set of narratives, number of clauses per text averaged 15 in the youngest group of gradeschoolers, 25 at middle school, 20 at high school, and 33 among adults (Berman and Nir-Sagiv, 2004, 2009).

This varied database is motivated in principle by the importance of going beyond the early phases of language acquisition noted in the Introduction, including the fact that children's early complements are confined to particular verb constructions (Diessel, 2004). Thus, in contrast to most psycholinguistic studies relying on semi- or non-structured elicitations of children's speech, not only do age ranges differ across our sample, but also communicative contexts, including interactive conversations and monologic narratives produced by different elicitation procedures. Moreover, as noted, all the corpora included adult participants as a point of comparison with children's language.

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[15]http://childes.psy.cmu.edu/data/Other/Hebre

TABLE 1A | Sources of adult-child interactive data by elicitation setting, age, size of corpus (total utterances), and reference sources.

Setting	Participants	Age-Range	Size of corpus: # Utterances	References
(i) Adult-child longitudinal	Lior, girl	2.0 – 3.1	12,031	Lustigman and Berman, 2016
	Leor, boy	2.0 – 3.0	13,646	
	Hagar, girl	2.0 – 3.3	8,153	
(ii) Adult-child cross-sectional	20 per year-group	1.0 – 1.11	3,892	Dromi and Berman, 1986
		2.0 – 2.11	8,455	
		3.0 – 3.11	6,752	
		4.0 – 4.11	3,895	

TABLE 1B | Narrative database by elicitation setting, number and age of participants, size of corpus (in clauses) and reference sources.

Elicitation setting	Participants	Age-Range	Size of corpus: Total # clauses	References
"Frog-story" narratives"	12 at each	3–4 years	367	Berman and Neeman, 1994
	age-group	4–5 years	451	
		5–6 years	619	
		9–10 years	748	
		20 s – 30 s	734	
"Fight-story" Narratives	12 at each	3.2 – 4.3	124	Berman, 1995
	age-group	5.0 – 5.6	112	
		7.0 – 7.6	118	
		9.0 – 9.11	120	
		20 s – 30 s	422	
Interpersonal conflict narratives	20 at each	Grade IV (9–10)	297	Ravid and Berman, 2006
	age-group	Grade VII (12–13)	502	
		Grade XI (16–17)	390	
		Adults (20 s – 30s)	654	

The following section presents findings from this diverse set of data in terms of different developmental phases, as explained in the Introduction (§1) for different types of verb/predicate chaining as defined and illustrated for MH in the preceding section (§3.1–§3.2).

5 FINDINGS

Findings are presented for different developmental phases at each of the three levels of verb/predicate chaining delineated in Section 3, as follows: Mono-clausal verb chaining (§5.1), Inter-clausal predicate chaining (§5.2), and Discursive topic chaining (§5.3). Our predictions were largely confirmed. The general developmental trajectory that emerges is initial usage of bi-verbal mono-clausal chaining, to acquisition of bi- and multi-clause predicate chaining, and on to mature mastery of complex, discursively motivated inter-clausal chunks of predicate chaining.

5.1 Monoclausal Chaining

"Complex predicates," in the form of a finite trigger verb followed by a verb in the infinitive in the same clause, occurred across the data-base (§4), from two-year-olds to adults, in conversational interactions and oral narratives. Consequently, findings for this construction are presented in greater detail than for the constructions described in Sections "Inter-clausal

Predicate Chaining" and "Predicate Chaining as a Means of Discourse Connectivity".

- **Monoclausal Phase I: Isolated Infinitives**

Infinitival forms emerge early in toddlers' speech (Lustigman, 2012) but, as shown by the examples in (19), from three different toddlers between ages 1.9 and 2.3, they initially serve as isolated predicating elements.[16]

(19) (a) *ima,*   *la-rédet*
   mommy, INF-**get.down**
   'I want to get down (from her high chair)'

(b) *li-xtov* *po!*
  INF-**write** here!
  'I want you to write it down here!'

(c) *li-rot,* *li-rot,* *li-rot* *ta séfer!*
  INF-**see,** INF-**see,** INF-**see** ACC.DEF book!
  'I want to-see the book = show me the book!'

(d) *le-saper* *li* *gamad* *katan*
  INF-**tell** to.me dwarf small
  'Tell me (the story about) the little dwarf'

(e) *la-sim* *kan?*

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[16]This analysis does not include the "pre-grammatical" phase of uninflected "bare stems" described in §2.1, since they typically occur as lone, hence non-clausal, items.

INF-**put**   here?
'Should I/can I put (it) down here?'

(f) ***lo***   ***li-pol!***
    not   INF-**fall!**
    'Don't fall!' (said to the child's teddy bear)

This widespread early use of "lone infinitives" in the form of truncated, rather juvenile constructions reflect various irrealis speech acts, like wishing, requesting, instructing, querying, or prohibiting – not, however, serving reportative or descriptive functions. And they typically follow on earlier emergence of the modal verb *roce/roca* 'want.PRES.3SG.M/F' without any complement. These uses are not characterized here as "pre-grammatical," since similar uses of lone infinitives occur in adult spoken Hebrew as well, typically but not only from caretakers, parents, and teachers, issuing orders and prohibitions to children (Berman, 2018c). Examples of such constructions in child-directed speech include:

axšav li-šon 'now (it's time to go) to-sleep,' *le-exol yafe!* 'to-eat nicely = don't mess,' *lo li-cok!* 'not to-shout = don't shout,' *kulam la-šévet* 'all to-sit = everybody sit down!'.

- **Monoclausal Phase II (a): Tensed trigger plus + Infinitive**

Isolated infinitives are soon expanded to mono-clausal verb chaining, as illustrated in (20) recorded from children aged 2.3–2.11 years old.

(20) (a) ***roc-a***   ***le-cayer***   *et*   *ha-kélev*
      want-SG.F   INF-**draw**   **ACC**   the-dog
      'I want to draw the dog'

(b) *lo*   ***yexol-a***   ***le-saper***   *lax*
     not   **can-SG.F**   INF-**tell**   to.you
     'I don't know how to tell you (the story)'

(c) *lo*   ***gamár-ti***   ***le-exol***
     not   **finish:.PST-1SG**   INF-**eat**
     'I haven't finished eating'

(d) *hu*   *lo*   *ohev*   *le-saxek*   *it-i*
     he   **not**   like   INF-**play**   with-me
     'He doesn't like playing with me'

Adult input uses similar trigger verbs in a wider range of inflected forms than their toddlers. These include, for example, *rací-nu* 'want:PST-1PL = we-wanted,' *t-uxl-i* 'FUT.2-can-2.F = you'll be able to,' in contrast to their children's invariant (except for gender-dependent self-reference) *roce~ roca* '(I) want:M~F,' *yaxol~ yexol-a* '(I) can:M~F'.

In **lexico-semantic terms**, once children start using "extended predicates" in MH, they expand them to a larger set of initiating modal expressions in addition to the initial very widespread 'want' in (20a) – mainly *yaxol* 'can, be able to' as in (20b) and *carix* 'must, have to'. These are followed by aspectual triggers like *gamar* 'finish' (20c), *hitxil* 'begin, start,' followed by an infinitive, and by evaluative expressions such as *ohev* 'like' in (20d), extended later to more sophisticated verbs like *maadif* 'prefer'. Children's modal expressions are by and large deontic, including permission/prohibition, requests, and judgments rather than epistemic modals referring to hypothetical contingencies, as

demonstrated by findings from texts written by school-age children in Hebrew and other languages (Reilly et al., 2002).

Adults' input to their toddlers, as noted, makes use of a richer repertoire of such expressions, including non-verbal triggers, as in the excerpts in (21) from a mother talking to her 20-month old daughter:

(21) (a) ***asur***   ***li-mróax***   *et*   *ha-pomelit*   *al*
      forbidden   INF-**smear**   ACC   the-grapefruit   on
      ha-šulxan
      the-table
      'You're not allowed to .../you mustn't spread grapefruit on the table'

(b) *et*   *ze*   ***i-efšar***   *ki*   *en*   *po*   *xor,*
     ACC   it   **non-possible**   because   not   here   hole,
     efšar   ***le-hašxil***   *rak*   *be-dvarim*   *sše-yeš*
     possible   INF-**thread**   only   in-things   that-be
     ba-hem   *xor*   *mi-šney*   *ha-cdadim*
     in-them   hole   from-both   the-sides
     'It's impossible (= you can't) because there's no hole here, you can thread only things that have a hole on both sides'

- **Monoclausal Phase II(b): Lative directives**

At the same time as children start using finite triggers with infinitival complements, they also make use of the other type of complex mono-clausal predicate noted in §3.1 above:

directives with the verbs meaning 'come' and 'go' inflected for tense or mood. The first example of such a construction in (21a) is ungrammatical, since the form *kfoc* is a lone stem without the required infinitival marker *li-* in the form *likfoc* 'to.jump'.

(21) (a) <u>Unmarked:</u> *doda Ogi,*   ***bo-i***   ***kfoc***
              Aunt Orly,   **come.IMP-SG.F**   **jump**
              'Auntie Orly, come and jump = let's jump'
              [Leor, 2;1.20, to his aunt]

     (b) **Infinitive:**   ***bo***   ***le-sader***   *et*   *ha-báyit*
              come:IMP.2SG.M   INF-**tidy**   ACC   the-house
              'Come and tidy up the house' [Lior, 2;1.27, to her mother]

     (c) <u>Future:</u>   ***bo-i***   ***ni-re***
              come.IMP-2-SG.F   **1PL- see:FUT**
              'let's see' [Hagar, 2;0.11, to her mother]

Our findings for use of the canonic "extended predicate" construction illustrated in toddlers' speech in (19) and in adult input in (20) from the longitudinal sample are compatible with those of Dromi and Berman (1986), as described in **Table 1A**. Their cross-sectional analysis of adult-child interactions revealed "a gradual rise in the use of more than one verb in the same clause: Around 3% of all clauses at age 2.0–2.11, as against some 6% at age 5 are 'expanded VPs' in which modal and aspectual verbs are used together with an infinitival subjectless complement".

- **Monoclausal Phase III: Later developments in verb chaining**

Two major developments were found beyond early childhood, consolidating in school-age and adolescent usage: (a) **syntactic**

chaining of two or more infinitival complements to a single trigger; and (b) elaboration of the **lexical repertoire** of trigger elements inflected for tense or mood.

Chaining of two or more infinitives is grammatically possible up to several such elements preceding the same "head" verb in a single clause (e.g., constructed *hu xašav le-hamšix le-nasot la-azor la-sader…* 'he thought to-continue to-try to-help to-arrange . . . = he thought of continuing to try to help arrange . . .'). These were largely confined to the usage of adolescents and adults. For example, in the occurrences illustrated in (22) through (25), listed by age-schooling level, the first example, in (22a) is largely formulaic.

(22) [From kindergarten children, aged 5 to 6 years, in interactive settings]

(a) *lo   roce   la-léxet   li-šon*
    not   **want**   INF-**go**   INF-**sleep**
    'I don't want to go to sleep'

(b) *hu   yodéa   le-lamed   le-saxek*
    he   **knows**   INF-**teach**   INF-**play**
    'He knows how to teach (people) to play'

(23) [From grade-school children, aged 7–9 years, in elicited texts]

(a) *hi   crix-a   li-lmod   le-daber   yafe*
    she   **must-SG.F**   INF-**learn**   INF-**talk**   pretty
    'She has to learn how to talk nicely'

(b) *hem   hexlít-u   le-hatxil   le-histovev   le-xapes*
    they   **decided-3PL**   INF-**begin**   INF-**wander**   INF-**search**
    et ha-cfardéa
    ACC the-frog
    'They decided to start walking about looking for the frog'

(24) [From high school students, aged 16–17, in elicited texts]

(a) *ani   lo   yaxol   le-haspik   la-azor*
    I   not   **can**   INF-**manage**   INF-**help**
                                            le-xa
                                            to-you
    'I can't manage [= don't have time] to help you'

(b) *hu   himšix   le-nasot   le-hatrid*
    he   **continued**   INF-try   INF-**harrass**
    oti   kol   ha-tixon
    me   all   the-high.school
    'He kept trying to harass me all through high school'

(25) [From adult graduate-students in their 20 s and 30 s, in elicited texts]

(a) *carix le-nasot   lo   le-hištameš   ba-yadáyim*
    must INF-**try**   not   INF-**use**   in-hands
    'We have to/people should try not to use their hands'

(b) *ani   yaxol   le-hamšix   li-xyot   im   ze*
    I   **can**   INF-**continue**   INF-**live**   with   it
    'I can go on living with that'

Chaining of more than two infinitives in a single clause, representing what we term Phase III "mastery" of monoclausal complex predicates, is illustrated in (26), from an adult talking about problems with this students.

(26) *atem   xayav-im   le-nasot   le-haclíax*
     you:PL   **obliged-PL**   INF-**try**   INF-**succeed**
     le-šaper   et
     INF-**improve**   ACC
     ha-ciyunim   šelaxem
     the-grades   **your**
     'You're must try and improve your grades'

The type of finite trigger verbs also changes in variety and level of usage with age. This is illustrated in (27), from adults' oral personal-experience narratives and discussions of interpersonal conflict, by semantic class of trigger verb or verbal operator.

(i) <u>Modal</u>: ***efšar** le-taken* '(it's) **possible** to-fix'
    *hayiti   **amura**   la-avod* 'I-was **supposed** to-work'
    ***aléxa**   li-lmod* '(it's incumbent) **upon** you to-learn**'**
    ***nitan**   li-rot* '(it's) **given** to-see = one can see'

(ii) <u>Aspectual</u>: ***notim** la-riv* '(they) **tend** to-quarrel'[17]
    ***hispíku** le-sakem* '(they) managed = had-time to-summarize'
    ***naclíax** le-sader* 'we'll-manage = succeed to-arrange'

(iii) <u>Attitudinal</u>: ***adif** la-asot* '(it's) preferable to-do . . .'
    ***naim** le-hizaxer* '(it's) nice to-remember'
    ***naxon** **yoter**   le-hitpašer* '(it's) better to-compromise'

In sum, mono-clausal complex predicates, typically with a single finite trigger verb, emerge early in development, but they are by no means a purely juvenile phenomenon in MH usage, both spoken and written (see, further, Berman and Nir-Sagiv, 2004). Phase III development reflects syntactic addition of more than a single infinitival complement to a given finite trigger, and lexico-semantic variety and register of trigger elements.

5.2 Inter-Clausal Predicate Chaining

As discussed in §3.2, in Hebrew this most typically applies across **coordinated constructions** with the second conjunct clause initiated by the conjunction *ve* 'and,' in the form of a null-subject construction, as in (28), repeated from (9) above.

(28) (a) [Mother to her 2-year-old]
     carix li-šon   al   ha-mita]
     must INF-**sleep** on   the-bed]
     ve   lo   le-cayer   aléha   be-kapot   ha-ragláyim

---

[17]The plural present tense forms of the two aspectual verbs meaning 'tend' and 'manage' in (27ii) occur without an overt pronoun, despite the general feature of non-person marking on present-tense *benoni* form verbs noted in §2.5. This is because they are used here in generic impersonal, subjectles constructionds (Berman, 2011).

    and not INF-**draw** on.it   with-palms the-legs
    'You're supposed to sleep in your bed and not to draw
    (pictures) on it with your feet'
  (b) [7-year old's picture-based account]
    hu   *raca*   *li-tfos*   *et*   *ha- ciporim]*   *ve*
    He   **wanted** INF-**catch** ACC the-birds]   **and**
    le-exol otam
    INF-**eat them**
    'He wanted to catch and eat the birds [= the bees]'

As detailed in §1.2, such constructions are analyzed as instances of **predicate chaining,** since they meet the criteria of (i) expressing two distinct events, hence representing separate clauses, (ii) being non-finite, hence more dependent and less autonomous than clauses with an overt subordinating marker, and (iii) the subject of both clauses being co-referential.

Although adults may use such constructions in addressing their toddlers, such constructions represent a more advanced phase than the monoclausal complex predicates delineated in the preceding section. They did not occur in the corpora analyzed for preschoolers from age 3 to 5 years, while the lone example in the longitudinal simple (*li-kro iton ve le-hadlik or* 'INF-read newspaper and INF-turn.on light,' from Leor, 2;7.11), does not really make sense, since typically switchng on a light precedes the act of reading.

Rather, young Hebrew-speaking children opt for different alternatives to non-finite predicate chaining by coordination. These are noted below "Phase I" precursors as to predicate chaining in Hebrew.

- **Interclausal Phase I: Precursors to non-finite predicate chaining:**

This takes three main forms, two in coordinated clauses, and a third mixing coordination and subordination with same-subject ellipsis. The first represents juvenile usage, with repetitive chaining of **finite** clauses introduced by 'and' followed by a superfluous and/or ambiguous pronoun or a topic-changing lexical, as in (29), from a picture-book account from a pre-kindergarten child.

(29) [Excerpt from "frogstory picturebook" account by a
    boy aged 4;2]
    ve   *axarkax*   *hu*   *yaca*
    'and afterward **he**   went.out
    ve   *hu*   *tipes*   *al ha-ec*
    'and **he**   climbed up the-tree
    ve   *axarkax*   *hu*   *nafal*   *me-ha-ec*
    'and afterward **he**   fell   from-the-tree
    ve   *axarkax*   *ha-kélev*   *barax.*
    'and afterward **the-dog**   ran.away'.

This type of juvenile combining of coordinated clauses is common in Hebrew children's storytelling, both in the frog-story corpus (Berman and Neeman, 1994, pp. 313–323) and in other narrative as well as interactive contexts (Berman, 1990, 1996; Lustigman and Berman, 2016). We do not analyze

this as predicate chaining, since it fails to meet the criterion stipulated earlier of requiring same-subject ellipsis across at least two clauses.

A more advanced type of early clause linkage is confined to **bi-clausal** coordination of **finite** clauses, using same-subject ellipsis as well as lexical and pronominal subjects. This is illustrated in (30) by coordinated constructions common in the narratives of children aged 5–7 years of age.

(30)   [Account of a quarrel by a girl aged 5;1]
  (i) *yom exad* **sixák-ti**   *xével ba-xacer,*
    day one   **play-PST-1SG**   rope in.the-yard,
  (ii) *pitom*   *yéled exad šovav* **kafac**
    suddenly boy   one   naughty **jump:PST**
  (iii) *ve*   *itxil*   *le-acik*   *lá-nu*
    and 0 **start:PST** INF-**annoy** to-us
  (iv) *ve*   *hifria*   *la-nu.*
    and 0 **bother:PST** to-us.
  (v) *az*   *kol ha-xaverot šel-i*   *hitacben-u.*
    then all the-friends of-me **got.mad-PL.**
  (vi) *ve*   *axarkax*   *hitxil-u*   *li-rdof*   *axar-av*
    and afterward 0 **began-PL** INF-**chase** after-him
  (vii) *ve*   *tafs-u*   *oto,*
    and 0 caught-PL him,
  (viii) *ve*   *az*   *hu yarak al-ay*
    and **then** he spat   on-me
  (ix) *ve*   *ani daxaf-ti*   *oto*
    and **I**   pushed-1SG him
  (x) *ve*   *amar-ti*   *oto la-ganenet.*
    and- 0 told-1SG him to.the-teacher.
    'One day (I) was playing jump-rope in the yard.
    Suddenly a rude kid jumped up and started annoying
    us, and bothering us. So my girlfriends and me all got
    mad. And afterward they began to run after him and
    caught him, and then he spat on me, and I pushed him,
    and told on him to the teacher'.

This story represents the "emergence" phase of **initial clause combining** of 5- to 6-year-old narratives in Hebrew. Anchored in past tense, 7 of the 10 clauses open with *ve,* like the more juvenile example in (28), in three instances supported by an overt marker of sequentiality in the form of *az* 'then, so' or *axarkax* 'afterward'. In contrast, lexical subjects or overt pronouns are used to indicate topic-shifting in clauses (ii) and (v) and clauses (viii) and (ix) respectively. **Finite clause combining** occurs with same-subject ellipsis, marked by zero in the gloss, in the rest of the clauses.

A rather more sophisticated alternative in children's narratives takes the form of **mixing** of finite coordination with subordination, introduced by the invariant subordinating conjunction *še* 'that' and also *ki* 'because,' as in (31), from a 6-year-old girl.

(31) (i) *páam axat, ze haya ba-yomuledet*   *šel yéled exad*
    time one it was in-the-birthday of boy   one
    me-ha-gan,
    from-the-school,

(ii) **ráv-ti**   im   xaver-a šel-i
     quarreled-1SG with friend-F of-me

(iii) **ki**   hi lo   racta   le-šatef   oti ba-misxak
      because she not wanted INF-include me in.the-game
      šel-ahem
      of-them

(iv) **az   kaás-ti**
     so 0 mad:PST-1SG

(v) **ve   amár-ti**   la
    and 0 told-1SG   to.her

(vi) **še   ani** brogez.
     that I   at-outs.

(vii) **ve   axarkax hi** bikš-a   mi-méni
      and afterward she asked-3SG.F from-me

(ix) *le-hašlim*
     INF-make.up

(x) **ve   hiskím-a**
    and 0 agreed-3SG.F

(xi) **še   ani gam yi-saxek**
     that I   also 1SG-play:FUT
     'Once at the birthday party of a kid at our kindergarten,
     I quarreled with my friend because she didn't want to
     let me join in their game. So I got mad and told her
     we're not friends, and afterward she asked me to make
     friends and agreed that I would also play'.

This type of clause combining manifests (Phase III-like)
command of grammatical inflection for person and tense,
as well as topic-shifting, and coordination interspersed with
subordination. However, it does not count as fully mature Phase
III topic chaining, since it does not meet the criterion of more
inter-dependent *non-finite* predicate chaining stipulated at the
outset of §3 above.

- **Interclausal Phase IIa: Bi-clausal chaining of non-finite predicates**

Contrary to what we had expected, bi-clausal predicate
chaining occurs only from school-age up, as shown in (32).

(32) (a) [From a 9-year-old personal narrative]

lifney	*šana*	**hitxil**	*yéled*
before	year	**began**	boy
exad	*me-ha-kita*	*še-li*	**la-rédet**
one	from-the-class	of-me	INF-hassle
al-ay			
on-me			
ve	**le-hagid**	*kol*	*miney*
and	**INF-say**	all	kinda
dvarim	*meod*	*mevadxim*	
things	very	amusing	
ledaato al	*kibucnikim*		
in.his.mind about		kibbutzniks	

'A year ago a kid from my class began hassling me
and saying all kinds of things about kibbutzniks that
he found funny'

(b) [From a high-school student recounting an experience
to a friend]

hu	*nahag*	**la-ruc**	*axar-ay*
he	used	INF-run	after-me
be-xol	*makom*]		
in-all	place]		
ve	**le-hatrid**	*oti*	*stam*
and	INF-harass	me	just
le-hanaa-to			
to-pleasure-his			

'He used to run after me all over the place, and harass
me just for his own enjoyment'.

The examples in (32) reflect another important advance in bi-
clausal predicate chaining: There is a marked increased in the
internal complexity of the clauses that are combined together,
with intra-clausal density of information co-occurring with inter-
clausal predicate combining.

- **Interclausal Phase IIb: Multi-clausal combining of non-finite predicates**

Predicate chaining in the form of combining more than
two infinitival clauses is also a school-age achievement, as
illustrated in (33).

(33) (a) [From a 9-year-old talking about violence
at school]

(i) | *la-more* | *asur* | **li-cok** |
|---|---|---|
| to.the-teacher | forbidden | INF-yell |
| *al* | *yeladim* | |
| on | children | |

(ii) | **ve** | **le-haxzik** | *otam* |
|---|---|---|
| **and** | **INF-keep** | them |

(iii) | **ve** | **la-káxat** | *otam* |
|---|---|---|
| **and** | **INF-take** | them |
| *la-mnahel* | | |
| to.the-principal | | |

'The teacher shouldn't/isn't allowed to yell at kids
and to keep them in and to take them to the
principal'.

(b) [From a high-school student's talk about problems
at school]

(i) | *lo* | *carix* | *le-haašim* | *otam* |
|---|---|---|---|
| not | must | INF-blame | them |

(ii) | *carix* | *li-mco* |
|---|---|
| must | INF-find |

(iii) | *me-efo* | *ze* | *matxil* |
|---|---|---|
| from-where | it | bebgins |

(iv)	*ve*	*le-tapel*	*be- ze*
	and	INF-tend	in-it
(v)	*ve*	*mi-gil*	*cair*
	and	from-age	young
	le-xanex		
	INF-educate		
(vi)	*ve*	*le-hasbir*	*kvar*
	and	INF-explain	already
	me-ha-gan		
	from-the-nurseryschool		
(vi)	*še*	*ze*	*ha-davar*	*ha-lo*
	that	it	the-thing	the-not
	naxon			
	right			

'One/you shouldn't blame them/They
shouldn't be blamed, you should find out
where it starts from and take care of it and
from a young age educate and explain right
from nursery school that it's the wrong thing'

Combining several non-finite clauses with *ve* 'and' turned out to be a relatively immature type of construction, en route to what we define as Phase III command of predicate chaining. As shown to some extent in (32b) compared with (32a), more proficient speakers tend **not** to repeat the basic coordinating marker. Rather, they select other options for multi-predicate chaining by alternating different kinds of coordinators with subordination as in (34).

(34)		[Adult's talk on problems between people]			
	(i)	*ata*	*carix*	*o*	*le-hitnacel*
		you	must	or	INF-apologize
	(ii)	*o*	*la-xšov*		
		or	INF-think		
	(iii)	*ex*	*la-asot* et	*ze*	*ba-atid*
		how	INF-do ACC	it	in.the-future
	(iv)	*kdey*	*le-šaper*	*et*	*ha-txuša*
		so.as	INF-improve	ACC	the-feeling
		šel-xa			
		of-you			

'You have to either apologize or think of how
to do it in future, in order to improve your
feeling about it'.

In (33), the speaker starts with a complex type of coordination, expressing alternativeness by the correlative *o*. . . o 'either . . .or' tightly linking clauses (33i) and (33ii), which are then followed by a question-complement clause in (33iii) and an adverbial of purpose in (33iv). In other words, multi-clausal coordination of the type illustrated in (32) cannot really be defined as having reached "Phase III". Rather, as shown in the next section, mature multi-clause predicate chaining takes the form of

juxtaposing of non-finite clauses as a means of cohesive topic maintenance in Hebrew.

5.3 Discursive Topic Chaining

A finding we had not expected is alluded to in the preceding paragraph.

- **Phase III of predicate chaining in MH**

This most advanced type of predicate chaining takes the form of packaging together coreferential (typically non-finite) clauses without any overt lexical connector. Such **chaining by juxtaposition** is illustrated by the excerpt from a high-school girl's narrative in (34), where the auxiliary verb *hayí-nu*.PST-1PL' is followed by a *participial* form of the verb standing for **habitual past** (as described earlier in §2.3).

(34)	(i)	*gadál-nu*	*betor*	*xavura šel*
		grew-1PL	as	group of
		yeladim		
		kids		
	(ii)	*še*	*hayí-nu*	*mamaš*
		that	be.PST-1PL	really
		kmo	*axim*	
		like	brothers	
	(iii)	*hayí -nu*	*os-im*	*ha-kol beyaxad*
		be:PST-1PL	do:PRS-PL	the-all together
	(iv)	*holx-im*	*le-betsefer*	
		go:PRS-PL	to-school	
	(v)	*xozr-im*		
		return:PRS-PL		
	(vi)	*yoc-im*	*ba-erev*	
		go.out.PRS-PL	in.the-evening	
	(vii)	*nos-im*	*le-mekomot*	*šonim*
		travel:PRS-PL	to-places	different
		beyaxad		
		together		
	(viii)	*im*	*ze*	*im*
		if	it	with
		ha-mišpaxot,		
		the-families		
	(ix)	*im*	*ze*	*bli*
		if	it	without
		ha-mišpaxot		
		the-families		

'We grew up as a group of kids who were just
like siblings, we used to do everything together,
go(ing) to school, go(ing) home from school,
go(ing) out in the evening, travel(ing) to
different places, whether with or without our
families'.

Phase III command of discursive predicate chaining in MH also manifests different choices with respect to the **temporal**

texture of a given piece of language. The text in (34) represents a stylistic option for use of a complex predicate to express habitual past tense in current Hebrew, which may but need not be employed when talking about events that used to occur in the past. In contrast, the adult's picturebook account describing the activities of the boy and his dog in search of their lost frog in (18) above relies on chaining of past tense predicates, interspersed with an occasional present tense verb in clauses (xv) and (xxviii) for highlighting a given situation.

A third option for Phase III advanced predicate chaining is illustrated by the "atemporal" non-narrative text in (35), showing extended juxtapositioning of coordinated clauses. This excerpt, from a college-graduate woman's talk on problems between people, likewise reveals symmetrical, inflectionally repetitive, chaining, here of infinitives following a noun phrase 'the nature of man = human nature'.

(35) (i) | beayot | ben | bney.adam | novot |
| --- | --- | --- | --- |
| problems | between | people | derive |
| mi-sibot | šonot | | |
| from-reasons | varied | | |
| ve | mi-écem | tiv-o | šel |
| and | from-actual | nature-his | of |
| ha-adam | | | |
| the-man | | | |

   (ii) **la-riv**
      INF-quarrel

   (iii) **le-hitvakéax**
      INF-argue

   (iv) **le-hitpalmes**
      INF-dispute

   (v) **le-hitxašben**
      INF-reckon.up

   (vi) **ve le-kane**
      and INF-**envy**

      'Problems between people come from various sources and from the very nature of man, to quarrel, to argue, to dispute, to keep accounts, and to be jealous'.

In (35), four infinitives are chained in juxtaposed clauses, headed by the same NP, and concluding with an overt coordinating conjunction.

Such chaining of juxtaposed coordinated clauses, relying on three types of temporality (simple past, habitual past, atemporal present) and interpreted here as representing Stage III in verb/predicate chaining in Hebrew, represent a particularly tight and cohesive or integrative type of clause combining at the service of discursive topic continuity and textual connectivity. Reflecting the highest level of verb/predicate chaining in MH usage, as noted further in the concluding section, these are **rhetorical options** available to proficient users at Stage III in mastery of their language, rather than grammatically required constructions. That is, not only are such extended chunks of discursively motivated

predicate chaining confined to mature, highly proficient usage, they represent stylistic choices on the part of individual speakers.

6 DISCUSSION

Two main insights emerge from this discussion of verb and predicate chaining in Modern Hebrew. First, the innovative hierarchy in different degrees of verb/predicate linkage, defined here for Hebrew as a non-clause chaining language, mirrors developmental phases in child language. Second, monoclausal chains of finite verbs or verbal operators followed by infinitival complements are grammatically obligatory, and are common from an early age, whereas bi- and multi-clausal predicate chaining represents an optional rhetorical choice on the part of a given speaker-writer in a particular communicative context and are largely confined to more mature language users.

The following discussion touches on the following topics: MH typology, the nature of this study, implications of its findings, and more general significance for child language and cross-linguistic research.

Typologically, the fact that Modern Hebrew lacks canonical types of clause-chaining constructions is attributed to such features as the absence of serial verb and converb constructions in the language (§2). Relatedly, the language lacks simplex verbs with no inflectional marking, so that it has no unequivocal "basic" or neutral verb form; many valence-changing and aspectual categories expressed with auxiliary verbs in other languages are encoded verb-internally by means of the morphological system of Semitic root-and-pattern verb formation. Of particular importance in the current context, the paucity of non-finite constructions outside of more formal registers places a heavy functional burden on infinitives as invariant, minimally inflected forms across the history of the language and in the use of speakers to this day.

Methodologically, the study differs from much work on language acquisition in the nature of its data-base which includes conversational interaction (longitudinal and cross-sectional) between adults and young children as well as different types of monologic discourse (§3). Analysis of findings was conducted in relation to different developmental phases, from initial emergence across structure-bound acquisition and on to discursively motivated usage of the constructions in question. Despite the diversity (in participants, age-groups, and elicitation settings), similar developmental trends were identified across different corpora. For example, in both natural everyday interactions with their caretakers or an investigator as well as in producing personal experience narratives, 3-year-olds were able to use mono-clausal verb chaining with non-finite modals and aspectual verbs followed by finite verbs. In contrast, only adolescents and adults constructed texts using the third and highest level of discursive topic chaining, across different types of narrative settings and elicitation procedures.

This diverse data-base meant that we were able to trace the history of a given construction-type – in this case verb/predicate chaining – from its emergence in early childhood

via its establishment as a well-formed grammatical structure, to consolidation as a contextually appropriate discursive device. Another advantage is that a variety of sources makes it possible to conduct comparisons of use of the target construction(s)in relation to different text-types (narrative or expository, descriptive or argumentative) and mediums of expression (written versus spoken). This was not undertaken in the present context, but preliminary analyses suggest that extended chaining of juxtaposed clauses with an overt subject/topic at the outset and an explicit connective conjunction only at the end may be favored in higher-register expository type discourse rather than personal experience narratives. Another suggestion emerging from this study is that the type of elicitation procedure has an effect on use of chaining constructions: These might be particularly favored in narratives based on graphic input in the form of picture-series (Karmiloff-Smith, 1979; Hickmann, 2003) or the "frogstory" picture book used in the present study (Berman and Slobin, 1994), where a series of events is presented graphically to participants – as illustrated above for Hebrew by the juvenile text in (29) compared with the maturely proficient adult text in (18), based on the same storybook. Moreover, alternation in the expression of temporality in verb/predicate chaining may emerge as a function of text-type as well as of target language typology (Kupersmitt, 2015). For example, the chaining of complex predicates in the habitual past with auxiliary 'be' plus a participle as in the text in (34) occurs in a narrative account of what the narrator used to do with her friends when she was younger, whereas simple past tense is used throughout in a text like that in (18) from an adult's picturebook account describing the activities of the boy and his dog in search of their lost frog. And these in turn contrast with reliance on large atemporal present tense in non-narrative contexts as illustrated in the text in (35).

Despite, perhaps thanks to, the typological constraints mitigating against clause chaining in MH, the study enabled us to define an original three-tiered classification as ranging in length (hence, also, structural complexity) from mono-clausal verb chaining (§3.1), to bi-clausal predicate chaining of coreferential, coordinated clauses with same-subject ellipsis (§3.2), and on to discursively motivated chunking of such constructions (§3.3). This hierarchy proved to reflect levels of development, on the one hand, and of syntactic-discursive integration, on the other. The only construction type found to occur across the data-base from toddlers to adults, in all types of elicitation settings, were monoclausal, consisting of a finite trigger verb plus infinitival complement verb. This can be explained both developmentally, as simplex types of verb phrase elaboration, and also typologically, as a key facet of MH syntax in all types of usage. Besides, in contrast to verb chaining in the monclausal complex predicate construction, the two other levels of inter-clausal predicate chaining are not obligatory in Hebrew and can generally be replaced by finite subordinated constructions. Rather, use of predicate chaining, both bi-clausal and even more so in cases of lengthy discursive chunking, represents a rhetorical choice on the part of a given speaker-writer in a particular communicative context (Nir and Berman, 2010).

The fact that speakers of MH were found to rely heavily on paratactic clause combining reflects the favoring of parallel or equivalent constructions noted for Biblical Hebrew (e.g., Hauser, 1980; Berlin, 1985; Polak, 1998; and see, too, references at the beginning of §3.2.2). Unlike the phenomenon of chiasmus defined for Biblical poetry as "reverse parallism" or "syntactic inversion," our database reveals a tendency to use juxtpositioning of clauses, each representing a different event or facet of a given event, without an overt lexical connective. This provides speakers of MH with a means of tightly cohesive discursive packaging, as shown with finite-verb clauses in the examples in (17) and (18) and with non-finite clauses in (34) and (35). This, too, reflects a stylistic option favored by some, though by no means all, of the texts in the adolescent and more markedly in the adult corpora.

Another type of alternation between individual rhetorical choices was found in mention or omission of repeated surface subjects typical of Hebrew narrative discourse, representing speakers' personal preferences for using a pronominal form where this is not grammatically required. In this, Hebrew differs from languages like Spanish or Italian where deletion of coreferential pronouns is obligatory. This is shown by the fact that in an earlier analysis of the cross-linguistic corpus of "frog story" picture-book based narratives, overt subject pronouns are extremely rare in the Spanish texts, they are used by as many as around three-quarters of the English-speaking narrators, and occur in around one-third of all clauses in the Hebrew texts, with little change between texts of preschoolers and adults in this respect (Berman and Slobin, 1994, p. 540). These distributions reflect the grammar of different target languages, here for languages where an overt subject pronoun is or is not required under subject/topic coreference (with English most subject-requiring, Hebrew mixed, and Spanish typically "pro-drop"). And they have not only typological, cross-linguistic, but also developmental significance, since where a feature is deeply entrenched in the grammar of a language, it is typically acquired early, so that its distribution will not change in a given communicative setting (such as picturebook-based narratives) as a function of age/schooling.

In terms of development, as noted, our predictions were largely confirmed. Young children use monoclausal Phase I verb chaining, moving only later to inter-clausal Phase II predicate chaining, while discursive Phase III topic chaining is confined to older speakers.

The study thus extends the notion of developmental phases enunciated in the Introduction to show that within given construction types (here, of verb/predicate chaining), different phases can be defined both within and across over-arching levels of syntactic complexity for a family of constructions in a given language.

The study also reveals the advantages noted by Elman (1993) for "starting small," with age-related additional length in packaging of speech output reflecting developing cognitive abilities in terms of processing of information, memory load, and pre-planning in production of extended chunks of inter-connected syntactic and thematic content. Moreover, increased inter-clausal length was often accompanied by heavier and more complex information-packing within the boundaries of a given

clause from middle childhood, as in the example in (31a) from a 4th-grade boy, translated into English as "A year ago, a kid in my class started to make fun of me] and to say all kinds of very things, amusing in his opinion about kibbutzniks]" – the first clause in Hebrew consisting of 9 words (vs. English 14) and the second of 11 (vs. English 14) in the more synthetically inflected Hebrew original. Taken together, these findings for increased chunking within a single syntactic package, combining intra- and inter-clausal density of information, highlight the role of verb/predicate chaining in the concurrent grammatical development of complex syntax and discursive development of information packaging.

The study also underscores another combination of linguistic abilities that develop in tandem: syntax and lexico-semantics. Across the analysis, more complex clause linkage involves more varied, specific, and higher-register use of lexical items such as modals and connectives, as in examples (13) and (25) to (27) above. And it also goes along with higher-level semantic options, as noted earlier for the shift in early childhood from modal to aspectual and evaluative "triggers," and from deontic to epistemic modal expression.

Numerous open questions remain from this initial study of verb/predicate chaining in Modern Hebrew. For example, cross-linguistic comparisons of parallel or at least corresponding data-bases in different languages might shed further light on typological issues in relation to language development. Detailed distributional analyses of both form and function of such constructions would help to delineate precise developmental trajectories while also shedding further light on the role of communicative context in their use in Hebrew as in other languages – in terms of discursive setting (interactive or monologic), genre (picture-based accounts, personal-experience or fictive narratives, expository or literary prose), and medium of production (spoken or written).

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

RB and LL worked in close cooperation with each other and with the editor of this special issue of Frontiers in Psychology throughout the process. RB contributed mainly in the domains of research on the grammar of Modern Hebrew and later language development. LL provided expertise and analyses in the domains of early child language and adult-child interaction.

ACKNOWLEDGMENTS

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To Link or Not to Link: Clause Chaining in Japanese Narratives

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Japanese is a clause chaining language, in which a sentence is formed by linking two or more clauses in a series (chain), using different forms of the verb in "non-final" clauses within the chain from the "final" clauses that end the chain. Since the verb comes at the end of a clause in Japanese, speakers must decide by the time they reach the verb at end of one clause whether or not to connect it to the following clause. This study analyzes the narratives of Japanese children and adults with the dual goal of discovering why narrators decide either to link the clause they are producing to the following clause or not to link, i.e., to end the clause chain. Stories were elicited from 60 3- to 7-year-old children and 10 adults, who performed two tasks: (1) telling the story depicted in a hand-drawn cartoon, and (2) viewing a 7-min video and then recounting the plot from memory. The data were analyzed qualitatively and quantitatively. The qualitative analysis examines story length and prompting, length of clause chains, variety of linking connectives, semantic relations—such as simultaneity, temporal sequence, and causality—between clauses in chains, shifts of subject from one story character to another (switch-reference), and contexts in stories where narrators end clause chains. For the quantitative analysis, a multifactorial, mixed-effects model was fit to determine which of several potential predictors have a significant effect on the probability that narrators will link clauses. The model is significant, though weak in discriminatory power. Among the significant effects, simultaneous relations between events increase the probability that narrators will link clauses, while changing the subject referent and reaching the end of a narrative unit, e.g., an episode, increase the probability that narrators will end their clause chain. There are no significant age effects: the children respond in the same way to the predictors as the adults. The qualitative and quantitative results of the study are interpreted with respect to the close relation between grammar (clause chains) and discourse (narrative structure) as well as the cognitive process of producing clause chains during narration.

Keywords: clause chain, Japanese, language development, semantic relations, switch-reference, narrative, mixed-effects model

Abbreviations: ACC, accusative; ADJ, adjective; CMPLT, completive; COP, copula; DAT, dative; DIM, diminutive; EXCL, exclamation; FHP, floor-holding particle; FS, false start; GEN, genitive; HON, honorific; IMP, imperative; INT, intentional; INSTR, instrumental; LOC, locative; NEG, negative; NOM, nominative; NPST, non-past; PASS, passive; PL, plural; POL, polite; POT, potential; PROG, progressive; PST, past; PURP, purpose; Q, question; QT, quotative; SFP, sentence-final particle; SUBJ, subject; TOP, topic.

INTRODUCTION

Clause chaining occupies a key position at the nexus of clause-level grammar and discourse structure. From a grammatical perspective, a clause chain consists of one or more "medial" clauses with non-finite verbs preceding a "final" clause with a finite verb, while from a discourse perspective, clause chains may constitute or help construct discourse units of varying size and function (Longacre, 1985, pp. 264, 282–283). Since clause chains figure prominently in longer stretches of discourse, analyses of clause chaining have often focused on narratives.

Prior research on Japanese narratives has emphasized the function of clause chains in creating and managing discourse continuity (Iwasaki, 1993a, Watanabe, 1994). To create continuity, speakers link clauses into chains on the basis of semantic relations such as additive, sequential, causal, means, contrastive, concessive, and conditional (Hasegawa, 1996, pp. 176–210; Iwasaki, 2002, pp. 247–260). At points of discontinuity, speakers may choose grammatical forms that reflect and signal the break, e.g., ending a clause chain when switching the subject referent (Iwasaki, 1993a, pp. 75–76).

Switch-reference, i.e., referential discontinuity, has been a major focus of research on clause chains since many clause chaining languages have morphology encoding whether the subject referent will be maintained or changed in the following clause. This morphology serves the discourse function of assisting the listener's referent tracking (Haiman and Munro, 1983, p. ix), which may be especially useful in narratives with multiple characters. Although switch-reference is not grammaticalized in Japanese, particular clause-linking connectives are followed by differing frequencies of switch-reference. Iwasaki (1993a, pp. 57–65) and Watanabe (1994, pp. 149–152) report that the most common connective, -te 'and (then),' is associated with subject continuity and -tara 'when, if' with discontinuity.

From a cognitive perspective, the process of producing of clause chains is organized by the typology of a language. Since Japanese is an SOV language and clause-linking forms either attach to the verb stem or follow an inflected verb, the speaker must decide by the end of each clause whether and how to link it to the following clause. This raises the question: What factors motivate speakers to link the current clause to the next or not to link, i.e., to end the clause chain in progress? The present study will address this question, using narrative data from Japanese children and adults.

Clause Chaining and Monoclausal Verb Linking in Japanese

Japanese fits the definition of a clause-chaining language in that there is a clear distinction between the non-finite verb forms in medial clauses and the finite forms in the last clause of a chain. The default clause-linking -te suffix in (1a) contrasts with the past tense verb inflection -ta in (1b), which could be used to end a chain and determine the tense of the preceding medial clauses.

(1) (a) nage-**te**   (b) nage-**ta**
          throw-TE   throw-PST
          'throws/threw and'   'threw'

The verb suffix -te 'and (then)' is the most frequent clause-linking connective suffix and the most neutral semantically; in clause chains, the sequence of clauses connected by -te is generally taken to represent the sequence of events (Iwasaki, 2002, p. 261). Semantically more specific suffixes also appear on verbs in medial clauses, e.g., -tara 'when, if' and -nagara 'while.'

Japanese clause chains depart from the standard definition, however, in that non-final clauses sometimes have finite verbs followed by a connective. Finite clauses with the conjunction to 'when, if' have received the most attention (Myhill and Hibiya, 1988; Iwasaki, 1993a, 2002). Since the verb preceding to is restricted to non-past tense, as in (2), it has been characterized as "partly non-finite" (Watanabe, 1994, p. 128); as with clause-linking suffixes, the actual tense depends on the final verb in the chain.

(2) nage-**ru**   **to**
      throw-NPST when
      'when (SUBJ) throws/threw'

While connectives such as to 'if, when' have tense restrictions, many connectives occur with finite verbs inflected for either past or non-past tense, as in (3).

(3) nage-**ru/ta**   **kara**
      throw-NPST/PST because
      'because (SUBJ)   throws/threw'

In discourse, Japanese speakers freely link clauses with non-finite (1a), "partly finite" (2), and fully finite (3) verbs within the same clause chain (Alpotov and Podlesskaya, 1995, p. 482; Iwasaki, 2002, p. 265). For purposes of this paper, therefore, I will use the term "non-final" rather than "medial" for clauses other than the last one within a chain. Despite their grammatical differences, non-final clauses typically display similar particles with pragmatic functions and prosodic patterns.

In addition to clause-final connectives, Japanese also has several lexical adverbs with a linking function. These connectives, such as soshite 'and then' and sorede 'and so/then', are usually found at the start of a new clause. Thus two linked clauses often feature a connective verb suffix such as -te at the end of the first clause as well as a freestanding adverbial like sorede at the beginning of the second clause. In this paper, I will focus exclusively on the former, clause-final type of clause linking.

The -te form in (1a) also serves a variety of monoclausal functions in which -te is suffixed to the stem of the initial, main verb while the second verb functions as an auxiliary. For example, V-te plus (i)ru/aru 'exist' forms progressive, perfective, and resultative aspects; V-te plus kuru 'come' and iku 'go' encodes inchoative aspect from different points of view; V-te plus shimau 'put away' (contracted to V-chau in Tokyo dialect) conveys completive aspect; and V-te plus ageru/kureru/kudasaru 'give' and V-te + morau 'receive') form benefactive constructions (Hasegawa, 1996; Iwasaki, 2002).

Acquisition of Monoclausal V-*te* V and Clause Chaining

Research on the acquisition of Japanese has documented the emergence of -*te* in monoclausal and clause-linking functions at approximately 2;0–2;6 years of age [summarized in Clancy (1985, pp. 425-426, 471-475)]. V-*te*, historically a reduced form of the benefactive construction V-*te kure/kudasai* 'V-TE give.IMP,' is a very common imperative in child-directed speech. In the first few months of inflecting verbs, children use -*te* in this function productively and contrastively with inflections such as -*ta* (past) and -*u* (non-past) and aspectual forms incorporating -*te*, such as V-*teru/-teta* (non-past/past progressive or resultative).

V-*te* also appears early in constructions expressing deontic modality, including requests, suggestions, permission, and prohibition. The main verb, inflected with variants of the -*te* suffix or -*tara* 'if,' is followed by predicates such as *ii* 'is all right' or *dame* 'not good,' which take the main clause as their argument (Hasegawa, 1996, pp.151–156). In the game of pretend play in (4), the child is telling her mother to eat the imaginary food she is serving (Akatsuka and Clancy, 1992, p. 186). The child's age appears in parentheses.

(4) tabe-**te** i-i.   (2;1)
     eat-TE be.all.right-NPST

     'It's all right to eat (it).'

Linking clauses with -*te* also begins soon after 2 years of age. In (5), the same child as in (4) is explaining how to place one game piece on top of another. She uses -*te* to link the non-final clause to the final clause, which has an inflected verb plus the sentence-final particle (SFP) *no* (Clancy, 1985, p. 472).

(5) koo   shi-**te** nose-**ru**   **no**.   (2;1)
     like.this   do-TE put.on-NPST SFP

     '(You) do like this and put (it) on/Doing like this, (you) put it on.'

Following -*te*, several other connectives appear in two-clause chains during the first half of the third year. Okubo (1967) documents the following forms in her daughter's speech before 2;6 years of age: *kara* 'because,' -*tara* 'when, if,' -*tari* 'and' (for repeated or representative actions), *toki* 'when,' *to* 'when/if,' *noni* 'although' and *kedo* 'but.' The suffix -*nagara* 'while' did not appear until much later, at 3;8.

Between 2 and 3 years of age, benefactive constructions with -*te* are also acquired (Horiguchi, 1979). Takahashi (1975) reports that 4-year-old children have acquired most constructions involving deictic and metaphorical motion with V-*te kuru/iku* 'V-TE come/go' (1975, cited in Hasegawa, 1996, p. 109).

In sum, longitudinal studies have found that by 3 years of age, Japanese children are using V-*te* as an imperative, in various tense/aspect forms incorporating -*te*, and in several constructions in which the main verb with -*te* suffix is followed by an auxiliary verb. In addition, the basic tools for clause chaining are in place: children can use -*te* and several other connectives to link clauses, and they know how to end clause chains with inflected verbs and, optionally, sentence-final forms such as *no*.

The Present Study

The primary goal of this study is to examine the semantic and discourse properties of clause chains in Japanese narratives, focusing on the factors that motivate narrators to link clauses into chains and to end clause chains in progress. Qualitative analysis will be used to address the following questions: When do children begin producing clause chains in narratives, and how do their clause chains change over time? What semantic relations can be identified in the clause chains of young children and adults, and which connectives do they use in conveying those relations? Does switch-reference impact narrators' choice of the default -*te* clause-linking suffix vs. the semantically more specific -*tara* 'when,' as documented in prior research? What discourse contexts are associated with narrators' use of finite verbs to end clause chains? Once potential motivations for clause linking and chain ending have been identified through qualitative analysis, a statistical analysis will be employed to discover which ones have a significant impact on narrators' decision to link—or not link—the clauses in their stories.

The paper is organized as follows. The following section describes the methodology for the study. The section "Qualitative Analysis" presents an analysis of the narrators' clause chains, with examples illustrating their key properties. In the section "To Link or Not to Link: A Statistical Analysis," several potential predictors of clause chaining vs. chain ending are modeled in a multifactorial, mixed-effects analysis. The final section concludes the paper with a general discussion and suggestions for further research.

METHODOLOGY

The narratives for this study were elicited using two methods: (1) having narrators tell the story of a nine-frame, hand-drawn cartoon, and (2) having narrators view a short video and then recount the story from memory. The first method has been popular in developmental research, e.g., Berman and Slobin's (1994) use of a wordless picture book about a runaway frog to elicit a multi-language corpus of "frog stories." The video method was introduced by Chafe (1980a) in his Pear Story project; participants viewed a short film and then told the story to an interviewer. Both methods have the advantage of giving the analyst full access to the experience underlying the story. Since narrators are all telling the same story, common patterns are easily recognizable, while comparison of adult vs. child narratives helps identify developmental differences.

Subjects

The participants in this study were 60 children and ten adults living in a middle-class suburb of Tokyo. The children, five girls

TABLE 1 | Cartoon and video data.

Age	Cartoon stories	Clauses	Video stories	Clauses
3;8 – 4;0	9	111	10	152
4;4 – 4;8	10	103	10	110
5;0 – 5;4	10	108	10	332
5;8 – 6;0	10	95	10	245
6;4 – 6;8	9	108	10	363
7;0 – 7;4	8	114	10	328
Adult	10	236	10	755
		875		2,285

and five boys at each of the age ranges in **Table 1** were attending either a private kindergarten for 3- to 6-year-olds or the first grade of a public elementary school. The adults were undergraduate and graduate students of 21–29 years old who were attending a private university nearby.

Materials

The cartoon used to elicit narration depicts in nine frames a story featuring two girls at a playground (see **Appendix**). During elicitation, the frames were displayed (unnumbered) in transparent covers taped horizontally from left to right. The video is a 7-min segment titled *"Akachango"* 'Babytalk' from the *Sazaesan* television series, a popular program about the everyday life of Sazaesan and her family. Since this program was being televised at the time of the study, the narrators were familiar with the characters and typical storylines. The cartoon and video stories are summarized below.

Cartoon frames: (1) An empty playground in a park. (2) Two girls, identified as Yukiko and Sachiko before the cartoon was shown, arrive at the playground, holding hands with their mothers and carrying balloons. (3) Sachiko is on a swing, holding her balloon. (4) Yukiko is on the slide, holding her balloon. (5) Yukiko is halfway down the slide, with a startled expression, as her balloon flies away. (6) Yukiko looks downcast as Sachiko approaches, holding her balloon. (7) Sachiko gives Yukiko her balloon. (8) Yukiko gives Sachiko her hat. (9) The girls leave the playground with their mothers, Yukiko holding Sachiko's balloon and Sachiko wearing Yukiko's hat.

Video: Baby Ikura is being cared for at Sazaesan's house because his mother is ill. He tears the house apart, opening drawers and throwing the contents around, to the great annoyance of Sazaesan's younger siblings, Wakame and Katsuo. The next day, Ikura's father returns to say that the baby will be at home with his now-recovered mother; then he apologizes for Ikura's bad behavior. Sazaesan's family is mystified, since they had not complained and Ikura does not know how to talk. Later, however, Ikura's mother reports that he told her about having searched Sazaesan's house for medicine to give her. She explains that a mother can understand her baby, which she proves by successfully "translating" Ikura's babbled claim that he has seen a snail on a leaf.

Table 1 summarizes the data for this study, including the number of cartoon and video stories available for analysis, as well as the total number of clauses they contain.

Of the 3,160 clauses in **Table 1**, 23.2% consist of single-clause sentences. The remaining 2,428 clauses occur in sentences having at least two clauses, and provide the data for the statistical analysis. The overwhelming majority of these clauses appear either in chains having only non-finite verbs in their non-final clauses (58.7%) or in chains with both non-finite and finite verbs in their non-final clauses (35%). Only 6.3% appear in chains having only finite verbs in their non-final clauses.

Data Collection and Transcription

The elicitation sessions took place at the kindergarten and elementary school attended by the children. Each child met individually with two female college students, who served as elicitor and listener for the storytelling tasks. The cartoon elicitation was presented as a game in which the child sat beside the elicitor, with the cartoon spread out on a table in front of them, and told the story to the listener, who sat with her eyes covered to reduce the child's reliance on pointing. Next, the listener made an excuse to leave the room, and the child watched the Sazaesan video with the elicitor. The listener then returned and asked the child: *Donna hanashi datta no?* 'What was the story?' If the child fell silent during narration, the elicitor prompted: *Sorede?* 'And then?' or *Doo shita no?* 'What happened/what did s/he do?' If the child still could not proceed, the elicitor used a standard set of specific prompts for different points in the storyline. If verbal prompts failed, the child was shown a few photos depicting scenes from the video. The same procedure was followed with the adults, except that no prompts were used and the listener did not cover her eyes during the cartoon elicitation.

The narratives were transcribed drawing on the conventions in Chafe (1980a, p. xv) and elaborated in Du Bois et al. (1992, 1993): commas mark the ends of intonation units and periods represent sentence-final falling intonation, regardless of whether sentence-final syntactic closure was used. Although most intonation units are preceded by silent pauses, they are not included here, in order to facilitate the reading of examples. Japanese narrators, especially children, often end non-final clauses and clause-internal intonation units with the tag-like particle *ne* and rising intonation (Clancy, 1982, pp. 61–63; Iwasaki, 1993b). In an extended turn such as a narrative, *ne* seeks the listener's continued cooperation in holding the floor (Cook, 1992, p. 524). Final clauses in a chain typically end with a verb inflected for past tense, the SFP *no*, and falling intonation.

QUALITATIVE ANALYSIS

In this section, a qualitative analysis will be presented of the following properties of the narratives: story length and prompting, semantic relations in clauses linked by the three most common connectives in the children's stories, switch-reference in non-final clauses, reformulations that change a connective or the status of a clause as non-final/final, chain length and diversity of

TABLE 2 | Story length and frequency of prompting.

Age	Mean # of clauses per story		Mean % of clauses prompted	
	Cartoon	Video	Cartoon	Video
3;8 – 4;0	12	15	0.32	0.70
4;4 – 4;8	10	11	0.39	0.44
5;0 – 5;4	11	33	0.05	0.12
5;8 – 6;0	10	25	0.08	0.11
6;4 – 6;8	12	36	0.03	0.06
7;0 – 7;4	14	33	0.02	0.08
Adult	24	76	0	0

linking forms, and narrative contexts associated with the end of clause chains.

Story Length and Prompting

Table 2 summarizes the narrators' average story length and percentage of prompted clauses at each age. The length of the children's cartoon stories is fairly constant, but beginning at 5 years of age there is a marked increase in the length of their video stories. The adults' stories, especially their video stories, are much longer on average than the children's. The greater length of the video stories suggests that the complex plot afforded a more open-ended opportunity for narration.

The children's need for prompting decreases dramatically with age, as **Table 2** shows. While 32% of the 3-year-olds' cartoon clauses and 70% of their video clauses need prompting, by 5 years of age, the children are much more capable of narrating without assistance. Overall, the video stories require more prompting; even the adults occasionally commented on their difficulty recalling the complicated storyline.

The stories of children who need extensive prompting take the form of a question-answer dialogue, similar to the heavily scaffolded conversational stories of 2-year-olds (Miller and Sperry, 1988). These dialogic narratives often consist entirely of single-clause responses, with no clause chains. The story excerpted in (6) includes 17 short sentences with 15 interviewer prompts. (The participant number and age of narrator appear in parentheses; I = interviewer, C = child).

(6) I: akachan   ga   genkan   ni   i-ta   deshoo. doo
       baby   NOM   entrance LOC be-PST COP.INT how

       shi-ta   no   akachan   sorede?
       do-pst   SFP   baby   then

   C: tansu   n   naka   ake-te-**ta**.   (7: 3;11)
       drawer   GEN   inside   open-PROG-PST

   I: a,   hontoo. sorede doo   shi-ta   no?
       EXCL   really   then   how   do-PST SFP

   C: gamuteepu   de   hat-te-**ta**   **no**.
       packing.tape INSTR   stick-PROG-PST   SFP

A: sorede? donna   itazura   shi-ta,   Ikura-chan?
    then   what.kind.of   mischief   do-PST   Ikura-DIM

C: ano   ne,   nage-**ta**   **no**.
    um   FHP   throw-PST   SFP

I: 'There was a baby in the entrance, right? What did the baby do then?'
C: '(He) was opening up drawers.'
I: 'Oh, really. Then what happened?'
C: '(Wakame and Katsuo) were sticking (the drawers shut) with tape.'
I: 'And then? What kind of mischief did Ikura do?'
C: 'Um, (he) threw (things).'

While most 3-year-olds need continuous scaffolding of their video narratives, two told the story with minimal or no prompting. The video story excerpted in (7) is 34 sentences long and has only a single prompt at the start, which is ignored. Nevertheless, as in (6), the narrator relies almost exclusively on single-clause sentences.

(7) I: hajime   ni   dare   ga   i-ta   no?
       beginning at   who   NOM be-PST SFP

   C: ijime-te-**ta**   **no**.   (10: 3;11)
       bother-PROG-PST SFP

       soshite   ne,   ason-de-**ta**   **no**.
       then   FHP   play-PROG-PST   SFP

       soshite   ne,   eto   ne,   byooki   dat-**ta**   **no**.
       then   FHP um   FHP   sick   COP-PST   SFP

       soshite   ne,   netsu   ga   at-**ta**   **no**.
       then   FHP   fever   NOM exist-PST   SFP

       soshite   ne,   ason-de-**ta**   **no**.
       then   FHP   play-PROG-PST   SFP

       soshite   ne,   otoosan   ga   ne,   mukae   ni
       then   FHP   father   NOM FHP call.for PURP

          ki-**ta**   **no**.
          come-PST   SFP

       soshite   ne,   warui koto   shite-**ta** **no**.
       then   FHP   bad   thing do-PST   SFP

   I: 'Who was there at the beginning?'
   C: '(Ikura) was bothering (Wakame and Katsuo).
       And then, (Ikura and Tara) were playing.
       And then, um (Ikura's mother) was sick.
       And then, (she) had a fever.
       And then, (they) were playing.

And then, (Ikura's) father came to get (him).
And then, (he) was doing bad things.'

Like the narrators in (6) and (7), many 3-year-olds formulate their stories one clause at a time with almost no clause linking; this pattern essentially equates clause and sentence.

To Link: Semantic Relations in Non-final Clauses

Clause Linking With -te

Although some children under 5 years of age make minimal use of clause chains in their stories, others freely use -te 'and (then),' and sometimes more specific connectives such as -tara 'when,' to create chains of two or more clauses. The non-final clauses in these chains feature many of the semantic relations described in research on Japanese adults' clause chaining (Watanabe, 1994; Hasegawa, 1996).

Three-year-olds, for example, often use -te in cases of simultaneous or temporally overlapping relations between two linked clauses. Such clauses are typically characterized as conveying manner, i.e., the way in which the action is performed (Watanabe, 1994, p. 132; Genetti, 2005, pp. 53–54). The narrator in (8) is recounting the arrival at the playground of the two girls in the cartoon story.

(8) unto sorede, unto ne,   fuusen mot-**te**   (6: 3;11)
    um   then,   um   FHP balloon carry-TE

  ki-ta   no.
  come-PST SFP

  'Um then, um, holding balloons,
  (Yukiko and Sachiko) came.'

In this example, there is potential ambiguity between a monoclausal interpretation of V-te kuru 'V-TE come,' in which mot-te kita 'carry-and came' is lexicalized as 'brought' ('they brought balloons') and a biclausal, clause-linking interpretation ('holding balloons, they came'). A number of criteria were used to differentiate between monoclausal and biclausal cases. When only a single event was involved, e.g., booshi kashi-te ageta 'lend-and gave hat' (lit. 'gave the favor of lending (her) hat') or fuusen ton-de itta 'balloon fly and went' ('the balloon flew away'), a monoclausal interpretation was assigned. When a two-verb sequence could be interpreted as involving either one or two events, additional factors were taken into account. If the two verbs were articulated in separate intonation units, they were coded as comprising two clauses. A biclausal interpretation was also made if lexical material separated the two verbs; for example, in fuusen motte mama to kita 'holding balloons with their mothers they came,' the phrase mama to 'with (their) mothers' intervenes between mot-te 'carry-and' and kita 'came,' ruling out a monoclausal reading of motte kita as 'brought.' In many cases, context distinguished between monoclausal vs. biclausal interpretations, making one of the interpretations implausible given the relevant events in the cartoon or video.

Using these criteria, only a handful of ambiguous cases remained, such as (8), in which both monoclausal and biclausal interpretations are plausible. Since the arrival of the main characters at the empty playground is the key event of the second frame of the cartoon and was explicitly mentioned by most narrators, (8) was coded as biclausal, although this interpretation is challengeable. When the narrator of a cartoon story had already mentioned the girls' arrival at the park, or when the focus was exclusively on the balloons, the sequence mot-te kita 'carry-and came' was analyzed as monoclausal: 'they brought balloons.'

The most common type of simultaneous or partially overlapping relation between clauses involves the use of the quotative particle tte to convey speech that is produced while performing an action, as in (9).

(9) arigatoo   **tte yut-te**   (29: 5;2)
    thank.you QT   say-TE

  morat-ta   no.
  receive-PST SFP

  'Saying "thank you,"
  (Sachiko) received (Yukiko's hat).'

Since the two-verb sequence yut-te moratta 'say-and received' in (9) has the same form as a benefactive construction, the sequence in (9) could be interpreted as '(Sachiko) received the favor of (Yukiko) saying "thank you."' However, context clearly rules out this monoclausal interpretation of the eighth cartoon frame, in which Yukiko gives Sachiko her hat (see **Appendix**).

The quotative construction in (9) is frequently used without an overt verb of saying, which leaves the clause with the reported speech ending in the quotative particle tte, as in (10).

(10) ato wa ne, un . . . hai **tte**   (3: 3;10)
    next TOP FHP um   yes QT

  age-ta   no.
  give-PST SFP

  'Next, (saying) "here,"
  (Sachiko) gave (Yukiko her balloon).'

For purposes of this paper, a clause ending in tte is treated as a non-final clause when produced with non-final intonation and as a final clause when used with sentence-final intonation.

Temporal sequence is generally regarded as the unmarked relation between clauses in a chain, whose order cannot be reversed without changing the meaning (Iwasaki, 2002, p. 261). In (11), for example, the reverse order of clauses does not make sense.

(11) oniichan   no hikidashi o   ne,   ake-**te** (10: 3;11)
    older.brother GEN drawer   ACC FHP open-TE

  chirakashite-ta   no.
  scatter-PST   SFP

'(Ikura) opened older brother's drawers and
scattered (things).'

In addition to temporal relations of simultaneity and
sequentiality, clause-linking with *-te* frequently conveys
causality, as in (12).

(12) Ikura-chan Wakame ni ne, oko-rare-**te**,   (6: 3;11)
    Ikura-DIM Wakame by FHP get.angry-PASS-TE

    Ikura-chan nai-chat-ta   no.
    Ikura-DIM cry-CMPLT-PST SFP

    '(Lit.) Ikura was gotten angry at by Wakame and,
    Ikura cried.'

The sequence of events in the video that was most likely to
elicit clause chaining in the youngest children's stories is the one
in (13):

(13) unto ne, oniichan no ne, unto ne,   (19: 4;6)
    um FHP older.br GEN FHP um FHP

    koohi no naka ni ne,
    coffee GEN middle LOC FHP

    keeki ga hait-**te** ne,
    cake NOM enter-TE FHP

    oniichan no kao ni ne, unto ne, ano
    older.brother GEN face LOC FHP um FHP um

    ne, koohi ga ton-**de** ne,
    FHP coffee NOM fly-TE FHP

    unto oniichan ga ne, unto ne, okot-ta.
    um older.brother NOM FHP um FHP get.angry-PST

    'Um, the cake went into um the middle of older brother's
    coffee and,
    um um the coffee flew into older brother's face and,
    um older brother um got angry.'

The event sequence in (13) combines two key types of
causality: physical (the cake lands in Katsuo's coffee and
splashes in his face) and psychological (Katsuo's coffee splashes
on him and he gets angry). A less direct type of causality
involves socially appropriate motivations for action, as in
(14): Sachiko gives Yukiko her balloon, so Yukiko gives
Sachiko her hat.

(14) soshite ne, fuusen o ne, age-te ne,   (14: 4;7)
    then FHP balloon ACC FHP give-TE FHP

    age-**te** ne,
    give-TE FHP

sorekara ne, to ne, booshi o ne, pinku no
then FHP um FHP hat ACC FHP pink GEN

    hito ni ne, age-ta no.
    person DAT FHP give-PST SFP

    'then, (Sachiko) gave, gave (Yukiko) her balloon and,
    then, um, (Yukiko) gave the person in pink her hat.'

Clauses that compare two states, events, or situations are
also sometimes linked by *-te*. The semantic relation in (15) is
contrastive, while that in (16), which first appears in the 5-year-
olds' stories, has been termed "additive" [Hasegawa, 1996, p. 6; cf.
Longacre's "coupling" relation (Longacre, 1985, p. 241)].

(15) Soshite, akai fuusen moo   (10: 3;11)
    then red balloon already

    mi- mot-te-**te**,
    FS- carry-PROG-TE

    soshite un momorenjya no ne, ak-
    then um Peach Ranger GEN FHP FS-

    unto pinku no fuusen mot-te-ta no.
    um pink GEN balloon carry-PROG-PST SFP

    'And then, (Yukiko) was already holding a red balloon and,
    then um (Sachiko) was holding a Peach Ranger, re- um pink
    balloon.'
    (Momorenjya/Peach Ranger: a female anime character with
    pink hair and outfit)

(16) sorede ne, Yuki-chan ga ne,   (29: 5;2)
    then FHP Yuki-DIM NOM FHP

    fuusen kat-**te**,
    balloon buy-TE

    Sat-chan mo fuusen kat-ta no ne,
    Sat-DIM also balloon buy-PST SFP FHP

    'and then, Yukiko bought a balloon and,
    Sachiko bought a balloon too,'

Clause Linking With *Kara* 'Because' and *-Tara* 'When'

As examples (8–16) illustrate, *-te* is compatible with a wide
range of semantic relations. V-*te* is the most common connective,
appearing in 77% of the children's non-final clauses and 46% of
the adults'. Next most frequent for the children are *-tara* 'when'
(7%) and *kara* 'because' (5%). *Kara* 'because' first appears in the
stories of the 3-year-olds, as in (17).

(17) yoochien   de   asob-e-na-**i**   **kara**,   (10: 3;11)
kindergarten LOC   play -POT-NEG-NPST   because

ouchi   de   ason-de-ta   no.
house   LOC   play-PROG-PST SFP

'(They) couldn't play at kindergarten so,
(they) were playing at home.'

Although -*te* can be used to link a reason to an action or event, it is much more common for narrators of all ages to use *kara* 'because', as in (18).

(18) okaasan ga   byooki dat-**ta**   **kara**   ne,   (18: 4;5)
mother NOM   sick   COP-PST because   FHP

kusuri   o   ne, age-yoo   to   shi-t
medicine ACC FHP give-INT COMP   FS

shi-te-ta   no.
do-PROG-PST   SFP

'his mother was sick so,
(Ikura) was try- trying to give (her) medicine.'

The suffix -*tara* 'when' first appears in the stories of the 4-year-olds. Since -*tara* can serve many of the same temporal functions as -*te* but is much less frequent, it breaks the monotony of -*te* linking, creating a tighter sense of interclausal connection.

Hasegawa (1996, pp. 208–209) includes "setting" as one of the functions of -*te* linking; in these stories, settings often present the arrival of new characters with -*te*. But using -*tara*, as in (19), evokes a sense of closer relation to, and expectation about, the events that are to come.

(19) Wakame-chan ga   ne,   gakkoo   kara   (26: 5;1)
Wakame-DIM   NOM   FHP school   from

kaet-te   ki-**tara**   ne,
return-TE   come-when   FHP

a... unto ne,   akachan ga   ne,   un
FS   um   FHP baby   NOM FHP   um

kutsu   nage-chat-te   ne,
shoe   throw-CMPLT-TE   FHP

'When Wakame comes home from school,
the baby throws a shoe and,'

An especially common use for -*tara* is to create a tight link between successive turns in reported dialogue, such as the question-answer sequence in (20).

(20) unto fuusen na-ku   nat-chat-ta
um   balloon not.exist-ADJ become-CMPLT-PST

no tte yut-**tara**   ne,   (50: 6;7)
SFP QT say-when FHP,

Sat-chan ga   soo   yut-ta   kara   ne,
Sat-DIM   NOM   yes   say-PST because   FHP

'um when (Yukiko) said, "Did (your) balloon disappear?"
Sachiko said "yes" so,'

The sense of something tellable to come that -*tara* conveys can be used by narrators to increase the suspense at key moments in a story. In the video scene that elicited -*tara* most reliably, Ikura's mother declares that her babbling child has said that there is a snail on a leaf, and Wakame and Katsuo rush to discover whether this is true.

(21) ano ne, Katsuo-kun to   ne, Wakame-chan   (47: 6;6)
um FHP Katsuo-DIM and FHP Wakame-DIM

ga   ne,   it-te   ne,
NOM   FHP   go-TE FHP,

nozoi-te   **mi-tara**   ne,
peek-TE   see-when   FHP

hontooni ne, katatsumuri ga   i-ta   no ne,
really   FHP snail   NOM   exist-PST   SFP FHP

'um, Katsuo and Wakame go and,
when they take a peek,
there really is a snail.'

Iwasaki describes this use of -*tara* as comprising a voluntary action followed by the stative perception it enables (Iwasaki, 1993a, p. 71), which Watanabe characterizes as the "discovery construction" (Watanabe, 1994, p. 172).

-*Tara* can also have a concessive flavor, which Watanabe dubs the "action in vain" interpretation (Watanabe, 1994, p. 136). In (22), Wakame and Katsuo tape their desk drawers shut in anticipation of Ikura's return, only to discover that he has not come.

(22) Katuso-kun to   ne, Wakame-chan ne,   (30: 5;2)
Katsuo-DIM and FHP Wakame-DIM FHP

hikidashi   ni   ne,
drawer   LOC   FHP

teepu   **hat-te-tara**   ne,
tape   stick-PROG-when   FHP

unto ne, Ikura-chan ko-na-katta   no   ne,
um   FHP Ikura-DIM come-NEG-PST   SFP FHP

'(But) when Katsuo and Wakame were sticking tape on
their drawers,
um Ikura didn't come,'

The conjunction *to* 'when, if' is extremely rare in the children's stories, although the adults occasionally use *to* instead of *-tara* in the contexts in (19–22). Watanabe's "discovery" and "action in vain" analyses are based on *to* but are equally applicable to *-tara* in the present data. Presumably, the children will begin to use *to* for certain *-tara* functions at a later stage of development.

Examples (8–22) illustrate the most common semantic relations between non-final clauses in the children's stories. The statistical analysis of predictors that increase/decrease the probability of clause linking will include the following semantic relations: manner, temporal sequence (with 'dialogue' as a subtype), causality, setting, and comparative (defined as encompassing additive, contrastive, and concessive relations).

Switch-Reference in Non-final Clauses

As noted in the Introduction, research on Japanese clause chains has found differing frequencies of switch-reference following different connectives. For example, Iwasaki reports that in his sample of spoken narratives, 89% of *-tara* clauses but only 19% of *-te* clauses were followed by switch-reference (Iwasaki, 1993a, p. 64). Myhill and Hibiya found a similar pattern (66% switch-reference following *to* vs. 27% following *-te*) in a novel (Myhill and Hibiya, 1988, pp. 377, 390), and Watanabe in narratives from elementary school textbooks: 73% switch-reference after *to*, 17% after *-te* (Watanabe, 1994, p. 150). Iwasaki concludes that *-te* is used for continuous subjects and *-tara* for discontinuous subjects, while Watanabe proposes that *-te* is a "true Same Subject device" in clauses with human subjects, 100% of which maintained the same subject referent in the clause following *-te* (Watanabe, 1994, p. 152).

The cartoon and video in this study feature multiple characters engaged in action-reaction scenarios and back-and-forth dialogue. The cartoon, in fact, was specifically designed to elicit switch-reference, and many cartoon stories, such as (23), have a different subject in each clause. In (23), the narrator switches the subject referent following both *-te* (lines 2, 5) and *-tara* (line 3).

(23) (1) Sat-chan ga ne, buranko   (37: 5;8)
        Sat-DIM   NOM FHP swing

      ni   not-**te**   ne,
      LOC   ride-TE   FHP

   (2) **Yuki-chan** ga   ne, suberidai ni   not-**tara**   ne,
       Yuki-DIM   NOM FHP slide   LOC ride-when FHP

   (3) **Yuki-chan no fuusen** ne, ton-jat-**ta**   **no.**
       Yuki-DIM GEN balloon FHP fly-CMPLT-PST SFP

   (4) Soshite ne, **Sat-chan** ga   ne, age-ru   tte
       then   FHP Sat-DIM   NOM FHP give-NPST QT

       yut-**te**   ne,
       say-TE   FHP

(5) **Yuki-chan** ga   ne, booshi age-**te**,
    Yuki-DIM   NOM FHP hat   give-TE

(1) 'Sachiko went on the swing and,
(2) when Yukiko went on the slide,
(3) Yukiko's balloon flew away.
(4) Then, Sachiko said, "(I)'ll give (you mine)" and,
(5) Yukiko gave (Sachiko her) hat and,'

Table 3 compares the percentage of switch-reference (DS = different subject) following *-te* 'and (then)' and *-tara* 'when' in the cartoon vs. video narratives. In the cartoon stories, as well as the video stories of children under 5 years of age, *-tara* is too infrequent to permit reliable conclusions. However, the expected distinction between *-tara* and *-te* is evident in the video stories of the children over 5 years old, who averaged 80% switch-reference following *-tara* vs. 53% following *-te*. The adults' video stories show a similar pattern: 81% switch-reference after *tara*, 46% after *-te*.

While these findings support the claim that *-tara* is more strongly associated with switch-reference than *-te*, the percentage of switch-reference following *-te* is much higher than in prior studies: combining all age groups, the children average 72% switch-reference after *-te* in their cartoon stories and 54% in their video stories. Even the adults' lower frequencies (33% and 46%, respectively) exceed the 17–27% rates of switch-reference following *-te* in previous research.

Apparently, the rate of switch-reference varies considerably depending on the storyline, and these stories call for frequent changes of subject. The narrator's degree of elaboration and point of view are also relevant. Compared to the children, the adults tend to maintain a single character's point of view in their cartoon stories and to recount the actions of each character in greater detail before switching subject, resulting in a lower percentage of switch-reference.

Given the frequency of switch-reference with *-te* in these narratives, which feature human subjects in most clauses, it is clear that *-te* is not functioning as a Same Subject device. Nevertheless, consistent with previous findings, *-tara* is

TABLE 3 | Switch-Reference following *-te* 'and (then)' vs. *-tara* 'when'.

Age	Cartoon Stories				Video Stories			
	-te		*-tara*		*-te*		*-tara*	
	N	% DS	*N*	% DS	*N*	% DS	*N*	% DS
3;8 – 4;0	28	0.64	0		19	0.58	0	
4;4 – 4;8	22	0.73	4	1.00	33	0.52	4	0.75
5;0 – 5;4	54	0.74	2	1.00	135	0.49	26	0.81
5;8 – 6;0	44	0.82	1	1.00	121	0.50	10	0.70
6;4 – 6;8	55	0.75	1	1.00	212	0.58	19	0.84
7;0 – 7;4	71	0.65	5	0.80	184	0.55	18	0.83
Adult	83	0.33	3	0.33	200	0.46	32	0.81

more likely than *-te* to be followed by switch-reference, setting up expectations that probably guide narrators' choice of connective and offer listeners some assistance in referent tracking.

Reruns: Linking and Delinking Reformulations

Narrators' process of deciding whether to link—or not link—adjacent clauses is usually invisible. Such decisions are subject to monitoring, however, and occasionally are revised. In (24), the narrator introduces the setting for a new episode with *-tara* and then switches to *-te*.

(24) sorede ne,   soshite mata tsugi no hi ni   (48: 6;6)
      then   FHP then   again next GEN day to

        nat-**tara**   ne,
        become-when   FHP

      nat-**te**,
      become-TE

      'Then, then again when the next day came,
      (it) came and,

Such reruns are not always self-corrections; narrators sometimes use a rhetorical strategy of "recapitulation" (Genetti, 2005, pp. 49–50), in which the final clause of one chain is reformulated as the initial clause of the next [see Guérin and Aiton (2019) on "bridging constructions."] In (25), Wakame and Katsuo's question in line 1 is the final event of one episode; initially presented as the final clause in a chain, it is then reiterated in line 2 in shortened form as a connecting link to the first event of the next episode, which starts in line 3.

(25) (1) sorede ne,   unto unto Sazae-san   ne,   (40: 5;10)
           then   FHP   um   um   Sazae-HON   FHP

             unto aa Katsuo-kun to ne, Wakame-chan ne,
             um   uh Katsuo-DIM and FHP Wakame-DIM FHP

             unto unto Sazae-san   ni ne,
             um   um   Sazae-HON to   FHP

             unto n nande okor-ana-i   no tte ne,
             um   FS why   get.angry-NEG-NPST SFP QT FHP

             yut-**ta**   no ne,
             say-PST SFP FHP

      (2) so soo yut-**tara**   ne,
           FS so say-when   FHP

      (3) otoosan ga   ne,   kaet-te   ki-ta   no ne,
           father NOM   FHP   return-TE come-PST SFP FHP

(1) 'And then, um um Sazaesan um uh Katsuo and
       Wakame um um said to Sazaesan,
       "Why don't (you) get angry?"
(2) When (they) said that,
(3) their father came home,'

The recapitulation strategy reformulates a final clause as a non-final one. Alternatively, as in (26), the narrator may delink a non-final clause, reformulating it as a final clause.

(26) unto ne, Ikura-chan no   otoosan ga   ne,   (19: 4;6)
      um   FHP Ikura-DIM GEN   father   NOM   FHP

        okaa-   mama no   okaasan   no
        FS   mom GEN   mother   GEN

        byooki ga   naori-mashi-ta   tte yut-**te** ne,
        sickness NOM get.better-POL-PST QT say-TE   FHP

      yut-**ta**   no.
      say-PST SFP

      'um, "His moth- mom mother has recovered," Ikura's father
          said and,
      said.'

Unlike the clauses in the preceding section, reformulations do not have a particular semantic relation to the preceding clause; instead, they simply repeat, elaborate, or summarize the clause they follow [cf. Longacre's "paraphrase" relation (Longacre, 1985, pp. 246–247)]. This type of interclausal connection, here termed "rerun," will be included in the statistical analysis along with the semantic relations from Section "To Link: Semantic Relations in Non-final Clauses."

Chain Length and Diversity of Connectives in Non-final Clauses

Despite the minimal use of clause chains by many children under 5 years of age, five narrators use four- to six-clause chains, and one 3-year-old uses a single, 20-clause chain to tell the entire cartoon story. The narrative in (27) illustrates this 'story-in-one-chain' pattern. (The accent marks represent heavy stress and high pitch, a prosodic scheme sometimes used at the ends of intonation units instead of *ne*).

(27) Mazu ne,   buranko to   ne, suberidai   (55: 7;3)
      first FHP swing   and FHP slide

        ga   at-**te**   ne,
        NOM   exist-TE   FHP

      Yukiko-chan mo   daremo   i-naku-**te**   ne,
      Yukiko-DIM also nobody   exist-NEG-TE   FHP

kondo Yukiko-chan to   Sachiko-chan ga   ne,
now   Yukiko-DIM and Sachiko-DIM   NOM FHP

  are fuusen o   mot-**té**,
  um balloon ACC hold-TE

okaasan mo tsure-**te** ne,
mother also bring-TE FHP

kondo ne, Sat-chan ga   buranko ni   not-**té**,
now   FHP Sat-DIM NOM swing   LOC   ride-TE

Yukiko-san-chan gá,   are suberidai yat-te-**té**,
Yukiko-HON-DIM NOM um slide   do-PROG-TE

sono fuusen ó,   tobashi-chat-**té**,
that balloon ACC let.fly-CMPLT-TE

Sat-chan gá,   mot-te-ru   fuusen ó,   age-**té**,
Sat-DIM NOM   carry-PROG-NPST balloon ACC give-TE

booshi to   torikae-**té**,
hat   with exchange-TE

soshite okaasan-tachi tó   are kaet-ta
then   mother-PL   with um return-PST

  ka shir-ana-**i**   **kedo**,
  Q know-NEG-NPST but

iki-mashi-ta.
go-POL-PST

'At first, there's swings and a slide and,
neither Yukiko nor anybody's there and,
now Yukiko and Sachiko have balloons and,
bring their mothers and,
now Sachiko rides on the swing and,
Yukiko goes on the slide and,
(she) lets her balloon fly off and,
Sachiko gives (Yukiko) the balloon (she)'s holding and,
exchanges (it) for her hat and,
then (I) don't know whether (they) go home with their
  mothers but,
(they) leave.'

Narrating an entire story in a single clause chain seems at first glance to be the polar opposite of the one-clause-at-a-time pattern in stories with no clause chains. In a sense, though, the two patterns are similar: both create a narrative with no multi-clause prosodic and grammatical unit that is more inclusive than a single- clause sentence but less inclusive than a sentence composed of the entire story. This kind of intermediate-sized, multi-clause unit is exactly what clause chains can help create within a narrative. None of the adults recount an entire narrative, not even the cartoon story, in a single clause chain.

The length of clause chains varies considerably, not only across different speakers but within a single story. Narratives with one or two extremely long chains also usually include chains of more moderate length. For example, one 6-year-old whose video story has a 25-clause chain also includes six two- to five-clause chains.

The diversity of connectives in non-final clauses also varies a great deal. Very long chains typically rely on -*te*, as in (27), but sometimes even young children's chains are both extremely long and internally diverse. The video story of one 4-year-old, for example, includes a 35-clause chain with 26 -*te* connectives, as well as -*tara* 'when,' *kara* 'because,' -*tari* 'and' (for representative actions), and *mae(ni)* 'before.'

Chain length and the diversity of connectives in non-final clauses (Diverse Non-final) will be included in the statistical analysis to determine whether they exhibit developmental trends and/or impact the probability of clause linking.

. . .or Not to Link: Ending Clause Chains

Turning from non-final to final clauses, this section will consider two discourse contexts, switch-reference and the boundaries of narrative units, where narrators sometimes end their clause chains.

Switch-Reference in Final Clauses

Research on Japanese clause chains has identified switch-reference as a site where narrators sometimes end clause chains. In his analysis of third-person subjects in adults' narratives, Iwasaki found that 77.3% of clauses end with a finite verb when the next clause has a different subject referent, as compared with only 32.5% when the subject referent is the same (Iwasaki, 1993a, p. 76).

This pattern can be seen in (28): at the end of line 3, the narrator ends the clause chain in progress with a finite verb and SFP *no* before changing the subject referent from Ikura to Katsuo and Wakame in line 4.

(28) (1) soshite ne, soshitara ne, mata   (30: 5;2)
         then   FHP then   FHP again

         Ikura-chan ga   ne, unto hikidashi
         Ikura-DIM NOM   FHP um drawer

         o   ake-te   ne,
         ACC open-TE FHP

     (2) unto ne, Katsuo-kun   to   Wakame-chan no
         um   FHP Katsuo-DIM and Wakame-DIM GEN

         ne, obenkyoo no   tokoro ne,
         FHP study   GEN place FHP

         yoku dashi   toka ake-te   ne,
         well drawer and open-TE FHP

(3) soshité, unto ne, itazura shi-te-**ta**   **no** ne.
  then um FHP mischief do-PROG-PST SFP FHP

(4) soshite ne, unto ne, **Katsuo-kun to Wakame-chan**
  then FHP um FHP Katsuo-DIM and Wakame-DIM

    kankan okot-ta   **no** ne.
    fuming get.angry-PST SFP FHP

  (1) 'And then, then, again Ikura opened up drawers and,
  (2) um, (he) opened lots of drawers and things in Katsuo and Wakame's study area and,
  (3) then um was doing mischief.
  (4) Then, um, Katsuo and Wakame got furious.'

The role of clause chains in creating episode-internal sub-units is apparent in (28). By ending the first clause chain at the point of switch-reference, the narrator organizes the events of the episode into an Action (lines 1–3) – Reaction (line 4) pattern.

Boundaries of Narrative Units

Switch-reference creates a break in the referential continuity of a story, but usually a relatively minor one: the narrator's focus simply shifts from one story character to another, often within the same episode, as in (28). The boundaries of major discourse units, on the other hand, represent a more significant break in narrative continuity. Chafe has characterized episode boundaries as places of scalar change co-occurring along one or more dimensions including space, time, character configuration, and orientation to a new central event (Chafe, 1979, pp. 176–180; Chafe, 1980b, pp. 40–47). The narrator typically presents such changes in the setting of a new episode; the number of changes and their degree of elaboration help create episode boundaries of varying degrees of strength. The cognitive impact of these combined changes in time, location, characters, and action is evident in the location of recall problems. In the video stories, if a narrator experiences memory failure, it is usually at an episode boundary. It makes sense, then, that a key site for ending a clause chain is at the boundary of an important narrative unit.

In (29), the narrator begins by presenting the setting for her cartoon story—the playground, arrival of characters, and key props (balloons)—in lines 1–3. She ends her first clause chain at the end of the setting in line 3, with a finite verb and the SFP *no*. Then lines 4–6 present the events of the first episode, in which the girls play and Yukiko's balloon flies away.

(29) (1) ano ne, buranko to suberidai ni (28: 5;1)
    um FHP swing and slide   LOC

    daremo not-te-na-katta noni
    nobody ride-TE-NEG-PST although

  (2) da- de ne, unto ne, Yuki-chan to ne, Sat-chan
    FS- and FHP um FHP Yuki-DIM and FHP Sat-DIM

    ga ne, fuusen mot-te
    NOM FHP balloon hold-TE

(3) mama to ki-**ta**   **no** ne,
  mom with come-PST SFP FHP

(4) sorede ne, Sat-chan no fu- ano ne, buranko
  then FHP Sat-DIM GEN FS- um FHP swing

    ni not-te ne,
    LOC ride-TE FHP

(5) Yuki-chan wa ne, fu- ano ne,
  Yuki-DIM TOP FHP FS- um FHP

    suberidai ochi-te   ne,
    slide   go.down-TE FHP

(6) de ne, soshitara ne, fuusen ga ne,
  and FHP then   FHP balloon NOM FHP

    ton-de it-chat-**ta** **no**.
    fly-TE go-CMPLT-PST SFP

  (1) 'Um, there was nobody riding on the swings and slide but,
  (2) bu- and, um, Yukiko and Sachiko, carrying balloons,
  (3) came with their moms.
  (4) Then, Sachiko's bal- um, rode on the swing and,
  (5) Yukiko, bal- um, went down the slide and,
  (6) And, then, (her) balloon flew away.'

After ending her second clause chain in line 6, the narrator proceeds to the next episode. Thus the ends of clause chains in (29) not only reflect changes in story content but help create boundaries between narrative units.

Another type of boundary involves a shift in the narrator's point of view. The Sazaesan video, in which the story characters have differing amounts of information from one another—and from the narrator—often elicited this type of shift, as in (30). In lines 1–3, the narrator is recounting the episode during which Wakame and Katsuo discover the snail on a leaf [see example (21)]; at the end of line 3, she concludes a 23-clause chain with this discovery. Then, instead of explaining from the characters' perspective how Sazaesan's family finds out about Ikura's motivation, she simply shifts in line 4 to "omniscient" voice and presents the explanation herself.

(30) (1) ano ne, Katsuo-kun to ne, (47: 6;6)
    um FHP Katsuo-DIM and FHP

    Wakame-chan ga ne, it-te ne,
    Wakame-DIM NOM FHP go-TE FHP,

  (2) nozoi-te mi-tara ne,
    peek-TE see-when FHP

(3) hontooni   ne,   katatsumuri   ga   i-**ta**   **no**   ne,
     really   FHP   snail   NOM   exist-PST   SFP   FHP

(4) shite   ne,   ano   Ikura-chan   wa   ne,   dooshite
     then   FHP   um   Ikura-DIM   TOP   FHP   why

     ne,   asoko   no   hikidashi
     FHP   there   GEN   drawer

     ake-te-ta   ka   tte   yu-u   to   ne,
     open-PROG-PST   Q   QT   say-NPST   if   FHP

(5) mama   ga   byooki   dat-ta   kara   ne,
     mom   NOM   sick   COP-PST   because   FHP

(6) kusuri   o   sagashi-te-te   ne,
     medicine   ACC   look.for-PROG-TE   FHP

(1) 'um, Katsuo and Wakame go and,
(2) when they take a peek,
(3) there really is a snail.
(4) Then, um . . . as for why Ikura was opening drawers over
     there,
(5) (his) mom was sick so,
(6) (he) was looking for medicine and,'

As with the referential breaks created by switch-reference, the boundaries of the narrative units in (29–30) are highlighted and strengthened by iconic breaks in the ongoing clause chain.

TO LINK OR NOT TO LINK: A STATISTICAL ANALYSIS

The preceding qualitative analysis has identified potential motivations for linking clauses (particular semantic relations) as well as for ending clause chains (switch-reference and the boundaries of narrative units). Yet these motivations do not mandate clause linking or chain ending: narrators are free to end a chain between two clauses with a close semantic relation or to continue chaining through the end of an episode. Statistical analysis can help clarify the impact of semantic relations, switch-reference, and the boundaries of narrative units on the probability that narrators will link one clause to the next or end the clause chain in progress.

A Mixed-Effects Model

To explore the factors that may be motivating narrators to continue or end clause chains, a mixed-effects analysis has been performed, using R (Fox and Weisberg, 2019; R Core Team, 2019), lme4 (Bates et al., 2015) and rms (Harrell, 2019). Mixed-effect models are ideal for observational, corpus-based data, which are not well balanced and very "noisy" compared with experimental data (Gries, 2015, p. 97). For the present study, a mixed-effects model is required, since each narrator in the sample contributed more than one data point, i.e., clause.

This lack of independence in the data is handled in a mixed-effects model by separating out the effects of the individual differences between narrators, i.e., "random effects," thereby permitting a more accurate assessment of the "fixed effects," i.e., the relationship between the predictor (independent) variables and the (dependent) variable of interest (Gries, 2015).

The dependent variable in the model is clause type: non-final or final. The fixed effects predicting clause type include: (1) Semantic Relation, (2) Switch-Reference, (3) Unit Boundary, (4) Task, (5) Age, (6) Chain Length, (7) Chain Use (percentage of chained clauses in a story), and (8) Diverse Non-final (diversity of clause-linking connectives). The random effects are varying intercepts for the speakers. The data for the analysis are the 2,428 chained clauses in the stories: 1,630 for the children and 798 for the adults.

The first three variables—Semantic Relation, Switch-Reference, and Unit Boundary—are motivated by prior research, as described in Sections "To Link: Semantic Relations in Non-final Clauses," "Switch-Reference in Non-final Clauses," and "Boundaries of Narrative Units," respectively. It was anticipated that the relatively "tight" Manner and Causal semantic relations would increase the probability of non-final clauses, i.e., clause linking, while switch-reference and narrative unit boundaries would increase the probability of final clauses, i.e., ending clause chains. The effects of Semantic Relation, Switch-Reference, and Unit Boundary on clause linking vs. ending were predicted to vary by Task and Age. Since the cartoon task was simpler than the video task, the effects of Semantic Relation, Switch-Reference, and Unit Boundary were expected to be stronger in the cartoon stories. The effects of these three variables were also expected to be stronger with increasing age, as the children's familiarity with the factors motivating clause linking and chain ending increased.

The fixed effects Chain Use, Chain Length, and Diverse Non-final were included in the model because it was anticipated that they would increase the probability of non-final clauses and interact with Age. Thus it seemed likely that with increasing age, narrators would link a higher percentage of the clauses in their stories into chains (Chain Use), include a greater number of clauses in their chains (Chain Length), and use a more diverse repertoire of clause-linking connectives in non-final clauses (Diverse Non-final). In addition to interacting with Age—and consequently with any other variable that interacted with age—these three variables were also expected to have an effect on the dependent variable of non-final vs. final clause type. That is, since Chain Use, Chain Length, and Diverse Non-final all involve linking clauses into chains, it was predicted that increases in these three variables would increase the probability of non-final clauses.

Coding
Clause Type (Non-final, Final)

Clause type was coded on the basis of verb form: clauses with linking verb suffixes or finite verbs followed by connectives were coded as "non-final," while clauses with finite verbs not followed by conjunctions were coded as "final." Given the flexibility of word order in Japanese, non-final clauses were sometimes

produced at the ends of sentences, after the "final" clause to which they were semantically linked; such clauses were coded as "non-final." Following colloquial usage, clauses with non-final connectives but sentence-final intonation were coded as "final"; there were 20 such clauses (0.8%) in the data.

Semantic Relation (Causal, Comparative, Dialog, Manner, Rerun, Setting, Temporal)

Each clause was coded for its relation to the next clause, as follows:

Causal: physical cause, psychological motivation, or reason for next clause

Comparative: additive, contrastive, or concessive relation to next clause

Dialog: reported speech responded to in next clause

Manner: speech, thoughts, emotions, or actions in partial overlap or simultaneous with next clause

Rerun: clause is reformulated, corrected, or repeated in next clause

Setting: time, place, arrival of characters, or ongoing activities that set the scene for next clause(s)

Temporal: actions, events, states that precede those in next clause

The Temporal relation was coded only if more specific temporal relations—typically Causal, Dialog, or Setting—were not relevant. The last clause in a story as well as the last clause before the narrator left the storyline to address the interviewer were not coded for semantic relation.

Switch-Reference (SameSubj, DiffSubj)

Each clause was coded as having a subject referent that was the same or different from that of the following clause. Many children overused subject ellipsis but the predicate—in conjunction with the cartoon or video—usually clarified the intended subject. The last clause in a story was not coded for switch-reference.

Unit Boundaries (ContUnit, EndUnit)

A clause was coded "EndUnit" if it was the final clause in a setting, episode, or story; abstract or coda; or particular narrator perspective. All other clauses were coded "ContinueUnit" (ContUnit) since they belong to the same narrative unit as the following clause.

Episode boundaries were identified on the basis of shifts in time, place, characters, and ongoing activity in the input story. The Sazaesan video was analyzed as having 11 potential episode boundaries—of which most narrators recounted a subset—and the cartoon stories as having three: frames 1–2 (setting), frames 3–5 (episode 1: play on swings and slide, loss of balloon), and frames 6-9 (episode 2: exchange of balloon for hat, departure).

Following Labov (1972, pp. 363–365), abstracts were defined as introductory summaries of story characters and/or plot, while codas were defined as the narrator's concluding commentary, minimally *sorede owari* 'and then (it was) the end.' In stories with codas, both the last clause of the final episode and the last clause of the coda were coded "EndUnit."

Speaker

Each clause was assigned a number from 1 to 70 representing narrator; 68 narrators who produced at least one story with at least one clause chain were included in the analysis.

Task (Cartoon, Video)

Each clause was coded for narrative task.

Age

Each clause was coded for the narrator's age group (see **Table 1**).

Chain Length

Each chain in a narrative was assigned a number corresponding to its order within a story. To measure Chain Length, each clause was given two numerical codings: its chain number and its sequential position within the chain. For example, one 5-year-old started his narrative with a two-clause chain: *Buranko to suberidai ga atte ne, Yukichan to Satchan ga asobi ni kita no.* 'There were swings and a slide and, Yukiko and Sachiko came to play.' The clause chain number was coded as "1" for both clauses, since this was the first clause chain in the story. In a separate coding, the first clause was coded "1" and the second "2" as the first and second clauses, respectively, within that first chain. Using these two codings, the number of clauses within each chain in the sample was calculated.

Chain Use (Percentage of Chained Clauses)

Chain Use was calculated as the number of clauses in a story that were linked into chains (including the final clauses of chains) divided by the total number of clauses in the story.

Diverse Non-final

This variable represents the diversity of clause-linking devices in the non-final clauses of a story. In the cartoon and video stories, a total of 43 clause-linking devices were used, including particular clause-linking verb suffixes, conjunctions following inflected verbs, and a few instances of gapped or ellipted verbs and of the stem (*renyookei*) form of the verb. Using the equation for Shannon entropy, H was calculated for every story and the value assigned to each clause in the story. The cartoon and/or video stories of 26 children have a Diverse Non-final value of 0, since every non-final clause in the story has the same clause-linking form, usually *-te*. The value of H increases as the number of different clause-linking devices in the story increases and as they become more equiprobable. Thus a story with 23 connectives, 22 of which are *-te*, has a score of 0.258, while a story with nine connectives—seven *-te*, one *-tara*, and one *tte*—has a score of 0.986. The values of H range from 0 to 3.09.

Results

A multifactorial, mixed-effects model was fit, following the stepwise model selection procedure in Zuur et al. (2009) and Gries (2015): variables that are not significant or do not participate in any significant higher-order interactions are eliminated. The final model, summarized in **Table 4**, is significant: LR = 262.33, df = 12, $p < 0.0000001$. Each of the

TABLE 4 | Results of model (predicted level of Clause Type = 'Non-final').

Random effects:

Groups Name	Variance	Standard Deviation
Speaker (Intercept)	0.068	0.261
Number of obs: 2235	groups:	Speaker, 68

Fixed effects:	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)				
UnitBoundEndUnit	−0.600	0.348	−1.727	0.084.
SwitchRefSameSubj	−1.544	0.243	−6.343	2.263–10 ***
SemRelComparatv	0.306	0.133	2.304	0.021 *
SemRelDialog	0.581	0.257	2.262	0.023 *
SemRelManner	0.336	0.257	1.307	0.191
SemRelRerun	2.098	0.368	5.674	1.39e−08 ***
SemRelSetting	−0.126	0.165	−0.371	0.711
SemRelTemporal	−0.164	0.166	−0.988	0.323
TaskVideo	0.459	0.182	2.522	0.012 *
DvrsNfmal	−0.477	0.088	−5.424	5.83e−08 ***
ChainUse	2.820	0.383	7.370	1.70e-13 ***
UnitBoundEndUnit: TaskVideo	0.629	0.302	2.082	0.037 *

Signif. Codes: 0 '***' 0.001, '**' 0.01, '*' 0.05, '.' 0.1, ' ' 1.

three main fixed effects—Semantic Relation, Switch-Reference, and Unit Boundary—has a significant effect on Clause Type in the predicted direction. The semantic relation Manner strongly increases the probability of non-final clause type, i.e., clause linking, but counter to expectation, the Causal relation does not have a similarly powerful impact. Unit Boundary and, much less strongly, Switch-Reference increase the probability of final clause type, i.e., chain ending. Task interacts significantly with Unit Boundary: there is a higher probability of ending clause chains at the boundaries of narrative units in the cartoon stories. As Chain Use (the percent of linked clauses in a story) increases, so does the probability of non-final clauses (necessarily), but the expected increase with Age was not found. Contrary to prediction, as the diversity of clause-linking devices (Diverse Non-final) increases, the probability of non-final clauses decreases. Chain Length and—most surprisingly—Age did not have significant effects on Clause Type or participate in any higher-order interactions in the best-fitting model.

Although significant, the model has a relatively low degree of discriminatory power: C = 0.76. The fixed effects account for only 26% of the variance in the data (R^2marginal = 0.26), to which the random effect, Speaker, does not add much (R^2conditional = 0.27).

Figure 1 shows the significant effect of narrative unit boundaries (UnitBound) on the use of non-final vs. final clause type. In both cartoon and video stories, the probability that narrators will use a non-final clause decreases—i.e., their probability of using a final clause increases—when they reach the end of a narrative unit such as a setting, episode, or shift in narrator perspective.

Of the predictor variables, UnitBound is the only one to interact significantly with Task. The effect of narrative unit

FIGURE 1 | The boundaries of narrative units (UnitBound) decrease the probability of clause linking (ClauseType = 'Non-final'): the percentage of non-final clauses is higher within narrative units (CntUnit) than at the ends of units (EndUnit). The effect of narrative unit boundaries is stronger in the cartoon task than in the video task.
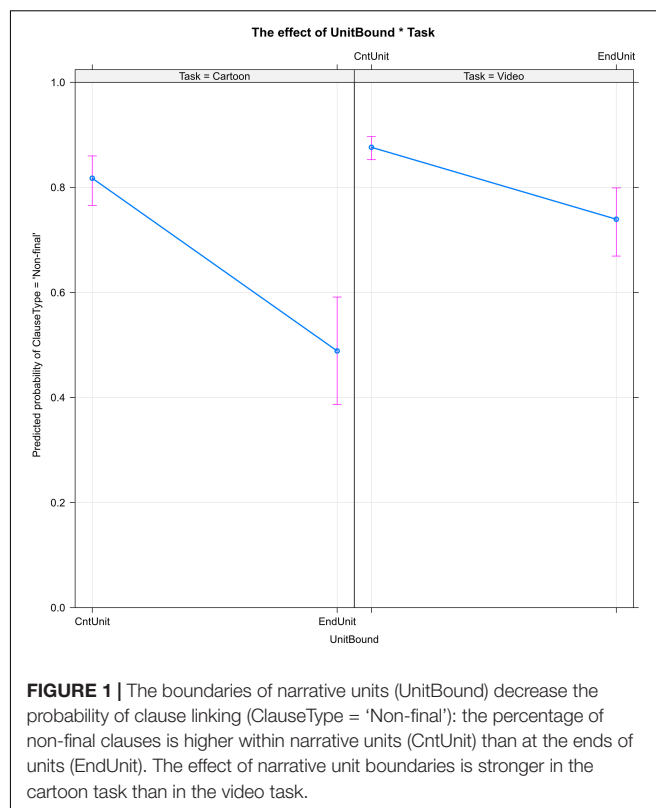
boundaries is stronger in the cartoon task: the end of a narrative unit reduces the probability of continuing a clause chain by more than 30% in the cartoon stories, but only by about 15% in the video stories.

Figure 2 shows the significant effect of semantic relations (SemRel) on the probability of clause linking (ClauseType = 'Non-final'). The Comparative relation, which encompasses additive, contrastive, and concessive relations between clauses, is associated with a slight increase in clause linking, as (to a lesser extent) is Dialog, the relation between successive turns in reported dialogue. But it is the Manner relation that stands out as strikingly different from the others, strongly increasing the probability that the narrator will link the current clause to the following.

Figure 3 shows the small, though significant, effect of switch-reference (SwitchRef) on clause type (ClauseType = 'Non-final'). As predicted, switching to a different subject lowers the probability that the narrator will link the current clause to the following, while maintaining the same subject increases the probability of clause linking.

Figure 4 shows the effect of Chain Use (the percentage of clauses linked into chains) on clause type (ClauseType = 'Non-final'). As the percentage of chained clauses in a story increases, the probability of non-final clauses (necessarily) increases. The densest concentration of stories is found at the high end of the scale, where about 74% or more of the clauses in a story are chained and non-final clauses are highly predictable.
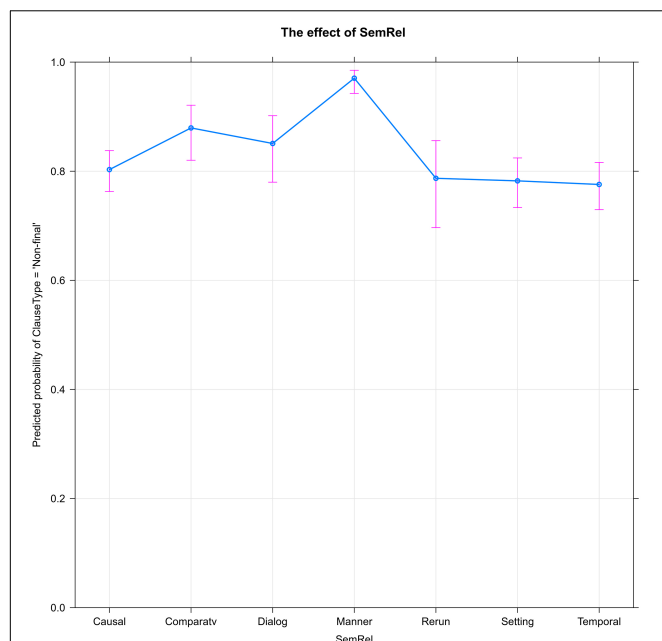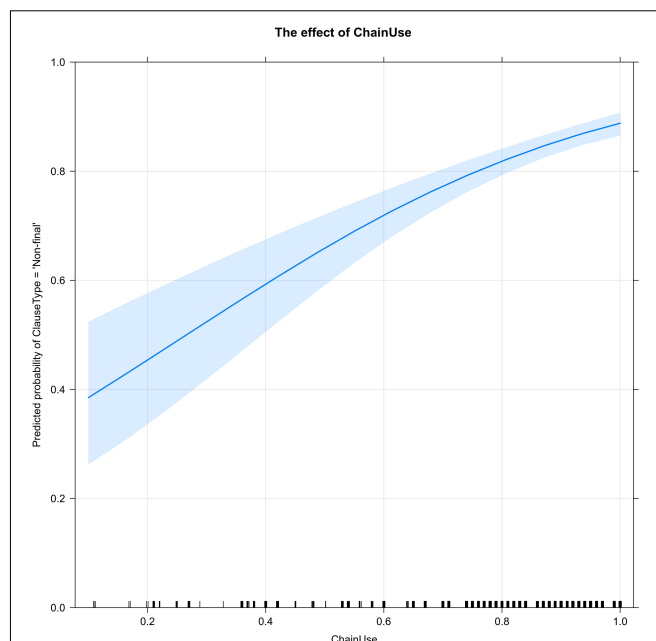
FIGURE 2 | Of the seven semantic relations coded, Manner strongly increases the probability of clause linking (ClauseType = 'Non-final').

FIGURE 4 | An increase in the percentage of chained clauses (ChainUse) in stories necessarily increases the probability of clause linking (ClauseType = 'Non-final'). The ticks along the *x*-axis show that the densest concentration of stories is at the high end of the scale: 74–100% chained clauses.

FIGURE 3 | Switch-Reference (SwitchRef) decreases the probability of clause linking (ClauseType = 'Non-final'): the percentage of clause linking is lower when the subject referent is changed (DiffSubj) than when the same referent is maintained (SameSubj).

of diversity in clause-linking forms are actually associated with a decreased probability of clause linking.

The highest percentages of non-final clauses are found in stories with little or no diversity of non-final forms; this typically occurs when the narrator relies very heavily or exclusively on the default connective *-te*. As the diversity of clause-linking forms increases, the percentage of clause-linking decreases; the lowest rates of clause-linking are found in stories with the highest levels of non-final diversity. As the ticks along the *x*-axis indicate, this pattern is comparatively rare: most stories have a high percentage (80–90%) of linked clauses and a moderate diversity (0.25 – 1.75) of non-final forms.

Discussion

The statistical analysis in this study is, to my knowledge, the first attempt to model the functional motivations underlying clause chaining in narrative discourse. As such, it has a dual goal: to discover which potential semantic and discourse predictors play a significant role in clause linking/chain ending and to demonstrate that a statistical approach—in particular, mixed-effect modeling of corpus data—can shed light on the semantic and discourse functions of clause chaining.

The significant fixed effects in the model—Semantic Relation, Switch-Reference, Unit Boundary, Chain Use, and Diverse Non-final—give insight into the forces that motivate speakers to link clauses into chains and to end chains in progress. The semantic relation of Manner, which typically links characters' thoughts, feelings, and speech to their actions, is a strong motivator of clause chaining, but the Causal relation lacks comparable impact.

As with Chain Use, it was anticipated that a greater diversity of linking forms (DvrsNfinal) would increase the probability of non-final forms. However, as **Figure 5** shows, very high levels

FIGURE 5 | The diversity of connectives in non-final clauses (DvrsNfinal) is represented by values of *H* along the *x*-axis. As the diversity of connectives increases, the probability of clause linking (ClauseType = 'Non-final') decreases. The ticks along the *x*-axis show that most stories have a high (80–90%) percentage of linked clauses and a moderate (0.25 – 1.75) diversity of connectives in non-final clauses.

When narrators switch the subject referent or reach the end of a major narrative unit, the probability increases that they will end their current clause chain. The probability of non-final clauses necessarily increases as narrators' percentage of linked clauses (Chain Use) increases, but decreases with the diversity of their connectives. The relatively weak predictive power of the model implies, not surprisingly, that these are not the only factors responsible for continuing and ending clause chains during narration.

For this analysis, only the boundaries of the highest-level narrative units were coded: between setting and episode, between episodes, and between different narrator perspectives. Including episode-internal shifts might have strengthened the effect of Unit Boundary on chain ending. In these stories there is no one hierarchical level at which even a single narrator will consistently end clause chains: narrators often ignore an episode boundary only to end the clause chain at a minor, episode-internal shift. This kind of inconsistency, both across and within narrators, means that the ends of clause chains will never correspond exclusively to the highest-level narrative units.

The interaction of Task with Unit Boundary probably reflects the different cognitive demands posed by narrating from the cartoon vs. the video. Telling the video story was much more challenging, requiring narrators to constantly retrieve material from memory, whereas the cartoon stories were told while viewing the pictures. Boundary cues such as changes in location and characters are depicted simply and clearly in the cartoon

but presented dynamically in the video, where they must be processed quickly to keep up with the storyline. The relative simplicity of the cartoon task may have allowed narrators to devote more attention to marking the ends of narrative units by ending clause chains.

Although temporal sequence is generally regarded as the hallmark of clause chains (Iwasaki, 2002, p. 261), the semantic relation with the strongest impact on clause linking, Manner, involves simultaneity or temporal overlap rather than strict sequentiality. Against the backdrop of primarily temporal/causal sequential relations in their stories, the narrators apparently felt the closest connection between simultaneous interclausal relations.

Unexpectedly, causal relations did not elicit a higher probability of clause linking than temporal ones, perhaps because the internal composition of both relations, as coded for this analysis, is rather heterogeneous. Causal relations included very tight bonds of physical causality between events, more loosely related psychological causality (emotional responses to events that could have been different), and reasons for events that are separate in time and place (e.g., Ikura's mother became ill, so he was cared for at Sazaesan's house). Similarly, the Temporal relation encompassed tightly related enabling actions that initiate—but do not cause—event sequences as well as what Chafe (1979, p. 178) calls "temporal elasticity" at episode boundaries. A more fine-grained coding of semantic relations might have yielded a stronger effect of this variable on clause type, increasing the predictive power of the model.

With respect to referential continuity, the two-protagonist cartoon and multi-character video elicited an unusually high rate of switch-reference compared to previous findings. Many stories in this sample have a different subject in almost every clause, making switch-reference a much less compelling reason for these narrators to end a clause chain. While this may have contributed to the relatively weak effect of switch-reference in the model, the Same Subject status of Manner clauses most likely played a role in the strength of that semantic relation as a predictor of clause linking.

An unexpected outcome is that the diversity of the connectives in non-final clauses (Diverse Non-final), which was predicted to increase clause linking, is instead associated with a higher probability of chain ending. The original prediction envisioned a narrator who commands a diverse repertoire of clause-linking connectives and deploys it maximally. The negative association between the diversity of non-final forms and clause linking suggests a different profile at a high rate of diverse connectives: a narrator who is sensitive not only to the semantic nuances motivating a variety of specific connectives but also to the discourse factors motivating sentence-final forms.

The most surprising result is a negative one: age is not a significant predictor of clause linking and does not interact significantly with any of the other predictors in the model. Chain length, the percentage of chained clauses (Chain Use), and the diversity of linking forms (Diverse Non-final) do not increase with age as predicted. Nor do the effects of semantic relations, switch-reference, and episode boundaries change significantly across the age range of narrators. There may well be other

age-related differences; prior research on these narratives has found significant age differences in the frequency of encoding switch-reference subjects with overt noun phrases (Clancy, 1992). But whatever other developmental differences exist in the data, when it comes to continuing/ending clause chains, the narrators in this sample are responding in similar ways to the set of predictors in the model: both children and adults tend to link clauses with the Manner relation and to end clause chains when switching the subject referent or ending a narrative unit. Future research on younger children, especially longitudinal research on the clause chains produced by 2- and 3-year-olds in storytelling, is needed to shed light on the process by which they develop adult-like treatment of clause linking and chain ending.

GENERAL DISCUSSION AND CONCLUSIONS

This study takes up the analysis of clause chaining at a stage of development when most Japanese children have probably had a year or two of experience using clause-linking and chain-ending forms. As documented in longitudinal research, children can link clauses with -te and inflect verbs for past tense shortly after 2 years of age (Okubo, 1967; Fujiwara, 1977; Clancy, 1985). The 3-year-olds in the present study can use -te to link clauses in their stories on the basis of semantic relations much like those in the clause chains of Turkish 3-year-olds: manner, causality, and temporal relations of sequence, overlap, and simultaneity (Aksu-Koç, 1994; Slobin, 1995). On the other hand, some of the youngest children in this sample struggle to produce a connected narrative rather than a series of single-clause responses to prompting.

The clause chains that the children did produce show a surprising lack of developmental change. Since age is not a reliable measure of linguistic development, the children in different age groups may well have had overlapping levels of narrative skill, arising from individual differences in the storytelling models they have experienced as well as in the cognitive capacities, such as attention and recall, potentially underlying particular patterns of clause chaining. Extensive variation across ages has been documented by Berman and Slobin (1994, p. 94), who found that certain adult "frog stories" in their corpus exhibit "a 'chaining' and then, and then type of style similar to that of school-age children." Thus several factors may have mitigated against the discovery of significant age differences.

An intriguing possibility is that the strongest predictors of clause linking/chain ending in the model may have a relatively natural, iconic basis, making them easy for children to acquire. Haiman (1985, p. 210) and Watanabe (1994, p. 142) have suggested that manner clauses, which significantly increased the probability of clause linking in this study, may be construed as aspects of a single action performed by the same character. This interpretation fits many of the manner clauses in these stories, e.g., saying tadaima 'I'm home' while entering the house. Episode boundaries, with their multiple dimensions of change, represent such strong breaks in discourse continuity that narrators typically

pause, produce fillers such as ano ne 'uh you know,' and sometimes even forget what comes next; it makes sense, then, that they also often end clause chains at these boundaries.

From a processing perspective, research on pausing and disfluencies suggests that speakers generally plan one clause at a time (Pawley and Syder, 2000). In Japanese, as in other languages, a new clause is usually preceded by pauses and fillers potentially indicative of planning. However, Japanese speakers typically produce each clause in a series of separate intonation units (Clancy, 1982; Iwasaki, 1993b; Matsumoto, 2000), a pattern that affords a number of clause-internal opportunities for planning. Since Japanese is an SOV language and non-final clauses are grammatically distinguished from final ones only by the forms suffixed to and/or immediately following the clause-final verb, speakers do not actually have to decide whether and how to link the clause in progress to the following clause until they reach the verb. This may reduce the amount of planning required before beginning a clause in Japanese, leaving the speaker free to make decisions about clause linking before or during the clause-final intonation unit.

Certain findings of this study can be interpreted as evidence that decisions about linking/not linking clauses have a measurable cognitive cost: (1) narrators' self-correcting "reruns" of their clause-final choices (see Section "Reruns: Linking and Delinking Reformulations"), which may suggest that the ideal form was not accessed quickly enough; (2) the lower probability of ending clause chains at narrative boundaries in the more challenging video task (**Figure 1**); and (3) the high concentration of stories in the "comfort zone" of moderately diverse non-final forms and relatively infrequent final forms (**Figure 5**). The highly effective narrator can preplan upcoming interclausal connections, attending to both the semantic relations that warrant specific connectives and to the breaks in discourse continuity that warrant ending the current clause chain.

Various ways to simplify the cognitive challenges of clause chaining are available to narrators: narrating without clause chains, i.e., using only or primarily single-clause sentences (example 7), linking all or most non-final clauses with the default -te form (example 27), and telling all or most of the story in a single clause chain (see Section "Chain Length and Diversity of Connectives in Non-final Clauses"). Narrators who use few or no clause chains are spared allocating cognitive resources to the choice of appropriate connectives at the ends of clauses, as are narrators who rely solely or primarily on -te. Narrators who use extremely long clause chains can ignore discourse discontinuities and keep chaining right through changes in subject referent and the shifts in time, place, characters, and action at the ends of narrative units.

For a discourse-based approach to grammar, the findings of this study highlight the intimate connection between clause-level grammar and narrative structure. Identifying units in spoken discourse has been a long-standing focus of research (e.g., Chafe, 1979, 1994; Hinds, 1979); according to Longacre (1985, pp. 282–284), clause chains can correspond to a sentence in non-chaining languages, to a spoken paragraph, or, in the case of "endless" chains, to an entire discourse. The present study continues this line of work by demonstrating how narrative units such as

episode or story are, in part, constituted by the clause chains that delimit their boundaries.

This study takes a preliminary step toward understanding the semantic and discourse functions of clause chains in Japanese, the cognitive processes underlying their production, and children's development of clause-chaining skills. As the weak predictive power of the mixed-effects model indicates, there is still much to be learned about narrators' motivations for creating/ending clause chains. Further developmental research is necessary, especially between about 2;6 years of age, where most longitudinal studies end, and just under 4;0, where this study begins. In addition to research on children's production, studies of the available models for clause chains in conversational narratives and storybooks are essential. With so much to be done, it is hoped that this study will encourage further qualitative and statistical investigation of the semantic, discourse, and cognitive factors underlying the use and acquisition of clause chaining in Japanese.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/**Supplementary Material**.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements at the time the study was carried out. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements at the time the study was carried out. Verbal informed consent was obtained from the principals of the schools, in accordance with national legislation and the institutional requirements at the time the study was carried out.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

ACKNOWLEDGMENTS

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg. 2019.03008/full#supplementary-material

DATA SHEET S1 | Appendix: Cartoon.

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Clause Chaining and Discourse Continuity in Turkish Children's Narratives

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The present study examines the development of complex sentences with non-finite clause combining with particular focus on clause chaining, in narratives of 40 Turkish-speaking 4- to 11-year-olds and six adults elicited by a wordless picture book. Results show a gradual increase by age in the variety of clauses combined, the length of the complex sentences and their frequency of use. Clause chains formed with converbal clauses are the earliest and most frequent type of clause combinations, already present in 4-year-olds' complex sentences with 1-non-finite clause. Older children's and adults' 2- or 3-non-finite clause complex sentences consist of some combinations of adverbial, complement, relative and converbal clauses. Developmentally, clause chains establish first, aspectual-temporal continuity, then temporal-causal continuity. Sentence-internal and cross-sentence-boundary referential continuities are present early, from age 4 onwards. These findings are discussed in terms of the demands of narrative organization as well as the syntactic and semantic complexity of the clause combination devices in Turkish.

Keywords: clause chaining, clause combining, Turkish, narrative, children

INTRODUCTION

Discourse, conversational or narrative, revolves around one or more topics. In conversation, speakers and listeners co-construct a topic in order to achieve a coherent account of what is at issue (Ervin-Tripp and Küntay, 1997). However, in narratives it is the task of the speaker to create coherence by organizing events in accordance with a goal motivated by the cognitive and affective states of the actors engaged (Labov and Waletzky, 1967; Bruner, 1990). As Givón (2017a, p. 29) puts it, "... coherent discourse tends to maintain, over a span of several clauses, the same topical referent, the same or contiguous time, the same or contiguous location, and sequential action." Thus, among the primary skills that children have to acquire in order to become effective conversationalists or narrators are linking the sequence of events temporally and causally and making clear reference to actors so that the listener can follow who is doing what to whom. That is, to effect connectivity in discourse, children have to master the clause combining and referent-tracking devices of their language.

Clause combining involves "the combination of a clause with some other constituent" (Gast and Diessel, 2012, p. 3). The two types of combination traditionally recognized are coordination and subordination. In coordination, "[at least] two constituents belonging to the same category are conjoined to form another constituent of that category" (Kroeger, 2005, p. 218), while in subordination one of the constituents is embedded and also dependent on the other for tense

and person marking. A third type of linkage is one where the syntactic combination is neither perfectly symmetrical as in coordination, nor does it involve embedding as in subordination (Sarvasy and Choi, forthcoming) but the sequenced clauses are dependent on the main clause. This type of linkage is characteristic of clause chaining which involves the sequencing of one or more clauses with verbal predicates that are under-specified for tense (and, often, other categories) combined with a single clause of which the predicate bears full tense, mood and subject reference marking (Sarvasy and Choi, forthcoming). The clauses in a chain are thus syntactically dependent but not embedded. The non-finite verbal predicates may indicate aspectual distinctions such as perfectivity and imperfectivity, temporal relations such as sequence and simultaneity as well as relations of cause-effect (Longacre, 2007, p. 400). The morphology of the non-finite verb forms may also indicate whether the subject of each should be interpreted as the same (SS "same subject") or different (DS "different subject") from the subject of the preceding or the following clause (Stirling, 2006; Longacre, 2007, p. 375).

Considering the relation between clause structure and referential mechanisms, Givón (2017a, p. 25) notes that "there is a correlation between referential continuity and non-finiteness" such that grammatical devices that are most finite indicate the least degree of anaphoric referential continuity, while those that are least finite mark the highest referential continuity. In an analysis of clause chaining in Japanese, Watanabe (1994, p. 141) argues that chaining devices mark "action/event continuity [that] has to do with the predictability or conceptual connectedness of action/event sequences." Two events are said to be conceptually more tightly connected when there is a larger degree of information overlap between them, which tends to be in terms of the most recurrent information in grammar, that is, referent, time, location and tense-aspect-mood (Watanabe, 1994, p. 142; Givón, 2017a). For example, two simultaneously occurring events are more likely to be perceived as a unit if the same actors (subjects) are involved, but may not be perceived so if the actors are different. Thus, it is through various combinations of their aspectual-temporal, locational and referential properties and the semantics of the verb, that chaining devices, create action/event continuity in discourse (Watanabe, 1994, p. 142).

Here, we target an analysis of the developmental trajectory of clause chaining in Turkish, a zero anaphora language. Although our focus is on (i) chains with converbs that involve dependency but not embedding (henceforth "clause chaining"), we also include in our analysis (ii) combinations with complement, relative and adverbial clauses that are both dependent and embedded (henceforth "clause combining"). For this purpose, we analyze narrative data from children and adults and trace changes in clause chaining and combining, asking whether the

development of the two types of complex sentences proceeds at different paces. We also ask whether there is a change with age in the role the aspectual-temporal and referential properties of chaining devices play in discourse continuity.

The organization of the paper is as follows. We first briefly describe the reference tracking and clause linkage devices of Turkish. Then, we refer to previous studies on clause chaining and combining. After presenting our methodology and results, we offer a discussion of the findings.

REFERENCE MARKING AND NON-FINITE CLAUSE CHAINING AND CLAUSE COMBINING IN TURKISH

Reference Marking

Turkish is an agglutinating language with flexible SOV order which is subject to pragmatic constraints. In the canonical order, non-finite clauses precede the main clause. There is no formal article system; indefiniteness is marked by the numeral *bir* "one," definiteness by the accusative case and by bare nouns. There is no grammatical marking of gender or animacy either in the nominal or the pronominal systems, and the third person singular pronoun *o* "he/she/it" has the same form as the demonstrative pronoun *o* "that." Clauses may lack overt subjects since the verb is marked by a person suffix for agreement. The use of pronouns, overt or null, is determined by the discourse context, and conveys pragmatic information such as contrast, similarity, emphasis or new information (Enç, 1986; Erguvanlı Taylan, 1986; Öztürk, 2001; Göksel and Kerslake, 2005; Azar et al., 2016). Once the discourse topic is set with a noun phrase or overt pronoun, continuity requires the use of null pronouns. But when the speaker wants to mark topic change, an overt pronoun is necessary for grammaticality (Öztürk, 2001, p. 240)

In short, Turkish uses overt or null pronouns as anaphoric expressions representing coreferentiality with another noun phrase (NP). To summarize from Erguvanlı Taylan (1986, p. 214–215, 217, 223), in simple sentences, coreference with a subject NP is expressed by zero anaphora regardless of the position of the subject. In embedded sentences, the subject is expressed with a zero representation when it is to be interpreted as coreferential with the main clause subject. In discourse, anaphoric relations extend beyond the boundaries of the sentence and the antecedent may be in the discourse context the sentence occurs in. Thus, in Turkish, it is null pronouns that go hand-in-hand with discourse continuity rather than pronouns.

Non-finite Clause Types Functional in Clause Chaining and Clause Combining

Four types of non-finite clauses stand out as participants in clause chaining and clause combining in Turkish. Ordered in terms of a cline of dependency and embedding, these are relative and complement clauses, adverbial clauses and converbal clauses. Among these, only converbal constructions are functional in clause chaining.

Turkish makes use of participial suffixes (*-En, -DIK, -EcEk, -mIş and -Ir*) to form relative clauses, and nominalizing

suffixes (*-DIK, -EcEk, -mEk, -mE*) to form complement and adverbial clauses.[1] In all three construction types, one of the respective suffixes is attached to the verb stem, which is followed by the possessive suffix for person/number and case in relative and complement clauses, and by case and/or a postposition in adverbial clauses (Erguvanlı Taylan, 2015, p. 207). The participial or nominalizing suffix occupies the same position as tense markers on the finite verb but may carry only aspectual-temporal or modal values depending on the semantics of the non-finite verb and the main verb. Since they have their own agreement markers, the nominal/pronominal subjects of these constructions can be omitted just as in main clauses (Kornfilt, 1997, p. 45–46, 48). In relative and complement clauses, the overt subject, if present, is marked with the genitive case. In complement clauses, the choice of the nominalizing suffix to be used is determined by the semantics of the main verb (e.g., *-DIK* with verbs of cognition). With this requirement and that for genitive marking on overt subjects, complement clauses pose some syntactic and semantic complexity for acquisition (Aksu-Koç, 1994). In adverbial clauses, simpler in both respects, the nature of the relationship between the two clauses (e.g., temporal or causal) is expressed either by a case marker or a postposition. Example (1) illustrates a complex sentence with an adverbial and a complement clause.[2]

(1) AD (p72) Situation: when the boy and dog wake up, they see that the frog is not there.

> *Uyan-**dık-lar-ı** zaman, kurbağa-nın*
> wake.up-ADV-PL-POSS.3SG time frog-GEN
> *ol-ma-**dığ-ı-nı** gör-müş-ler.*
> be-NEG-COMP-POSS.3SG-ACC see-NARR.PST-3PL[3]

'At the time they woke up, (they) saw that the frog was not (there).'

Converbs, also adverbial in function (Kornfilt, 1997; Göksel and Kerslake, 2005), are derived from verbs by attaching a morphologically unanalyzable suffix (Johanson, 1995, p. 315) or have a composite structure formed by a nominal suffix followed by case or a postposition. Göksel and Kerslake (2005, p. 404) note that the "most important structural distinction among converbs is between those that are marked for person and those that are not." In the present study, only those converbs that are not marked for person have been included in the analysis of chaining devices. Some converbs encode coreferentiality between the subjects of the clauses they join (SS), whereas in others, called "variable subject" converbs by Haspelmath (1995, p. 10)

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[1]Affixes alternate according to the rules of vowel harmony, which operate in terms of the high/low, front/back and rounded/unrounded phonological contrasts. Consonant assimilation and other regular morphophonological processes also apply. Alternating vowels and consonants are represented by uppercase characters.
[2]The examples are taken from the adult narrators of the present study. Age, participant identification number and situational information are given in the first line of each example. AD stands for 'adult'.
[3]The morpheme *-mIş* is the marker of perfect aspect, evidential modality and past tense, depending on context. It also marks the narrative genre. We therefore gloss it as 'narrative past' (NARR.PST) in the present narrative context.

or "open converbs" by Johanson (1995, p. 318), the subjects of the two clauses may be the same or different (SS/DS). Among the converbs that appear most frequently in our data are those formed with the suffixes *-Ip, -ErEk, -IncE, -ken*, and *-DIktEn sonra*.

Converbs with *-Ip* and *-ErEk* suffixes join clauses with shared arguments, hence they are SS devices which indicate that the subject of the upcoming clause is the same as the present one (Givón, 2017b, p. 106). Converbs derived with *-IncE, -ken* and *-DIktEn sonra* may connect clauses with shared or different arguments. In SS uses, the coreferentiality of the subject of the two clauses is expressed with a null pronoun. If the subject of either the main or the adjunct clause is represented by a pronoun or an NP, the converbal construction is interpreted as DS (Erguvanlı Taylan, 1986, p. 216).

The suffix *-Ip* corresponds to the general conjunction "and/and then" and joins clauses "that are semantically of equal status in the sentence" (Göksel and Kerslake, 2005, p. 410)[4]. Aspectually, *-Ip* marks perfectivity and a sequential relation with the event of the following clause if the predicates of both clauses are action verbs, and an almost single event interpretation if one of the predicates is a verb of cognition. The suffix *-ken* "while doing/being" is added to verbs already inflected for aspect, most often with the aorist *-I/Ar* that denotes imperfectivity. *-ken* expresses simultaneity with full or partial overlap between two events, depending on whether the verb it is attached to is perfective or imperfective. In example (2), an *-Ip* and a *-ken* clause form a SS chain that presents the action (looking) and the perceptual experience (seeing) of the same actor as the context for the perfective event performed by a different actor, the subject of the main clause.

(2) AD (p76) Situation: the boy is looking into the gopher's hole in the ground.

> *Tam deliğ-in iç-in-e bak-**ıp** içeri-yi*
> just hole-GEN in-POSS-DAT look-CVB inside-ACC
> *gör-me-ye çalış-ır-**ken** deliğ-in iç-i-nden*
> see-NOM-DAT try-AOR-CVB hole-GEN in-POSS.3SG-ABL
> *bir tane gelincik çık-mış.*[5]
> one piece gopher exit-NARR.PST

'Just as (he) was looking into the hole, trying to see inside, a gopher came out.'

Converbs derived with the suffix *-IncE* indicate perfectivity, the completion of the event expressed by the *-IncE* clause, resulting in the inception of the event expressed in the following clause. *-IncE* expresses a sequential temporal relation, meaning 'when/cause' or 'as soon as.' Example (3) is a complex sentence where an *-IncE* clause is followed by an adverbial clause with

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[4]Slobin (1995, p. 349) reports from Von Gabain (1941) that some version of *-Ip* is the oldest and most widespread clause chaining form in the Turkic languages. In Foley and van Valin's (1984) framework, converbs would be included under co-subordination (Erguvanlı Taylan, 1988).
[5]Since third person singular receives zero marking in Turkish, the finite verbs in third person are not marked 3SG.

the same subject, both connected to the main clause that has a different subject.

(3) AD (p77) Situation: the boy and dog sleep, the frog escapes from the jar.

Bir gece Ali uyu-yunca, köpeğ-i ile beraber
one night Ali sleep-CVB dog-POSS.3SG with together
uyu-duğ-u zaman kurbağa kavanoz-u-ndan
sleep-ADV-POSS.3SG time frog jar-POSS.3SG-ABL
kaç-mış.
escape-NARR.PST

'One night when Ali slept, at the time when they slept with his dog, the frog escaped.'

-ErEk 'by doing/in doing' functions both as a conjunction and an adverb describing manner of action (Göksel and Kerslake, 2005). Aspectually, *-ErEk* clauses get an imperfective interpretation. In a comprehensive analysis of the functions of Turkish converbs, Slobin (1995) observes that the event in the *-ErEk* clause is presented either as a preparatory, or an instrumental, or a simultaneous accompanying phase for the situation mentioned in the main clause. *-ErEk* thus integrates two situations as different but co-existential aspects of a single activity. The complex sentence in (4) describes the subject with a relative clause and the manner of his action with an *-ErEk* clause.

(4) AD (p76) Situation: the boy comes out of the pond holding on to a log.

Sırılsıklam ol-an Ali, bir kırık, bir kütüğ-e
thoroughly.wet be-REL Ali one broken one log-DAT
tut-un-arak göl-ün iç-in-den çık-mış.
hold-REFL-CVB pond-GEN in-POSS-ABL EXIT-NARR.PST

'Ali, who was thoroughly wet, holding on to a log, came out of the pond.'

The SS/DS *-DIktEn sonra* 'after verb-ing' is a composite structure formed by appending the nominalizing suffix *-DIK* and the ablative case *-DEn* to the verb stem, followed by the postposition *sonra* 'after' (Göksel and Kerslake, 2005, p. 429). *-DIktEn sonra* clauses indicate perfective aspect and an ordered temporal relation. Example (5) is an SS chain formed with the converbs *-DIktEn sonra,* and *-Ip,* and a relative clause modifying the object of the *-Ip* clause.

(5) AD (p76) Situation: introduction of the characters and setting.

Ali ile Fındık o gün dışarı-da uzun süre oyun
Ali and Fındık that day outside-LOC long period game
oyna-dıktan sonra bul-duk-lar-ı bir kurbağa-yı
play-CVB after find-REL-PL-POSS3SG one frog-ACC
al-ıp ev-e getir-miş-ler.
take-CVB home-DAT bring-NARR.PST-3PL

'Ali and Fındık, after playing outside for a long while, taking a frog that they found, brought it home.'

The semantic interpretation of converbs differs in terms of their specifity vs. context dependence. Slobin (1995, p. 356) draws an important distinction between *-IncE* and *-ken* vs. *-Ip* and *-ErEk,* in that the first two are inherently temporal whereas the last two rely on contextual inferences for their interpretation as successive or simultaneous. *-DIktEn sonra* also explicitly expresses a temporal relation. All five converbs contribute to aspectual-temporal and referential continuity between clauses in chained sequences.

The above examples from the adult data show that Turkish converbs, in addition to connecting sequences of events in chains, also combine with complement, relative or other adverbial clauses in complex sentences.

RESEARCH ON THE DEVELOPMENT OF CONNECTIVITY IN TURKISH

Crosslinguistic evidence on connectivity has demonstrated that children acquire coordinate constructions by age 3 (Bloom et al., 1980; Peterson and McCabe, 1988) and complex sentences with subordination by age 4 (Diesel and Tomasello, 2001; Givón, 2001), showing further developments until 7–12 years of age (e.g., Berman and Slobin, 1994a: English, German, Hebrew, Spanish, Turkish; Justice et al., 2006: English; Kit-Sum To et al., 2010: Cantonese; Mäkinen et al., 2014: Finnish; among others).

Research on Turkish similarly indicates that conjunctions, converbs, adverbial, relative, and complement clauses are acquired between ages 2;6 to 5;0 but the flexibility of use in narrative discourse continues to develop until early school years (Slobin, 1986, 1995; Aksu-Koç, 1994; Aksu-Koç and von Stutterheim, 1994; Küntay and Nakamura, 2004; Altan, 2008; Özge et al., 2010; Nakipoğlu and Yıldız, 2014; Sarılar et al., 2015). Studies on the development of referent tracking also evidence gradual progress during the preschool and school years (Özcaliskan and Slobin, 1999; Küntay, 2002; Aksu-Koç and Nicolopoulou, 2015).

Although there are no studies that specifically focus on input concerning connectives, children's own use in spontaneous conversations as well as in narratives indicate that they hear these forms early in development. Slobin provides evidence for their frequent use in books for preschool children (1995, p. 350) and from cros-sectional data of adult-child conversation where children's uses of converbs *-IncE* and *-ken* were recorded at 2;0 and of *-Ip* and *-ErEk* at 3;0 (1982, cited in 1995, p. 350). In this same data set, Altan (2005) observed that although children produce nominalized complements around 3;0, they prefer using sentential complements. In the longitudinal data of two children between 1;6 and 3;3, complement clauses were infrequent in the input either because mothers simplify their speech by using sentential complements or because there are few occasions to use them (Altan, 2005).

The development of clause linking in narrative discourse has been described for English, Hebrew, German, Spanish and Turkish in the now-classic work by Berman and Slobin (1994b) and for many other languages in studies in the same tradition.

This body of research on stories elicited by use of the picture book *Frog where are you?* (Mayer, 1969) has revealed that younger children use coordinating and older children subordinating constructions to package several related events into syntactically larger units or chunks by early school years (Aksu-Koç, 1994; Aksu-Koç and von Stutterheim, 1994; Bamberg, 1994; Berman and Slobin, 1994a; Slobin, 1995; Aarsen, 1996; Fernández, 2013; among others).

Berman and Slobin (1994a, p. 540–541) summarized the patterns observed crosslinguistically across the original five languages and observed that Turkish children, in line with the typological pattern of their language, prefer non-finite linking with converbal and infinitival constructions instead of connecting finite clauses with subordinating or non-subordinating conjunctions that are favored by peers speaking the other languages. Further evidence for Turkish children's early usage of converbal clauses in narratives and conversation is provided by Çapan (2013) and Rehbein and Herkenrath (2015). Both studies report an increase in the use of converbs between ages 4 and 5 in terms of frequency, variety and function. Converbs *-ken*, *-IncE*, and *-Ip* were scarce and limited to expression of temporality in the speech of 4-year-olds, whereas in the speech of 5-year-olds the frequency of their use increased and was not functionally restricted, expressing causality, manner and temporality. The speech of 5-year-olds and older children also displayed the use of other converbs such as *-ErEk*.

In the present analysis, we build on this previous work (Aksu-Koç, 1994; Berman and Slobin, 1994a,b; Çapan, 2013; Rehbein and Herkenrath, 2015) by tracing the use of chains and combinations of non-finite clause structures in complex sentences. Our research questions ask the following: (1) What is the developmental trajectory of complex sentences with clause chains and clause combinations as revealed by their frequency of use and the number and types of clauses combined? (2) What patterns of discourse continuity in clause chains—aspectual-temporal and referential—can be identified across age groups?

METHOD

Participants

Forty native Turkish-speaking children and 6 adults participated in the study. The distribution of the participants by age and sex is as follows: 10 4-year-olds (6 males, M_{age}= 4;8, range = 4;1–4;11), 10 5-year-olds (4 males, M_{age} = 5;6, range = 5;0–5;10), 10 8-year-olds (3 males, M_{age} = 7;8, range = 7;7–8;3), 10 11-year-olds (6 males, M_{age} = 11;2, range = 11;0–11;11) and 6 adults (1 male, M_{age} = 21;0, range = 20;7–22;0). Four- and 5-year-old participants were recruited from kindergartens and 8- and 11-year-olds from primary and secondary public schools in Istanbul, Turkey. The adults were psychology undergraduates at Istanbul Bilgi University in Istanbul, Turkey. All participants were of middle socioeconomic background. Appropriate permissions were obtained for their participation.

Material and Procedure
Narrative Production Task

Narratives were elicited using Mayer's wordless picture book 'Frog, where are you?' (1969). The story depicted is about a boy, his dog and his lost frog. In their search for the frog, the boy and the dog go through successive encounters with different animals (a gopher, an owl, bees, and a deer) in the woods and finally find their frog and take it back home. The events of the story, represented in 24 pictures, are conducive to clause chaining and combining (Ögel-Balaban, 2015).

Procedure

Each participant was tested individually in a separate room in their schools. The experimenter introduced the book and asked the participants to first look through all the pictures and then tell the story. She did not provide any prompts during story telling. Both the participant and the experimenter had the pictures of the book open in front of them as the story was being told. The narratives were video-recorded.

Transcription and Coding

Video-recordings of the narratives were transcribed using EUDICO Linguistic Annotator (ELAN), developed at the MPI for Psycholinguistics, Nijmegen, for the analysis of language, sign language and gestures (Lausberg and Sloetjes, 2009). The data analyzed consist of a total of 1,833 clauses (6,485 s) comprising the narratives of 4- to 11-year olds and a total of 373 clauses (1,143 s) comprising the narratives of adults.

The narratives were coded clause by clause. A clause was defined as a unit minimally consisting of a pairing of a predicate and a set of arguments (Gast and Diessel, 2012, p. 3). Each clause was coded for the following parameters:

(i) Type of sentence in which the clause occurs (code applies for each clause in the sentence):

Simple sentence: consists of a single clause with one verbal or nominal predicate marked for tense-aspect-mood and person/number.

Complex sentence: consists of a main clause with one verbal or nominal predicate marked for tense-aspect-mood and person/number and one or more embedded and/or dependent clauses.

(ii) Type of embedded and/or dependent clause:

Non-finite clauses that are dependent and embedded, and associated suffixes:

Adverbial (*-DIK*, *-EcEk*, *-mE*); complement (*-DIK*, *-EcEk*, *-mE*), relative (*-En*, *-DIK*, *-EcEk*, *-mE*)[6]

Non-finite clauses that are dependent but not embedded, and associated suffixes:

Converbal (*-Ip*, *-ErEk*, *-IncE*, *-ken*, *-DIktEn sonra*)

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[6]Infinitival complement clauses with *-mEk* followed by an aspectual or modal verb as in *Köpek arılardan kaçmak istiyordu* 'The dog wanted to run away from the bees' were not included since they do not link two events but focus on a phase of a single situation.

Finite clauses that are embedded but not dependent on the main clause:[7]

Clauses conjoined by the conjunction *diye* 'for' used in purpose clauses (e.g., *Kaç-ma-sın **diye** kavanoz-a koy-du-k* (escape-NEG-IMP.3SG for jar-DAT put-PST-1PL) 'We put it in the jar **so that** it won't escape.').

Clauses conjoined by *ki* as a complementizer (e.g., *Bir de bak-mış-lar **ki** kurbağa yok.* (one too look-PRF-3PL COMP frog NONEXIST) 'and they just look, the frog is not there.')

Direct speech reports: Clauses representing exact utterances of the story characters followed by the verb *de* 'say' were not coded for their content and not counted as part of the clause combination, but the associated non-finite clause was coded. For example, *Çocuk köpeğe "sessiz ol" der-**ken** kurbağa-yı gör-müş.* (boy dog-DAT quiet be say-CVB frog-ACC see-NARR.PST) 'The boy saw the frog while saying "be quiet" to the dog' was coded as a 1-NCL with *-ken* converb.

(iii) Type of referentiality for each clause type: Same Subject (SS), Different Subject (DS)

(iv) Number of clauses in a complex sentence with non-finite clauses:

1-NCL complex sentence: a non-finite clause and a main clause;

2-NCL complex sentence: two non-finite clauses and a main clause;

3-NCL complex sentence: three non-finite clauses and a main clause (includes the only two instances of 4-NCL combinations);

(v) Complex sentences with a syntactic or semantic error were included in the counts. They are displayed in **Table 6** and discussed in the text.

(vi) Subject markers: Each of the three characters, boy, dog and frog and all other characters combined as 'others' were coded for the following subject marking devices, only when they were in the subject role: NP, PRO, POSSESSIVE on the verb, NULL PRO.

(vii) Aspectual-temporal continuity in clause chains and combinations:

Same aspect: the non-finite clauses express the same aspectual distinctions (e.g., perfective–perfective).

Different aspect: the non-finite clauses express different aspectual distinctions (e.g., perfective–imperfective).

Aspect and modality: At least one of the non-finite clauses expresses aspect, and at least one, modality.

An inspection of the narratives which contained complex sentences with 2- and 3-NCL chains and clause combinations showed that they all maintained an anchor tense, providing continuity at the discourse level (either the *-mIş* inflection as the narrative past or the *-Iyor* inflection as the narrative present). Aspectual-temporal characteristics of the chains and clause combinations which concern relations between events at the sentence level were coded as indicating 'Same Aspect,'

'Different Aspect' or 'Aspect & Modality' on the basis of the aspectual meaning of the chaining and combining devices and the verbs they are attached to, as well as the aspectual meaning of the main verb. The tense-aspect marking on the main verbs, i.e., the anchor tense, which is the same across (almost) all utterances of a narrative, was not taken as criterial. For this reason, aspectual continuity was not traced in 1-NCL chains.

(viii) Cross-sentence boundary reference (XSR): Clauses were coded for XSR if the pronoun or null subject of a clause (non-finite or main) in a chain referred, for its identification, anaphorically to a referent expressed with an NP in a preceding clause external to the sentence, regardless of whether in subject or object role.

RESULTS

In view of the fact that the core element in clause chaining and clause combining is the verb and that there is a close relationship between lexical and syntactic development at younger ages (Marchman and Bates, 1994; Bastiaanse and Bol, 2001; among others), we used verb diversity as an index of general syntactic development. A one-way ANOVA on the mean number of different verbs by age revealed a significant difference between 4-year-olds and adults [$F_{(4,41)} = 4.18, p < 0.01$]. Although 4-year-olds and older children did not differ significantly, the means show that starting at age 5 there is a gradual increase in the variety of verbs used by each age group ($M_{4\text{-years}} = 20.80$, $M_{5\text{-years}} = 26.70$, $M_{8\text{-years}} = 29.40$, $M_{11\text{-years}} = 28.30$, $M_{\text{adults}} = 38.00$) suggesting that the verb diversity of 4-year-olds is restricted as compared to that of older children, whose verb diversity, in turn, is not as extensive as that of adults.

A preliminary analysis using G*power (Faul et al., 2007) demonstrated that the sample size was too small for a powerful mixed-design inferential statistical analysis of the differences between age groups and their interactions with clause types. Therefore, no inferential statistical analysis was conducted regarding the data presented in the following sections.

Overview of Syntactic Complexity of Narratives

Table 1 presents an overview of the syntactic complexity of children's and adults' narratives. First, the mean number of sentences shows an overall increase in the length of the narratives across age groups. Second, the relative percentages of simple sentences decrease (from 80% for 4-year-olds to around 50% for 11-year-olds and adults), and complex sentences increase (main and subordinate, from 20% for 4-year-olds to 45% for 11-year-olds and adults), indicating a change toward syntactic complexity by age.

Table 2 displays the frequencies of three types of embedded and/or dependent clauses in complex sentences found in the data: Finite subordinate clauses including direct speech reports and clauses joined by conjunctions *ki* and *diye,* and non-finite subordinate clauses including those that are both embedded and dependent and those that are only dependent. Direct speech reports are used with high frequency by 4- and 5-year-olds,

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[7]Non-finite clauses that are dependent but not embedded have been classified as co-subordination by Foley and van Valin (1984), while clauses that are embedded but not dependent are not discussed in their framework. This latter type is possible with a few constructions in Turkish, involving the verb *san-* 'presume' or the conjunctions *diye* and *ki* (Erguvanlı Taylan, 1988, p.339; Kornfilt, 1997, p.46).

TABLE 1 | Mean number (and percentage) of total sentences, simple sentences, main, and subordinate clauses in complex sentences by age.

Age	Total sentences	Simple sentences	Complex sentences	
			Main	Subordinate
4-years	37.30	27.60 (79.79)	4.30 (9.16)	5.40 (11.05)
5- years	44.20	39.10 (65.79)	6.70 (15.22)	8.40 (18.99)
8- years	55.10	36.90 (66.50)	8.70 (16.08)	9.50 (17.43)
11- years	47.00	25.40 (55.47)	9.80 (20.42)	11.80 (24.10)
Adults	70.00	36.67 (50.56)	14.83 (21.78)	18.50 (27.65)

TABLE 2 | Frequency (and percentage) of different types of embedded and/or dependent clauses by age*.

Age	Total	Direct Speech	Finite	Non-finite
4- years	54	26 (48.15)	1 (1.85)	27 (50.00)
5- years	84	20 (23.81)	5 (5.95)	59 (70.24)
8- years	95	11 (11.58)	18 (18.95)	66 (69.47)
11- years	119	3 (2.52)	4 (3.36)	112 (94.12)
adults	109	2 (1.83)	7 (6.42)	100 (91.74)

*Non-finite = Converbs, adverbial clauses, complement clauses, and relative clauses; Finite = Conjunctions (diye, ki).

TABLE 3 | Frequency (and percentage) of complex sentences with 1-, 2- and 3-non-finite clauses (NCL) by age.

Age	Total	1-NCL	2-NCL	3-NCL
4- years	27	27 (100.00)	–	–
5- years	50	43 (86.00)	5 (10.00)	2 (4.00)
8- years	62	57 (91.94)	5 (8.06)	–
11- years	93	77 (82.80)	14 (15.05)	2 (2.15)
Adults	80	62 (77.50)	16 (20.00)	2 (2.50)

TABLE 4 | Frequency (percentage) of types of non-finite clauses in 1-NCL complex sentences by age.

Age	Total	CVB	ADV	COMP	REL
4- years	27	23 (85.19)	3 (11.11)	1 (3.70)	–
5- years	43	37 (86.05)	4 (9.30)	2 (4.65)	–
8- years	57	34 (59.65)	19 (33.33)	4 (7.02)	–
11- years	77	53 (68.83)	8 (10.39)	10 (12.99)	6 (7.79)
adults	62	27 (43.55)	13 (20.97)	11 (17.74)	11 (17.74)

decrease in 8-year-olds' narratives and are rarely found in the narratives of older groups. Finite clauses linked with *ki* and *diye* are very few in 4- and 5-year-olds' narratives, are frequently used by 8-year-olds, but decline in the narratives of the older participants. Non-finite clauses that participate in complex sentences, on the other hand, show a steady increase across age groups (from 50% to 90%).

In the following analyses, direct speech reports and finite subordinate clauses are excluded, since our focus is only on clause chains and other non-finite clause combinations.

Developmental Trajectory of Complex Sentences With Chains and Other Non-finite Clause Combinations

Our first research question asked about the developmental trajectory of complex sentences with chains and other non-finite clause combinations as revealed by their frequency of occurrence and the number and types of clauses constituting them.

Table 3 presents the frequency of complex sentences that have one (1-NCL), two (2-NCL) and three (3-NCL) non-finite clauses by age. It is observed that 100% of the 4-year-olds' complex sentences are composed of 1-NCL and a main clause, while 2-NCL complex sentences are produced by all older children. The

narratives of 11-year-olds and adults have twice as many 2-NCL complex sentences as those of 5- and 8-year-olds. Examples of 3-NCL complex sentences are scarce overall.

These data indicate that both the frequency of complex sentences and the number of clauses comprising them increase around age 5 but approximate those of adults sometime around age 11. The length of the complex sentences, however, do not exceed 3-NCLs in the present data (except for two cases of 4-NCLs by adults).

1-NCL Complex Sentences

The frequency of 1-NCL complex sentences and of the associated clause types are presented in **Table 4**. The relative frequency of clause types is the same at successive ages, but both their frequency and variety increase. Converbal clauses, i.e., 1-NCL chains, are predominant at all ages, in particular for 4- and 5-year-olds, constituting about 85% of their complex sentences. Next in frequency are adverbial clauses, which show an increase at 8 years (33%), leveling off to 10–20% for the older groups. Complement and relative clauses are very infrequent in younger children's narratives but show a relative increase in the 11-year-olds' and adults' stories (on average 10% and 18%, respectively).

1-NCL Chains

Table 5 presents the distribution by age of the five converbs that stand out as chaining devices in our narratives. At all

TABLE 5 | Frequency (and percentage) of types of converbal clauses in 1-NCL complex sentences by age.

Age	Total	-Ip	-ken	-IncE	-DIktEn sonra	-ErEk
4- years	23	9 (39.13)	4 (17.29)	7 (30.43)	3 (13.04)	–
5- years	37	17 (45.95)	11 (29.73)	4 (10.81)	3 (8.11)	2 (5.41)
8- years	34	16 (47.06)	7 (20.59)	8 (23.53)	2 (5.88)	1 (2.94)
11- years	53	21 (39.62)	14 (26.42)	6 (11.32)	4 (7.55)	8 (15.09)
adults	27	10 (37.04)	7 (25.93)	2 (7.41)	2 (7.41)	6 (22.22)

ages, converbal clauses with *-Ip* have the highest relative frequency (40%), *-ken* (20–30%) and *-IncE* (10–30%) clauses have intermediate frequencies, and *-DIktEn sonra* (6–13%) and *-ErEk* (3–20%) clauses are at the lower end. The developmental order is, thus, *-Ip > -ken* and *-IncE > -DIktEn sonra* and *-ErEk*.

As noted by Johanson (1995, p. 314–315), in chains constructed with SS suffixes, the verbs of the converbal and the main clauses may either form a common verbal phrase with no interposed elements between them, thus presenting the two events almost as a single event [example (6)], or there may be two full predicates presenting successive events [example (7)].

(6) 5;0 (p106) Situation: the boy and the dog find the frog, take it and leave

*Sonra o kurbağa-yı al-**ıp** gid-iyor.*
then that frog-ACC take-CVB go-IPFV

'Then taking that frog (he) goes.'

While children use *-Ip* early on, *-ErEk*, the other SS converb, is scarce in the narratives of the younger children, becoming more frequent in 11-year-olds' and adults' narratives. In example (7) from a 5-year-old, the *-ErEk* clause presents the first event as the instrumental/enabling phase for the second.

(7) 5;0 (p107) Situation: boy falls on the deer that emerges behind the rock

*Bir taş-ın üst-ü-ne çık-**arak** geyiğ-e*
one rock-GEN top-POSS.3SG-DAT climb-CVB deer-DAT
bin-miş.
ride-NARR.PST

'Climbing a rock, (he) rode on the deer.'

In DS chains, both the main and the converbal clause have a full verb as well as a subject of their own (Johanson, 1995, p. 314-315). Example (8) illustrates an 8-year-old's DS use of the simultaneity suffix *-ken* and example (9) an SS chain with *-IncE*.

(8) 8;0 (p11) Situation: the boy catches the dog as it is falling.

Sonra köpek düş-er-ken çocuk o-nu yakala-mış
then dog fall-AOR-CVB boy that-ACC catch-NARR.PST

'Then while the dog was falling, the boy caught him.'

(9) 4;0 (p93) Situation: the dog gets his head stuck in the frog's jar.

*Sonra da köpek bu-nun iç-i-ne bak-**ınca***
then and dog this-GEN IN-POSS.3SG-DAT look-CVB
sıkış-mış.
get.stuck-NARR.PST

'And then, when the dog looked in this, it got stuck.'

The overall frequency of *-ken* chains are higher than *-IncE* chains, and their DS uses are more frequent than SS uses most likely because the pictures of the story book depict the activities of the two protagonists simultaneously. The frequency of the SS vs. DS *-IncE* chains are relatively balanced.

Chains with the converb *-DIktEn sonra* are infrequent across age groups (around 10% or less). The SS chain in example (10) from an 8-year-old presents the events referred to by the two predicates in an explicit temporal relation.

(10) 8;0 (p12) Situation: the boy finds the frog.

*Bul-**duktan sonra** çok sev-in-di.*
Find-CVB after much love-REFL-PST

'(He) was very happy after finding it.'

1-NCL chains with all of the five converbal suffixes are produced without error by 11-year-olds and adults. Although younger children use converbs early on and seem well aware of their structural requirements as noted by Çapan (2013, p. 109) (e.g., for an aspectual-temporal marker between the verb stem and the suffix *-ken*), they also make occasional errors. **Table 6** presents the distribution of different types of errors observed in the data.

One 5-year-old and two 8-year-olds use the SS suffix *-Ip* where the use of *-IncE* as a DS marker would be grammatical. In example (11), two clauses with different subjects are connected with *-Ip,* violating the requirement for the use of *-IncE*:

(11) 8;0 (p8): Situation: an owl comes out of the tree hole and makes the boy fall down.

*Sonra iç-i-nden baykuş çık-***ıp** düş-müş*
then in-POSS.3SG-ABL owl exit-CVB fall-NARR.PST
çocuk yer-e.[8]
boy ground-DAT

'Then, an owl coming out, the boy falls to the ground.'

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[8](*) indicates an ungrammatical and (*0) a missing morpheme.

TABLE 6 | Distribution of types of errors by age.

	Syntactic error						Semantic error	
	Wrong chaining device		Missing genitive		Missing possessive		Semantically anomalous	
Age	1-NCL	2-NCL	1-NCL	2-NCL	1-NCL	2-NCL	1-NCL	2-NCL
4- years	3	–	–	–	–	–	1	–
5- years	1	–	1	–	1	–	1	2
8- years	2	–	–	–	–	2	3	–
11- years	–	1	–	1	–	–	–	–
adults	–	–	–	–	–	–	–	–

It has been noted that crosslinguistically, SS marking is the morphologically simpler means whereas DS marking may require an overt NP or an agreement marker (Stirling, 2006, p. 318). Although *-IncE* does not involve any agreement marking, it nevertheless appears to pose problems to children in its DS uses. The two forms may be confused because they both indicate perfective aspect and sequentiality, and *-Ip* may be accessed first because it is the earliest acquired and most frequently used form.

Other 1-NCL Combinations

As presented in **Table 4** and noted above, the proportion of adverbial, complement and relative clauses in 1-NCL sentences is much lower than that of converbal clauses, particularly for 4- and 5-year-olds. These clause types that are both embedded and dependent are also morphosyntactically more complex than converbal clauses, hence their gradual increase across age groups.

Adverbial clauses are mainly used to express causal relations in the present narratives [example (12)], and complements refer to mental sates [example (13)].

(12)   8;0 (p12) Situation: beehive falls when dog pushes the tree.

Köpek it-tiğ-i   için arı kovanı düş-tü.
dog   push-ADV-POSS.3SG for bee hive   fall-PST

'The beehive fell because of the dog's pushing it.'

(13)   8;0 (p25) Situation: the boy and dog are searching the frog.

O-ndan   sonra ormanlık-ta
that-ABL after woods-LOC
ol-acağ-ı-nı
be-COMP-POSS.3SG-ACC
düşün-üyor-lar.
think-IPFV-3PL

'Then they think it will be in the woods.'

Errors are also observed in the use of 1-NCL complex sentences with these clause types. In example (14a) the subject of the complement clause lacks the genitive suffix and its verb the accusative suffix. In addition, a verb for the adverbial clause implied by the postposition *için* 'for' is missing. The correct version is given in example (14b).

(14)   5;0 (p119) Situation: the boy is looking for the frog in the forest.

a. *Sonra   kurbağa-cık-*0   nerede*
then   frog-DIM-*0GEN   where
ol-duğ-u-*0   için bağır-mış-tı.
be-NOM-POSS.3SG-*0ACC for call-PFV-PST

'Then (he) called out where the little frog is.'

b. *Sonra kurbağa-cığ-ın nerede ol-duğ-u-nu*
then frog-DIM-GEN where be-COMP-POSS.3SG-ACC
anla-mak   için bağır-mış-tı.
understand-NOM *for* call-PFV-PST

'Then he called out to find out where the little frog is.'

These examples illustrate that morphosyntactic complexity affects young children's production of complex sentences. The errors concerning the use of *–IncE* mentioned above, on the other hand, suggest that it is not just complex morphosyntax that causes problems, but the conceptual coordination of the activities of different actors may also be at issue.

2-NCL and 3-NCL Complex Sentences

In **Table 7**, we have the distribution by age of 2- and 3-NCL clause chains and other non-finite clause combinations. It is observed that the number of complex sentences composed of converbal clauses only, i.e., chains, is limited for each age group.

4-year-olds do not produce any 2-NCL or 3-NCL complex sentences. Chains with at least two converbal clauses constitute 71.43% of the complex sentences for 5-year-olds, 25.00% for 11-year-olds and 27.77% for adults. 8-year-olds do not produce any two converbal chains. Combinations with at least one converbal clause and an associated adverbial or an embedded complement or relative clause constitute 28.57% of the complex sentences for 5-year-olds, 20% for 8-year-olds, 56.25% for 11-year-olds and 55.55% for adults. Complex sentences composed of adverbial and/or complement or relative clauses are 80% for 8-year-olds but do not exceed 20% for the older participants.

		Chains	Other non-finite clause combinations				
Age	Total	CVB +CVB (+COMP)	CVB + ADV (+REL)	CVB + COMP	CVB+ REL	ADV + ADV (+REL)	ADV + COMP
4- years	–	–	–	–	–	–	–
5- years	7	3(+2)	–	2	–	–	–
		(71.43)		(28.57)			
8- years	5	–	1	–	–	2	2
			(20.00)			(40.00)	(40.00)
11- years	16	4	4(+1)	3	1	1(+1)	1
		(25.00)	(31.25)	(18.75)	(6.25)	(12.50)	(6.25)
adults	18	4(+1)	5(+1)	2	2	2	1
		(27.77)	(33.33)	(11.11)	(11.11)	(11.11)	(5.56)

*The frequencies of 3-NCL clauses are indicated in parenthesis following the + sign.

Below, we discuss the predominant patterns of clause chains and other combinations for each age group.

5-year-olds

The first clause chains with more than one converbal clause are observed in the 5-year-old narratives. Example (15) illustrates the repeated use of -Ip to relate the actions of the same actor in temporal succession, and (16) the repeated use of -ken to relate the activities of different actors as simultaneous.

(15) 5;0 (p102) Situation: the bees follow the dog who made their beehive fall.

*Kovan-a gir-**ip** bal-lar-ı al-**ip** çocuk ve*
hive-DAT enter-CVB honey-PL-ACC take-CVB boy and
köpeğ-in kafa-sı-na bal koy-muş.
dog-GEN head-POSS.3SG-DAT honey put-NARR.PST

'Entering the beehive, taking the honey (they = bees) put the honey on the boy's and dog's heads.'

(16) 5;0 (p105) Situation: the boy and dog are sleeping, the frog escapes from the jar.

*Sonra çocuk uyur-**ken** köpek de uyur-**ken** kurbağa*
then boy sleep-CVB dog too sleep-CVB frog
sessiz sessiz kaç-mış.
silent silent escape-NARR.PST

'Then while the boy is sleeping and while the dog is sleeping the frog escaped silently.'

As **Table 7** shows, two 5-year-olds also produced 3-NCL complex sentences composed of a chain of two repeated converbal clauses with a complement clause. In the SS chain of example (17), the first -IncE clause sets the temporal frame, and the second -IncE clause presents the perception of the absence of the frog expressed

with an embedded complement clause, as the cause for the event of the main clause.

(17) 5;0 (p105) Situation: the boy and dog wake up, the boy is surprised to see that the frog is not in the jar.

*Sonra köpek ile çocuk uyan-**ınca** kurbağa-nın*
then dog and boy wake.up-CVB frog-GEN
*bu kavanoz-da ol-ma-**dığ**-ı-nı gör-**ünce***
this jar-LOC be-NEG-COMP-POSS.3SG-ACC see-CVB
şaşır-mış.
be.surprise-NARR.PST

'Then, upon waking up and seeing that the frog was not in this jar, the dog and the boy were surprised.'

These examples suggest that repeating the same chaining device in successive clauses to relate sequential activities of the same actor or simultaneous activities of different actors may be the easiest strategy for young children, conceptually as well as syntactically. This strategy also ensures chain-internal aspectual continuity, for example, perfective aspect with the repetition of -Ip clauses and imperfective aspect with the repetition of -ken clauses, and also contributes to chain-internal referential continuity, as discussed in Section on Referential Continuity.

8-year-olds

For 8-year-olds, the main linking strategy is event packaging with adverbial clauses. Only one of the five complex sentences contains a converbal clause combined with an adverbial clause; the rest are combinations of two adverbial or an adverbial and a complement clause (**Table 7**) and reveal a shift of emphasis from temporal to causal relations. Examples like (18) where a converbal and an adverbial clause present the temporal-causal background, and (19) where two adverbial clauses present the causal basis for the event of the main clause, show that complex sentences with adverbial clauses may also function like chains.

(18) 8;0 (p23) Situation: the boy and dog are sleeping, the frog escapes from the jar.

Akşam ol-unca çocuk ile köpek uyku-ya
night   be-CVB   boy   and   dog   sleep-DAT
dal-dık-lar-ı-nda   kurbağa kavanoz-dan
fall-ADV-PL-POSS.3SG-LOC   frog   jar-ABL
çık-mış.
exit-NARR.PST

'As evening came, upon the boy and dog's falling asleep, the frog exited the jar.'

(19) 8;0 (p24) Situation: the boy is looking into the owl's hole.

Burda da baykuş çocuğ-u rahatsız
here   and   owl   boy-ACC   uneasy
ed-iyor-muş,   bak-tığ-ı   için
make-IPFV-NARR.PST   look-ADV-POSS.3SG   for
ev-i-ne,   rahatsız et-tiğ-i   için.
home-POSS-DAT uneasy   make-ADV-POSS.3SG   for

'And here, the owl was bothering the boy, for looking into his home, for bothering him.'

Although 8-year-olds produce complex combinations of converbal, adverbial and complement clauses, some of the examples still display errors such as the omission of the accusative marker on the verb of the complement clause and the agreement marker on the verb of the adverbial clause, similar to the errors of 5-year-olds. Such morphosyntactic errors prevailing at 8 years point to the processing demands of formulating complex language when the task is one of producing organized narrative discourse.

11-year-olds

Three of the four 2-NCL chains found in the narratives of this age group are formed with the repetition of the same converb, similar to the pattern observed for 5-year-olds. In example (20), two SS -*ErEk* clauses are chained to describe the psychological state of the actor and his consequent action from an integrated imperfective perspective, illustrating the conceptually complex discourse function of this form (Slobin, 1995, p. 349).

(20) 11;0 (p40) Situation: the boy gets angry at the dog's breaking the jar, picks him up and sets out to search.

Sonra çocuk sinirlen-erek köpeğ-i el-i-ne
then   boy   get.upset-CVB   dog-ACC   hand-POSS.3SG-DAT
al-arak gezme-ye çık-mış.
take-CVB stroll-DAT exit-NARR.PST

'Then the boy getting upset, taking the dog in his hand, set out for a stroll.'

In the other two examples where the same converbal suffix (e.g., -*Ip* and -*Ip*, or -*ken* and -*ken*) is repeated in the chained clauses, either different activities of the same actor, or similar activities of different actors are related. A deviation from this pattern is observed in the use of two different converbs -*ken*

and -*Ip*, connecting the ongoing activity of one actor to the temporally overlapping activity of a second one, as in example (21) where both clauses have overt subjects expressed with an NP, and the clause marked with -*Ip* is followed by the main clause with a null pronoun for subject, as signaled by the SS clause.

(21) 11;0 (p39) Situation: the dog makes the beehive fall while the boy is looking into a hole.

Çocuk ara-r-ken   köpek arı-lar ile uğraş-ıp
boy   search-AOR-CVB   dog   bee-PL   with   deal-CVB
o-nu   yer-e   düş-ür-üyor   böyle.
that-ACC ground-DAT fall-CAUS-IPFV like.this

'While the boy is searching, the dog bothers the bees and makes it (beehive) fall on the ground like this.'

The advance observed in the complex sentences of 11-year-olds is the increased variety of the types of non-finite clauses combined. In a total of eight 2-NCL and one 3-NCL complex sentence, a converbal clause is combined with an adverbial, a complement or a relative clause. In such combinations, a -*ken* or an -*Ip* converbal clause functions to frame events in terms of temporal and/or referential continuity. Example (22) is a 3-NCL complex sentence composed of a converbal, a relative, an adverbial and a main clause used to introduce the plot-initiating event of the story.

(22) 11;0 (p4) Situation: the boy and dog are sleeping, the frog gets ready to escape.

Can ve köpeğ-i   uyur-ken kurbağa-yı
Can and dog-POSS.3SG sleep-CVB frog-ACC
koy-duk-lar-ı   kavanoz-dan kurbağa kaç-mak
put-REL-PL-POSS.3SG   jar-ABL   frog   escape-ADV
için hazırlık yap-ıyor-du.
for preparation make-IPFV-PST

'While Can and his dog were sleeping, the frog was getting ready to escape from the jar that they had put the frog in.'

Older children can easily situate events referred to by an -*Ip* or -*ErEk* clause against background events expressed by an -*IncE*, -*ken* or adverbial clause, and further refer to the mental states of actors with a complement clause embedded in the sequence, thus producing complex sentences that can be regarded as 'chains with other non-finite clauses.' These advances in children's use of language reflect developments in their ability to coordinate actions and mental states of different actors, as well as in their developing narrative skills for backgrounding, foregrounding, and evaluating events from different perspectives.

Chains showing increased variability in terms of the relations contracted between clauses by use of different converbs are found more frequently in the narratives of the adults. Of the five full chains observed for adults, only one is a combination of -*ken* and -*ken* clauses, while two are -*ken* and -*Ip*, and two are -*dIktEn sonra* and -*Ip* combinations.

Continuity in Clause Chains and Other Non-finite Clause Combinations

As Givón puts it "… coherent discourse tends to maintain, over a span of several clauses, the same topical referent, the same or contiguous time, the same or contiguous location, and sequential action" (2017a, p. 29; also Watanabe, 1994). Following this idea, our second research question asked whether children's 2- and 3-NCL complex sentences showed a developmental pattern in terms of the type of discourse continuity contracted. Below, we present the distribution of chains and clause combinations in terms of the aspectual-temporal and referential continuities they display.

Aspectual-Temporal Continuity

We define aspectual-temporal continuity internal to a complex sentence (for clause chains or clause combinations separately) as the use of forms that encode the same aspectual distinctions in successive clauses (e.g., all encoding perfective or all encoding imperfective aspect). The patterns observed across 2- and 3-NCL chains and other non-finite clause combinations are summarized in **Table 8**. 1-NCL chains were not included in this analysis because the anchor tense marked on the main verbs of each narrative did not show any variation.

For 5-year-olds, complex sentences with chains display a high percentage of same aspect clauses (57.14%) whereas the complex sentences with other non-finite clause combinations display different aspectual specifications (28.57%). Eight-year-olds do not produce any clause chains, but their other non-finite clause combinations also show a preference for the same (60%) in comparison to different (20%) aspectual marking. Eleven-year-olds and adults, on the other hand, produce more complex sentences with other non-finite clauses (75% and 72%, respectively) than chains, and majority of these express different aspectual combinations. However, the dominant pattern across the clauses of their chains is same aspectual marking (3 out of 4, for 11-year-olds and 3 out of 5 for adults). These distributions in **Table 8** indicate that younger children install continuity at the sentential level by using clause chaining devices that present events from the same aspectual-temporal framework, as in examples (15) and (16). Older children and adults, on the other hand, tend to use varied combinations of converbal, adverbial, complement and relative clauses for expressing relations that hold beyond the sequential clausal level and from different perspectives as in example (22).

Referential Continuity

Referential continuity was evaluated for chains only. We define referential continuity internal to a chain in terms of the identity of subjects expressed by an NP, pronoun or a null pronoun, and cross-sentence-boundary referential continuity (XSR) in terms of the identity of subjects anaphorically referred to by a null pronoun or pronoun to an NP in one of the previous clauses external to the chain.

Table 9 summarizes the frequency of types of referential continuity by age. The category 'DS' refers to chains that link the activities of different actors, and therefore lack referential continuity. The category 'SS' refers to chains that link different activities of the same actor and therefore establishes referential continuity. The third type of referential combination, observed in case of 2- and 3-NCL chains, is '2SS-1DS,' where two of the actors are the same and one is different.

It is observed in **Table 9** that among 1-, 2-, and 3-NCL chains, the proportion of SS chains is higher (ranging between 60.87% and 70.59%) than that of DS chains (ranging between 28.12% and 39.13%) at all ages. The proportion of SS chains which is around 60% for 4- and 5-year-olds is somewhat higher in the narratives of the older age groups (around 70%). Furthermore, the proportion of chains with cross-sentence-boundary anaphoric reference is higher for SS than for DS chains (ranging between 60% and 75%) at all ages. These distributions indicate that by the age of 4 children are using chaining devices effectively, achieving referential continuity intra-sententially, and also beyond sentence boundaries, thus maintaining continuity with a previous discourse segment,

In example (23) from an 11-year-old, two -Ip clauses relate the activities of the same actor from a perfective-sequential perspective and contract both aspectual-temporal and referential continuity. Furthermore, the SS -Ip suffix makes anaphoric reference across the sentence boundary to an NP that went before, as well as signaling that the subject of the upcoming clause is the same.

(23) 11;0 (p15) Situation: the boy and the dog take their frog, salute the other frogs and leave.

*Sonra kendi kurbağa-lar-ı-nı   al-**ıp**   öbür*
then   PRO   frog-PL-POSS.3SG-ACC take-CVB other
*kurbağa-lar-a selam   ver-**ip**   ev-leri-ne*
frog-PL-DAT   greeting give-CVB   home-POSS.3PL-DAT
geri   dön-müş-ler.
back return-NARR.PST-3PL

'Then taking their own frog, greeting the other frogs, they went back to their home.'

In summary, evaluated from the perspective of continuity, the acquisition data suggest that Turkish children's earliest non-finite clause combinations and chains are built on aspectual and referential continuity, then differentiate to include temporal-causal perspectives, and coordination of subjects.

DISCUSSION AND CONCLUSION

In the present study, we investigated the development of complex sentences with non-finite clauses of varying degrees of dependency and embedding in the narratives of Turkish-speaking 4- to 11-year-olds and adults. Our first research question concerned developments in clause chaining with converbal clauses that are dependent but not embedded, as well as developments in clause combining with complement, relative and adverbial clauses that involve both dependency and embedding.

Our results show an early start and a gradual change across age groups. In terms of frequency, a clear increase in 1-, 2- and 3-NCL complex sentences is observed by age, the performance of 11-year-olds approximating that of adults.

TABLE 8 | Frequency (and percentage) of 2-NCL and 3-NCL complex sentences in terms of type of aspect by age.

	Total	Chains			Other combinations		
		Same aspect	Different aspect	Aspect and modality	Same Aspect	Different Aspect	Aspect and modality
4- years	–	–	–	–	–	–	–
5- years	7	4 (57.14)	1 (14.29)	–	–	2 (28.57)	–
8- years	5	–	–	–	3 (60.00)	1 (20.00)	1 (20.00)
11- years	16	3 (18.75)	1 (6.25)	–	2 (12.5)	7 (43.75)	3 (18.75)
adults	18	3 (16.67)	2 (11.11)	–	4 (22.22)	7 (38.89)	2 (11.11)

TABLE 9 | Frequency (and percentage) of DS, SS and 2SS-1DS combinations in 1-, 2- and 3-NCL chains and cross-sentence-boundary referential continuity (XSR) by age.

Age	Total	DS chains	SS chains	2SS-1DS chains	Total XSR	All DS XSR	All SS XSR	2SS-1DS XSR
4- years	23	9 (39.13)	14 (60.87)	–	15 (65.22)	6 (40.00)	9 (60.00)	–
5- years	42	16 (38.10)	25 (59.52)	1 (2.38)	25 (59.52)	7 (28.00)	18 (72.00)	–
8- years	34	10 (29.41)	24 (70.59)	–	16 (47.06)	4 (25.00)	12 (75.00)	–
11- years	57	17 (29.82)	39 (68.42)	1 (1.75)	21 (36.84)	6 (28.57)	15 (71.43)	–
adults	32	9 (28.12)	22 (69.75)	1 (3.13)	16 (50.00)	5 (31.25)	10 (62.50)	1 (6.25)

In terms of length, 4-year-olds produce maximally 1-NCL sentences, while older children and adults produce 2-NCL and occasionally 3-NCL sentences. Since the number of clauses a chain can potentially include is far above three observed in the present data, our findings need some explanation. First, it may be that the elicitation material that provides two or three events at a time in the pictures of the story book, thus the content to be told, could have limited the length of the chains. Second, longer chains, even 2- and 3-NCL clause ones might have been scarce because narrators, particularly older ones, present event packages where they combine converbal with adverbial, complement, and relative clauses. Third, this may be the nature of clause chaining in Turkish, where length of chains is rather limited to 3 or 4 converbal clauses.

In terms of the variety of clause types combined into a complex sentence, converbal and adverbial clauses are recorded from age 4 on, complement clauses appear at 5, and relative clauses are found only in the narratives of 11-year-olds and adults. The variety of clause types combined in a complex sentence also increases with age. The 2- and 3-NCL complex sentences of 5-year-olds consist mainly of combinations of converbal clauses and very few complement clauses, while those of 8-year-olds comprise adverbial and complement clauses, and those of 11-year olds and adults, combinations of converbal, complement, adverbial and relative clauses.

Among converbal clauses functional in clause chains, those with the SS -Ip suffix for sequencing emerges first and is the most frequent at all ages. Next are the SS/DS converbs, -IncE for relating events in temporal-causal succession, -ken for representing simultaneity, and -DIktEn sonra for temporal ordering of events. The SS converb -ErEk, which presents events from a temporally integrated perspective, is observed mainly in the stories of 11-year-olds and adults. The frequency of SS chains is higher than that of DS chains across all age groups. Adverbial clauses provide the temporal-causal circumstances for plot-advancing events in 8- and 11-year-olds' narratives, and complement clauses are used to make mental state attributions by 11-year-olds and adults. These developments are not error-free, however. Violation of the SS vs. DS subject requirements of converbs, and failure to provide the person/number and/or genitive suffixes for subject reference of adverbial and complement clauses, or the accusative case on complements reveal the semantic and morphosyntactic complexity of clause combining structures in Turkish.

Our second research question examined whether types of clauses that enter clause chains or clause combinations in complex sentences contribute to discourse continuity in children's narratives. We observed that younger children present events from the same aspectual temporal framework using converbal clauses in chains, while older children and adults present events from varied perspectives, using other non-finite clauses in clause combinations. As for referential continuity, we observed that children use SS chains more frequently than DS chains and make use of null pronouns across sentence boundaries from age 4 onwards. These patterns indicate that Turkish-speaking children are

quite competent in establishing both sentence-internal and cross-sentence-boundary referential continuity during the preschool years.

Evaluated from the syntactic point of view, the observed developmental trajectory indicates that converbs are easier and earlier accessed by children than adverbial, complement and relative clauses. This is not surprising since the morphosyntactic mechanisms involved in the construction of this latter group (nominalization, person/number marking on the embedded verb and/or case marking on its subject) are more complex than those involved in converbal clauses functional in clause chaining. An interesting question raised by these findings concerns the usage of direct speech reports and clauses conjoined with *ki* and *diye,* both embedded but not dependent. Although not included in the present analysis, the overview of sentence types used in the narratives (**Table 2**) showed that direct speech reports constitute 48% of the complex sentences used by 4-year-olds, showing a decrease with age to 2.5% at 11 years, and clauses conjoined with *ki* and *diye*, though 19% in the narratives of 8-year-olds, decrease to 3% and 6% in those of 11-year-olds and adults. The high frequencies of these structures at younger ages, particularly those of direct speech reports, shows that embedding *per se*, when dependency is not involved, may not pose difficulty, but that it is the combination of embedding and dependency that Turkish children find as a source of complexity in acquisition. A systematic comparison of structures with different combinations of these features remains to be a problem for future research.

Our findings concerning the functional development of chaining devices in children's narratives confirm the results of earlier studies on Turkish (Aksu-Koç, 1994; Slobin, 1995; Aarsen, 1996; Çapan, 2013; Rehbein and Herkenrath, 2015) as well as the cross-linguistic trends regarding event packaging reported by Berman and Slobin (1994a). Putting them together, we interpret the observed trajectory in language development in terms of two developmental shifts in children's cognitive abilities.

The first shift is between ages 4 and 5, as reflected in the emergence of 2- and 3-NCL complex sentences in the narratives of 5-year-olds compared to 4-year-olds. One explanation for this break may be in terms of the richness of their verb repertoire, i.e., their knowledge of the syntactic and semantic properties of verbs that can figure in combinations of other non-finite clauses (e.g., complement clauses). As was observed, the verb diversity of 4-year-olds is restricted as compared to that of older children, which could have affected their skill in clause combining. A second explanation for the fact that 4-year-olds produce 1-NCL sentences but not longer ones may be in terms of processing constraints rather than the syntax or semantics of these devices. Constructing complex sentences, whether by clause chaining or combining, requires planning, holding the subordinate units in working memory and inhibiting irrelevant information, all subskills of executive functions. In narrative discourse in particular, remembering the subject of a previous clause, and evaluating whether it

is same as, or different from the one(s) in the current and upcoming clauses is important for referential continuity and for shifting perspectives (Drijbooms et al., 2017). The effects of these processing constraints are likely to be somewhat reduced between the ages of 4 and 5, the age bracket when executive functions show a significant development (Friend and Bates, 2014).

The second qualitative shift is observed between ages 8 and 11, as revealed by the higher frequency of use of complement clauses which refer to the mental sates of the actors, and relative clauses which qualify referents in terms of their context-relevant properties, in the narratives of 11-year-olds compared to those of 8-year-olds. These changes in children's use of expressive means are observed along with changes in the conceptual content of their narratives. We suggest that such differences are due to advances in children's theory-of-mind capacities which allow them to integrate the perspectives of temporally and spatially displaced story characters into the event structure of the narrative through the use of the syntactic means they command. These relationships between complex sentence construction, executive function and ToM deserve future research in different discourse genres, using larger samples.

The need for an extended data base coming from larger samples and different discourse genres brings us to a consideration of the limitations of the present study due to the nature of the stimulus and the elicitation procedure used. As discussed above, relating events in terms of a coherent narrative and expressing them in a sequence of clauses present conceptual and processing demands. The 24-page wordless storybook was, therefore, kept in front of the narrators, with the successive pages of the book opened in tempo with the telling. The content of the pictures, with two protagonists engaged in two different activities, can be said to have set the boundaries for the content of the utterances, leading to the production of a limited number of chains of greater length. Future research should, therefore, use procedures where spontaneously self-generated narratives in everyday contexts are elicited.

In conclusion, our findings show a developmental trajectory where chaining devices, i.e., converbs, are the earliest non-finite clause linking structures children use, and that the pace of development is different but slower for other non-finite clause types. They demonstrate that the frequency, diversity and length of clause chains and clause combinations with other non-finite structures increase with age. Children's earliest clause chains are built on referential and aspectual-temporal, then on temporal-causal continuity. Referential continuity across sentence boundaries indicates that the scope of cohesive ties installed by referential means covers larger segments of discourse than individual clause chains. And most significantly, acquisition of these types of complex sentences rests not only on linguistic competence but also on conceptual development and processing skills.

DATA AVAILABILITY STATEMENT

The data for this study are available on request to the corresponding author.

ETHICAL STATEMENT

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

AUTHOR CONTRIBUTIONS

HÖ-B designed the study, collected data, conducted data analyses, and collaborated on the writing of the paper. AA-K designed the study, conducted data analyses, and wrote the paper.

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Development of Clause Chaining in Korean

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Korean is a language with the verb at the end of a clause/sentence. In chaining several clauses [each consisting of a subject and a verb] in a sentence, a conjunction (e.g., *-ko* "and then," *-ese* "because, and so") is suffixed to the verb of a non-final clause. Korean has an extensive set of conjunctions that connect to the next clause, expressing temporal, causal, and contrastive relations among others. In this paper, I lay out a developmental trajectory of clause chaining construction in Korean based on longitudinal and cross-sectional data samples, focusing on conjunctive forms and functions as well as morphological and syntactic properties of connected clauses in a sentence. The database comes from longitudinal naturalistic speech data of five children collected regularly over different time periods between 2 and 5 years of age, and from elicited descriptions of short video events from children - aged 3, 4, 6, 8, and 10 years - and adults. The results show that, at least from 2 years of age, the Korean children in the sample start connecting clauses using appropriate conjunctions. Within 6 months, they acquire several major conjunctions that express temporal, causal, conditional, and contrastive relations between events. By 4 years of age, the children's clause chains are quite adult-like in terms of the repertoire of conjunctive forms and functions, and of the morphological and syntactic features of the clauses that connect to the main clause. In particular they learn to express temporal relations that have some disjuncture between events. However, 4-year-olds still lack the ability to appropriately refer to differential subjects of the chained clauses and also to connect multiple clauses in a sentence. The elicitation data reveal that further development in clause chaining occurs over several years – with a milestone at 10 years – and through adulthood, particularly in relation to appropriate referential marking, conjunction frequency, and segmentation of a macro event into sub-events for clause-chaining construction. These developmental processes are presented from a cognitive perspective, in particular with regard to concept of temporal relation, reference specification involving two or more entities, and perceptual saliency of event type.

Keywords: Korean acquisition, clause chaining in Korean, topic continuity, anaphoric reference, acquisition of conjunction, event segmentation

Abbreviations: ACC, accusative; AUX, auxiliary verb; COMP, complementizer; CONN, connective; COP, copula; DAT, dative; FUT, future; HON, honorific; HORT, hortative; IMP, imperative; LOC, locative marker; NEG, negative; PASS, passive; POL, polite; PROG, progressive; PRS, present; PST, past; SBJ, subject; SE, sentence-ending; TOP, topic.

INTRODUCTION

Korean is a verb-final (SOV) language with rich agglutinative morphology. Grammatical markers, such as case markers and verb inflections, are suffixed to the corresponding nouns and verbs, respectively, with clear boundaries, as in the following examples:

(1a) *emeni-ka*   *Younghi-eykey*   *yeppun*
      mother-SBJ   Younghi-DAT   pretty

      panci-lul   *cwu-si-ess-ta.*
      ring-ACC   give-HON-PST- SE

      'The mother gave a pretty ring to Younghi.' (declarative)

(1b) *emeni-ka*   *Younghi-eykey*   *yeppun*
      mother-SBJ   Younghi-DAT   pretty

      panci-lul   *cwu-si-ess-ci/kwuna.*
      ring-ACC   give-HON-PST-SE

      'The mother gave a pretty ring to Younghi.'
      (certainty/inference)

As shown in (1a,b), the subject marker *-ka(/-i)* and the indirect object marker *-eykey* are suffixed to the corresponding nouns, and the verbal inflections, e.g., the honorific marker *-si-* referring to *emeni* "mother" and the past tense marker *-ess(/ass)-*, are suffixed to the verb stem, *cwu-* "give." In Korean, a sentence always ends with a SE suffix. In written reports and formal speeches, the SE suffix is typically the neutral declarative ending *-ta*[1] (1a). But in spoken narratives and conversations, a variety of SE suffixes are used, such as *-ci* and *-kwuna* in (1b). These SE suffixes typically carry epistemic/evidential meanings: They express the speaker's assessment about the truth of the proposition (i.e., degree of certainty) or the type of evidentiality (e.g., inference, hearsay) (Lee, 1991; Choi, 1995; Sohn, 2018). The SE markers in spoken discourse are highly interactional as they convey not only the speaker's assessment of an event/state, but also incorporate his/her understanding of the listener's knowledge about it. For example, the SE suffix *-ci* in (1b) means not only that the speaker is quite certain about the truth of the event but also that he/she believes that the listener shares the certainty of the event. (The SE markers can be followed by a speech register marker, for example, *-yo*, which marks politeness to the addressee).

As a head-final language, modifiers in Korean - whether they are phrasal or clausal - precede their heads. Thus, in (1a,b), the adjective "pretty" precedes the noun "ring." Similarly, in a complex sentence, a subordinate clause precedes its head, which could be a noun phrase, a verb phrase, or the main clause. Thus, in (2), the relative clause "the mother gave to Younghi" precedes its head noun, *kes* "thing", and in (3), the object complement clause "that the mother gave (her) the ring" precedes the verb phrase *malhay-ess-ta* "say-PST-SE." (The subject of the main

clause, *Younghi-ka* "Younghi-SBJ," can be separated from its verb occurring at the beginning of the sentence, i.e., before the object complement clause).

(2)   *[emeni-ka*   *Younghi-eykey*   *cwu-si-n]*
      mother-SBJ   Younghi-DAT   give-HON-COMP

      kes-un   *panci(-i)-ta.*
      thing-TOP   flower(-COP)-SE

      'The thing [that the mother gave to Younghi] is a ring.'

(3)   *[emeni-ka*   *panci-lul*   *cwu-si-ess-tako]*
      mother-SBJ   ring-ACC   give-HON-PST-COMP

      Younghi-ka   *malhay-ess-ta.*
      Younghi-SBJ   say-PST-SE

      'Younghi said [that the mother gave (her) a ring].'

The same head-final rule applies when the complex sentence involves clause chaining, which consists of one or more non-main (and non-final) adverbial clauses and a main (final) clause. In clause chaining, which is the topic of the present study, speakers provide additional information (e.g., time and cause) to the main event using adverbial clauses. In Korean, an adverbial clause canonically precedes the main clause. For example, in (4), the event of "ball hitting the vase" in the first clause explains the cause of the "vase breaking" in the second clause, which is the main clause. The causal relation between the two clauses is signaled by the conjunction *-ese* "because/as," which is suffixed to the bare stem of the medial verb *chi-* "hit."

(4)   *kong-i*   *kkocpyung-ul*   *chi-ese,*   *kkocpyung-i*
      ball-SBJ   vase-ACC   hit-because/as vase-SBJ

      kkayci-ess-ta.
      break-PST-SE

      'As the ball hit the vase, the vase broke.'

The present study examines how Korean children acquire the clause-chaining construction. In particular, I investigate some morphological and semantic aspects of the ways in which children acquire conjunctions and other grammatical features of clause chaining. I examine the development from 2 years of age and onward, using both longitudinal spontaneous speech data and cross-sectional elicitation data. In the following section, I first lay out the characteristics of the construction that are relevant to the present study.

Characteristics of the Clause Chaining Construction in Korean

In clause chaining, one or more adverbial clause(s) is/are connected to the main clause, providing information about the time, cause, manner, condition, or circumstance of the main event (see the section "Conjunctive Suffixes and Their Functions"). Adverbial clauses canonically occur in a medial/non-final position of the sentence, and the main event is typically, but not always, the final clause of the sentence. In

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[1]SE *-ta* in spoken conversation has a modal meaning of new information based on perceptual evidence (Choi, 1995, in press).

this paper, I will refer to these non-final adverbial clauses as "medial" clauses, although they may not always adhere to the established definition of a "medial clause" in that in Korean the verbs of "medial clauses" can be specified for tense (e.g., past tense, *-ess*) (see the section "Non-finiteness/Finiteness of the Verb/Predicate of a Medial Clause"). As in many other clause chaining languages, each adverbial clause ends with a verb and a conjunctive suffix, which connect both morphologically and semantically to the immediately following clause (Longacre, 1985; Watanabe, 1994; Dixon, 2009). These characteristics are illustrated in the following example, taken from the database of the present study (see the section "Cross-sectional Elicitation Study"):

(5) a. *kong-i   kwulle-ka-myense,*
       ball-SBJ   roll-go-while

    b. Ø   *kkocpyong-ul   chi-ese,*
           vase-ACC   hit-and.so/therefore

    c. *kkocpyong-i   nemeci-ese,*
       vase-SBJ   fall-and.so/therefore

    d. Ø   *kkayci-ess-ta.*
           broke-PST-SE

'While the ball was rolling, (the ball) hit the vase and so, the vase fell and so, (the vase) broke.'

Example (5) has three medial clauses (5a–c), each ending with a conjunction that connects to the next clause with a specific adverbial meaning. The first clause (5a) specifies the manner of the ball's motion (i.e., rolling) and provides the temporal frame of the ball hitting the vase (5b) with its conjunctive suffix *-myense* "while." Clauses (5b) and (5c) describe the series of events that led to the main event of the vase breaking (5d).

Conjunctive Suffixes and Their Functions

There are many conjunctive suffixes in Korean. Sohn (2009) lists about a hundred different forms that express specific semantic notions relating to time, cause, manner, condition, purpose, contrast, and so on. However, the list of commonly used conjunctions in spoken Korean is much shorter. Kim (1992), who examined clause chaining in adult narratives [elicited from 10 participants using the "pear" film clip (Chafe, 1980)], found a total of 15 conjunction types in her data. Of these conjunctions, Kim (1992) analyzes and reports on only six forms, which have a level of frequency – 20 or more tokens in the entire database – that warrant detailed investigation: *-ko* "and," *-ese* "and.then," *nuntey* "given.that," *-nikka* "because," *-myense* "while," *-taka* "while doing." (These six conjunctions are marked with asterisks in **Table 1**).[2] I should further note that, among these conjunctions, the form *-ko* "and" is reported to be the most frequent and thus is the most-studied conjunctive in clause chaining in Korean adult grammar (e.g., Lee, 2003; Kwon and Polinsky, 2005; Jendraschek and Shin, 2018). In the present study, the children in the longitudinal study use a total of 27 different connective forms between 2 and 5 years of age in their

spontaneous speech, of which 12 suffixes are more frequently produced, with *-ko* "and" at the top of the frequency list (see the section "Development of Conjunctive Forms and Functions").[3] The 12 suffixes are listed in **Table 1** with examples from the database of the present study.

The relationship between conjunctive forms and their functions is quite complex in Korean. On the one hand, the same form can serve several functions. For example, the most frequent conjunction, *-ko*, serves temporal, causal, and contrastive functions as well as a listing function (**Table 1**). Conversely, the same function can be expressed by several forms. For example, the temporal sequence function, "and then," can be expressed by *-ko*, *-ese*, and also by *-ekaciko*, as shown in **Table 1**. However, in many cases, such overlap between forms and functions is only at a general level. Detailed analyses of the way in which a given conjunction semantically relates to the next clause suggest that each form typically serves a specific function that is subtly but importantly different from the similar functions served by other forms (Sohn, 2009; see the section "Early-Acquired Conjunctive Forms and Functions").

Topic Continuity and Subject Marking

Topic continuity in clause chaining relates to the continuation (or discontinuation) of the nominal reference – particularly regarding the subject – from one clause to the next. Two aspects of topic continuity are worth noting regarding Korean. First, unlike some clause chaining languages (e.g., many Papuan languages), Korean does not have a switch-reference marker that explicitly signals whether the subject in the immediately following clause will have the same or a different subject from the current clause. However, in many cases, a given conjunction has a clear preference for the same subject (SS) or a different subject (DS) in the next clause. To this end, Korean conjunctive forms have a topic continuity feature (Kim, 1992). For example, the conjunction *-myense* "while" in (5a) is almost always followed by SS in the next clause, whereas the conjunction *-ese* "because/and.so" with a causal function often allows DS, as in (5b). In the present study, we will examine the topic continuity feature in children's and adults' use of Korean conjunctions.

Second, the major referential tools in Korean are full NP and zero anaphora. Korean has a system of pronouns, but it is infrequently used in conversations and narratives (Kim, 1992). A full NP is used when introducing a new character in the discourse or when the reference needs to be clarified, such as when two or more characters have been mentioned. When the referent is clear from the context or preceding discourse, arguments can be omitted. In clause (5b) above, the subject is omitted (=zero anaphora), which signals that it is the same, *kong* "ball," as the subject of the preceding clause (5a). (The same is true for 5c,d).

Zero anaphora is a communicatively efficient tool when the listener can retrieve the correct referent from the context or prior

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[2] Kim (1992) does not report the remaining nine conjunctive forms.

TABLE 1 | Conjunctive forms and functions with examples from children's spontaneous speech data.

		Semantic	
Form	**Gloss**	**Function**	**Example**
1. -ko*	'and'	Listing	*yeki ppalkan cha-to iss-ko, hayan cha-to iss-e.* here red car-also be-and white car-also be-SE 'Here is a red car and (here) is a white car.'
	'and then'	Sequence	*tangkun mek-ko, naynnayha-ney.* carrot eat-and sleep-SE '(It) eats a carrot and sleeps.'
	'by -ing'	Manner/means	*appa-ka taxi tha-ko, cip-ey o-n-tay* daddy-SBJ taxi ride-by home-to come-PRS-SE (hearsay) 'Daddy says he comes by taking a taxi.'
	'but'	Contrast/juxtaposition	*wuli telebi an po-ko, chayk ilk-ca.* we TV not watch-but book read-HORT 'Let's not watch TV but read a book.'
2. -ese*	'because/as'	Cause	*ttukewu-ese, tomangka-koiss-e.* hot-because flee-PRS.PROG-SE 'He is fleeing because (it) is hot.'
	'by -ing'	Manner	*cal-ase, mek-e.* cut-by eat 'Eat this by cutting (it).'
	'and then'	Sequence	*ppalli o-ase, mek-e-yo.* quickly come-then eat-IMP-SE 'Come quickly and eat.'
3. -myen	'if/when'	Conditional	*hakkyo-ey ka-myen, kongpwuha-lkke-ya.* school-to go-when study-FUT-SE 'When I go to school, I will study.'
4. -nuntey*	'given that'	Circumstance	*keki mwe-ka iss-ess-nuntey, pinocchio cip-i-ess-e.* there something-SBJ be-PST-nuntey pinocchio house-be-PST-SE 'There was something and it was Pinocchio's house.'
	'but'	Contrast	*na kongwon-eyse nemeci-ess-nuntey, an wul-ess-e.* I park-LOC fall.down-PST-but not cry-PST-SE 'I fell down in the park, but (I) didn't cry.'
5. -nikka*	'because'	Reason	*pi-ka o-nikka, wusan ssu-ca.* rain-SBJ come-because umbrella put.over.head-HORT 'Because it rains, let's use an umbrella.'
6. -ekaciko	'because'	Cause	*yak pal-akaciko, ta nah-ass-e.* medicine apply-because completely get.well-PST-SE 'Because I applied the medicine, (I) got completely well.'

(Continued)

TABLE 1 | Continued

		Semantic	
Form	Gloss	Function	Example
	'and then'	Sequence	*saykchilhay-kaciko, ikes-ul pwuchi-e* color-and.then this-do attach-SE 'Color this and then attach (it).'
7. *-teni*	'when/as'	Initiating event	*appa-ka bai-kulay-ss-teni, aitul-i tto manna-ca-ko kulay-ss-e.* dad-SBJ bye-say-PST-then, children-SBJ again meet-COMP say-PST-SE 'When daddy said 'bye', the children said 'let's meet again.'
8. *-le*	'(in order) to'	Purpose	*sopangseo acessi-ka pwul kku-le ka-ss-e.* fire.dept. man-SBJ fire extinguish-to go-PST-SE 'The fire man went to extinguish fire.'
9. *-taka**	'while doing'	Interrupted event	*kong-i hanul-ey ollaka-ss-taka, naylyeo-ass-e.* ball-SBJ sky-to go.up-PST-then, come.down-PST-SE 'The ball when up, then came down.'
10. *-ulttay*	'when'	Temporal frame	*ppalli ka-lttay, kicha-ka pwuditchi-l swu-iss-e.* fast go-when, train-SBJ collide-COMP possible-be-SE 'When (they) go fast, the trains can collide.'
11. *-myense**	'while'	Simultaneity	*wuli nolay tulu-myense, ca-ca.* we song listen-while, sleep-HORT 'Let's sleep while listening to the song.'
12. *-eto*	'though'	Adversity	*na-nun nemeci-eto, an wul-e.* I-TOP fall.down-even.if NEG cry-SE 'I don't cry even when I fall down.'

These conjunctions are analyzed in Kim (1992), as they occur relatively frequently in her adult narrative database.

discourse. On the other hand, it can also cause communicative breakdown when the referent is not recoverable, for example, when the speaker actually had not mentioned the referent earlier or the referent is not recoverable due to the distance between the prior mention and the ellipsis or because there are several possible candidates for the referent (Clancy, 1992). In the present study, we will examine how efficient young children at different ages are with their referential choices (full NP or zero anaphora).

Non-finiteness/Finiteness of the Verb/Predicate of a Medial Clause

In clause chaining, the verb/predicate of a medial clause is typically non-finite, meaning that the verb is in its bare stem and a conjunction is directly suffixed to it. The verb's tense/aspect/modal information is accessed from the fully inflected verb in the main clause, as in (4). In Korean, however, in some cases, the verb of a medial clause is inflected. Kim (1992) notes that the finiteness of the verb depends on "the degree of grammatical or conceptual integration in the discourse" (p. 122). Such characterization explains the Korean system well. For example, verbs of an adverbial/medial clause with the conjunction *-myense* "while" are always non-finite as the

conjunction denotes the overlap (i.e., integration) of a non-main event with the main event. On the other hand, verbs with conjunction *-nuntey* "but" can be finite, as the two events are juxtaposed, i.e., non-integrated.

Event Segmentation for Clause Chaining

Events can temporally overlap – fully or partially – or occur sequentially without clear perceptual boundaries between them. Take, for example, the ball-vase event sequence described in (5a–d): First, a ball rolls forward and hits a vase which, as a result, tips over and then breaks (see details in the section "Materials and Design"). These events flow from one to the next without pauses (i.e., no boundaries).

In order to linguistically describe the sequence of these events as one occurring before another or one causing the next, one needs to first segment connected events into event units (Baldwin et al., 2001, 2008; Levine et al., 2019). Segmented units can then be expressed as separate clauses and be connected with specification of the semantic relation between them. From the acquisition point of view, this process raises interesting questions: How do children segment event sequences for the purpose of linguistically encoding them? From a series of connected events, which types of event stand out to children for linguistic expression? In the

present study, we will address these questions systematically with an experimental elicitation database.

Constructions Excluded From Analysis: Serial Verb Constructions and Clauses With Conjunctive Adverbs

By definition, clause chains are multi-clausal, each medial clause having its own subject and predicate that connect to the next clause with a particular adverbial meaning. In this section, I clarify that two types of construction – serial verb constructions (SVCs) and clauses headed by conjunctive adverbs – will be excluded from the present analysis as they do not fit this definition. First, SVCs are excluded as they are typically considered mono-clausal (e.g., Lee, 1992; Sohn, 2009; Chae, 2015). In the SVC, two or more verbs are strung together with the connective -e, as in (6). These verbs form a verb phrase with no intervening material (e.g., nouns and adverbs) between them. Basically, it is a single predicate consisting of a sequence of verbs (Aikhenvald, 2006). The verbs share the same subject argument and express different aspects of a single event (e.g., Lee, 1992; Chung, 1993; Sohn, 2009; Chae, 2015), in particular, a single motion event (Zubizarreta and Oh, 2007; Pyoun, 2011). For example, in (6), the two verbs, nayli- "descend" and ka- "go" describe the path ("descending") and the deictic ("going") aspects of the single motion performed by John (Choi, 2016). Whereas the final verb carries tense/aspect/modality inflections, non-final verbs are in bare stem forms.

In addition, unlike conjunctions such as -ko "and then" and -ese "because," the connective -e does not have semantic content – it does not imply coordination or subordination – and simply serves to connect one verb stem to the next (Lee, 1992; Chung, 1993). Based on this analysis, the SVC, as characterized here, will be excluded from the present study on clause chaining.[4]

(6) *John-i   entek-ul   nayli-e   o-ass-ta.*
                                v1   v2

     John-SBJ   hill-ACC   descend-CONN   come-PST-DECL

     'John descended the hill, towards the speaker.'

The present study also excludes sentences with free-standing conjunctive adverbs, which typically occur at the beginning of a sentence and which semantically connect to the preceding sentence (Sohn, 2009). For example, the conjunctive suffix -ko in (7) has a corresponding free-standing adverb, kuli-ko, as in (8). Kuli- in (8) indexes the event of the preceding sentence. I only examine complex sentences involving non-main clauses connected to the main clause by a conjunctive suffix.

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[4]Another type of the V_1-e V_2 construction (a subtype of SVC) is AUX/predicate construction (AVC) in which V_2 functions as an AUX losing its full lexical meaning. In the following example (Suh, 2000, p. 69), V_2, po-, whose lexical meaning is "to see," serves to be an AUX meaning "try to":

John-i   chayk-ul   ilk-e   po-ass-ta.
John-SBJ   book-ACC   read-CONN   see(aux)-PST-SE

'John tried to read a book'

As in SVCs, the V_1-e V_2 in AVC forms a verb phrase of a single clause representing a single event. Thus, AVC will also be excluded from the present analysis.

(7) Conjunctive suffix:

   *Younghi-ka   pap-ul   mek-**ko**,   hakkyo-ey   ka-ss-ta.*
   Younghi-SBJ   meal-ACC   eat-and.then   school-LOC   go-PST-SE

   'Younghi ate and then went to school.'

(8) Conjunctive adverb:

   Younghi-ka   pap-ul   mek-ess-ta. **Kuli-ko**,   *hakkyo-ey*
   Younghi-SBJ   meal-ACC   eat-PST-SE. And then,   school-LOC

   ka-ss-ta.
   go-PST-SE

   'Younghi ate. And then (=after that) (she) went to school.'

Examples (7) and (8) convey the same information, but they differ in syntactic structure. In (7), the two clauses, Younghi eating and (Younghi) going to school, are connected and form a complex sentence with a conjunctive suffix at the end of the medial clause. But in (8), each clause stands alone as an independent sentence: The semantic relation of the two sentences is expressed by the conjunctive adverb in the second sentence. In this paper, I will only be concerned with complex clause chaining sentences such as (7).

The Present Study: Goals, Scope, and Database

Although there are several notable studies on clause chaining in the adult grammar in Korean (e.g., Kim, 1992; Lee, 2003; Kwon and Polinsky, 2005; Sohn, 2009; Chae, 2015), few studies have been conducted on how children acquire the Korean clause chaining construction. Therefore, the goal of the present study is, first and foremost, to lay out a general developmental trajectory of the clause chaining construction in Korean children. For this goal, I examine the following aspects:

  (i) Emergence and order of acquisition of conjunctive forms and their semantic functions;

  (ii) Topic continuity in Korean children's use of conjunctions;

 (iii) Non-finiteness and finiteness of verbs in medial clauses;

 (iv) Referential choices and their appropriate uses;

  (v) Event segmentation: Types of events that children pick out and connect in clause chains;

 (vi) Developmental milestones from age 3 years to adulthood in the acquisition of clause chaining construction.

The present study uses two sets of data for the investigation: longitudinal and cross-sectional. The longitudinal data are spontaneous mother–child interactions of five mother–child pairs recorded over various time periods between 1;11 and 5;1. The cross-sectional data are children's (in five age groups) and adults' descriptions of short animated video clips. Each video clip shows a series of object movements that are causally and temporally related. The longitudinal data are presented first, to lay out a general developmental trajectory of clause chaining

in the Korean children in this sample, particularly on the development of the relation between conjunctive forms and functions (i-iii). The cross-sectional data are then presented to systematically investigate the development of clause chaining from 3 years to adulthood, particularly in relation to conjunction frequency, referential choices, length of clause chaining sentence, and segmentation of a macro event into sub-events for clause chaining constructions (iv–vi). The cross-sectional data will also be compared to the longitudinal data as appropriate, particularly to examine consistent developmental patterns.

THE LONGITUDINAL STUDY

Database

The longitudinal data come from five children, all growing up monolingually in Korean in South Korea. As shown in **Table 2**, the data are grouped into two sets, based on the difference in the duration of study period. More specifically, among the five children, the study period duration for Child JW was much more extensive than those of the other four, spanning 2 years starting from 1;11 (year;months). JW also produced many clause chaining utterances, so his data constitutes a full dataset, Dataset 1, in its own right. During this 2-year period (1;11–3;11), JW produces all of the 12 conjunctions studied in this paper, thus his data are the main source of developmental data for this age period. The other four children, together constituting Dataset 2, were each recorded for about 1 year starting at different ages between 2;0 and 5;1, a period that overlaps with JW's study period and extends to the sixth year of life (i.e., 4;0–5;1). Dataset 2 supplements JW's data in the investigation of the development of clause chaining. Consistent patterns between the two datasets, particularly with regards to the types of conjunctive form and function acquired as well as their order of acquisition will suggest that, although limited in sample size, the findings are not idiosyncratic.

The five children and their mothers participated on a voluntary basis with verbal consent. JW was recruited through the Principal Investigator's[5] acquaintances for a 2-year longitudinal study. The other four children were recruited on the basis of a 1-year commitment, which was already a long period for mothers to commit themselves to the study, starting at different ages, to expand the database. All five families were of middle to upper-middle class, and the parents had completed higher education, i.e., a college degree or above.

The data collection method was the same for all five children. Each child was visited at his/her home twice a month by a researcher. At each visit, spontaneous mother–child conversations were audio-recorded for 30 min (**Table 2**). The conversation centered around joint activities – between the mother and the child – such as book reading, pretend play, playing games (e.g., jigsaw puzzles), or conversation on topics such as the child's everyday school experiences, past experiences, and future plans. For the purpose of the present study, only the data from the second visit of month are analyzed.

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[5]The PI was Dr. Hyeonjin Lee at Yeungnam University in South Korea. I am grateful for her permission to analyze the data collected under her direction.

All spoken interactions were transcribed with contextual notes. Two research assistants, trained in psycholinguistics, were assigned to each child in transcribing the recorded conversations. Of the two, the principal assistant transcribed the conversations first, then the secondary assistant checked those transcriptions. When the two transcribers did not agree, the Principal Investigator resolved the conflict. Unintelligible phrases/utterances were noted as such. The transcription followed the guidelines defined in Bae (2000) for transcribing Korean children's speech. An utterance ending was identified by rising/falling intonation and pauses of two or more seconds (Bae, 2000).

At each session, the total number of the child's utterances – excluding one-word utterances, *ung/ney* "yes (plain/POL form)" or *ani/aniyo* "no (plain/POL form)" and immediate and full imitation of mother's utterance - ranged between 150 and 300. In the present study, only those utterances consisting of clause chains in the transcript, as characterized in the section "Characteristics of the Clause Chaining Construction in Korean," are examined.

Child JW produced 20 clause chains on average per session, amounting to 517 utterances as Dataset 1 for the current study (**Table 2**). The other four children, KJ, SH, BK, and YJ, together produced a total of 411 clause chaining utterances, much less than JW did. Although they provided less clause chaining data than JW, the two datasets converge on a coherent developmental pattern of clause chaining in terms of the types of conjunctions produced during the study periods and the order of acquisition of those conjunctions.

Development of Conjunctive Forms and Functions

To assess a general developmental trajectory of the clause chaining construction, I first examine the types of conjunctive forms and functions that the children produced during the study periods. **Table 3** shows the conjunctive forms produced in Dataset 1 (JW) and in Dataset 2 (four children), total token frequency and in percent of conjunctive forms. It also shows the onset age of each form. An onset age is identified when the child produces a given conjunctive form at least three times in the same session or in three successive sessions combined. In the latter case, the first of the successive sessions was determined as the onset age. Note that the onset ages here concern the form and not a particular function. (Development of function will be presented in the sections "Early-Acquired Conjunctive Forms and Functions" and "Later-Acquired Conjunctions".)

Comparing between the two datasets, both the repertoire of the conjunctive forms and their frequency distributions are similar and converge on a coherent developmental pattern in terms of the acquisition order. Specifically, the first three most frequent conjunctive forms, *-ko* "and," *-ese* "and then, because" and *-myen* "if/when," are the same in both datasets. These three forms together constitute about 67% (Dataset 1) to 70% (Dataset 2) of the children's production of conjunctions. The next four forms on the list, *-nikka* "because," *-teni*, "when," *-nuntey* "given

TABLE 2 | Database of clause chaining utterances in the longitudinal study.

	Dataset 1	Dataset 2			
Child (M/F)	JW (M)	KJ (M)	SH (F)	BK (M)	YJ (F)
Sibling situation	1st child with younger sister	Only child	2nd child with older sister	1st child with younger brother	2nd child with older sister
Study period years;months	1;11–3;11	2;0–2;11	3;5–4;4	3;10–4;9	4;2–5;1
Average recording time per session (min)	29.7	30.2	31.1	30.3	31.5
Total number of sessions analyzed	26	12	12	12	12
Number of clause chains (CC)	517	134	97	92	88
Total CCs per dataset	517	411			

Each child was recorded twice a month, approximately 15 days apart between the two sessions. Of the two sessions, only the second session is included in the present study.

TABLE 3 | Conjunctive forms, token frequency, and percentage of use.

Conjunctive form/gloss	Semantic function	Dataset 1: JW		Dataset 2: four children	
		Token (%)	Onset age	Token (%)	Onset age
1. *-ko* "and"	Listing; manner; sequence; contrast	177 (34.2)	2;0	140 (34.1)	2;0
2. *-ese* "and then"	Manner; cause; sequence	118 (22.8)	2;0	62 (15.1)	2;4
3. *-myen* "if/when"	Condition	53 (10.3)	2;2	86 (20.9)	2;4
4. *-nikka* "because"	Cause	28 (5.4)	2;3	18 (4.4)	2;5
5. *-teni* "when/as"	Initiating event	26 (5.0)	3;3	0	n/a
6. *-nuntey* "given that"	Circumstance; contrast	23 (4.4)	2;1	26 (6.3)	2;2
7. *-ekaciko* "and then"	Sequence; cause	22 (4.3)	2;2	25 (6.1)	2;2
8. *-le* "(in order) to"	Purpose	16 (3.1)	2;2	4 (1.0)	2;7
9. *-taka* "while doing"	Interrupted event	12 (2.3)	2;7	6 (1.5)	2;9
10. *-ulttay* "when"	Temporal frame	6 (1.2)	3;10	12 (2.9)	3;11
11. *-myense* "while"	Simultaneity	6 (1.2)	3;4	8 (1.9)	2;10
12. *-eto* "though"	Adversity	6 (1.2)	2;11	5 (1.2)	2;11
Other[1]		24 (4.6)		19 (4.6)	
Total		517 (100)		411 (100)	

[1]*Other conjunctions include -lyeko "in order to," -key "so that," -ntaumey "after." -yaci "if/when," -eya "only when," -sunkaney "at the moment of," which are produced between two and four times in a dataset. In addition, nine other conjunctions are produced, but each occurs once in a dataset.*

that" and *-ekaciko* "and then," are produced much less frequently (than the first three forms), each ranging between 4 and 6% in each dataset. One exception is the conjunction *-teni* "when," which denotes an initiating event to the main event. Note that the initiating event with *-teni* "when" triggers the main event but does not directly cause it. (See the example of *-teni* in **Table 1** and also the section "From 2;7 to 3;11: Acquisition of complex temporal concepts"). JW produces it 26 times (5.0%), but no children in Dataset 2 use it during the recording sessions.[6] The third set of conjunctions in **Table 3** are *-le* "(in order) to," *-taka* "while doing," *-ulttay* "when," *-myense* "while," and *-eto* "though." These forms are produced with frequencies of 3% or less in each dataset. Regarding this last set of conjunctions, there are some differences between the two datasets. JW (Dataset 1) uses *-taka* "while doing" and *-le* "(in order) to" relatively more often than

the other four children. On the other hand, the temporal frame marker, *-ulttay* "when," is more frequent in Dataset 2 than in JW's speech.

Overall, the children produce the multi-functional conjunctions, *-ko* and *-ese*, most frequently. They also produce the conjunction *-myen* "if/when" frequently denoting a condition to the main event. The degree of frequency in children's production of conjunctions probably relates, at least in part, to the frequency rates in caregivers' speech. While it is beyond the scope of this paper to examine the mothers' frequency distribution of the conjunctions, the frequency data of conjunctions in the adult narrative data reported in Kim (1992) can be compared to the children's data. The six most frequent conjunctions in Kim's data are, *-ko* "and then," *-ese* "and then, because," *-nuntey* "but," *-nikka* "because," *-taka* "while doing," and *-myense* "while." Four of the six forms, *-ko* "and then," *-ese* "and then, because," *-nuntey* "but," and *-nikka* "because," are also ranked relatively high in the children's data for the current study (**Table 3**), supporting the input hypothesis to some degree. Further studies are necessary to examine the

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[6]It does not seem to be the case that the children in Dataset 2 overgeneralize already-acquired temporal conjunctive forms (e.g., *-nuntey* "given that") to include the "initiating event" function of *-teni* "when/as." An examination of Dataset 2 shows that there are only two cases – medial clauses – in which the four children could have used the conjunction *-teni*.

extent of the input frequency factor in children's development of conjunctions.

A coherent developmental pattern also emerges in terms of the *onset ages* of the forms, which are reported in **Table 3**. The 12 conjunctions can be divided into two groups according to their onset ages. In the first group, six of the first seven on the list, namely, *-ko* "and then," *-ese* "and then, because," *-myen* "if/when," *-nikka* "because," *-nuntey* "but," and *-ekaciko* "and then," appear in the children's production earlier than 2;6 in *both* datasets. The conjunction *-le* "(in order) to," appear at 2;2 in JW's speech, but only at 2;7 in Dataset 2. Not surprisingly, these conjunctions also rank high in frequency. The second group includes the remaining five conjunctions: *-teni* "when/as," *-taka* "while doing," *-ulttay* "when," *-myense* "while," and *-eto* "though," which appear after 2;7. In order to explain the particular order of acquisition of the forms, we need to look at their semantic functions and assess which types of meanings children convey earlier than others. Thus, in the following, I examine the development of the 12 conjunctions in terms of their semantic functions, starting with the earlier-acquired forms.

Early-Acquired Conjunctive Forms and Functions

Among the seven early-acquired forms, *-ko* "and then," *-ese* "and then, because," *-nuntey* "given that, but," and *-ekaciko* "and then, but" serve several functions (**Table 1**). I will first present how the functions develop in these multi-functional forms before going on to the other early-acquired forms. For each multi-functional form, I analyzed the semantic function expressed by the form in relation to the next clause, which is typically the final and main clause. Then, I determined the onset age of each function for the given form using the same criteria as those for the forms, i.e., the first session (or the first of the three successive sessions combined) in which the particular function of the form was expressed at least three times. **Table 4** presents the results of the analysis along with the token frequency of each function for the form.

-ko expressing list,[7] *manner, sequence, and contrast*

The conjunction *-ko* fulfills several functions: listing individual events/states (9), specifying the manner of an activity, and providing sequential, or contrastive information (10–13) in relation to the main clause. The frequency distribution of these functions in **Table 4** shows that the listing, the manner, and the sequential functions are prominent in the children's use *-ko*. In each dataset the four functions appear at different times but with same order of appearance. The conjunction *-ko* "and" is first used to simply list events/actions/states as in (9), and then a month later to provide manner information (10–11). In the manner function, *-ko* specifies the means by which the activity in the main event is performed, in particular the tool that one uses or carries to perform a task (10) or the type of vehicle one uses for a spatial motion (11). Such tool and vehicle specifications occupy 80% of all *-ko* uses with a manner function.

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[7] I use the term "listing" (Kim, 1992) as a general term that encompasses simple listings of events that do not have a relationship as well as an "additive" relation that has similar structure with the preceding clause.

TABLE 4 | Conjunctive forms and functions, onset age and token frequency of each function.

Conjunctive form/gloss		Semantic function	Onset age (token frequency)	
			Dataset 1	Dataset 2
-ko	'and'	Listing	1;11 (61/177)	2;0 (29/140)
	'by ~ing'	Manner/means	2;0 (62/177)	2;1 (55/140)
	'and then'	Sequence	2;4 (36/177)	2;4 (43/140)
	'but'	Contrast/ juxtaposition	2;6 (12/177)	2;8 (7/140)
-ese	'because'	Cause	2;0 (72/118)	2;4 (25/62)
	'by ~ing'	Manner	2;0 (17/118)	2;4 (20/62)
	'and then'	Sequence	2;1 (29/118)	2;4 (17/62)
-ekaciko	'and then'	Sequence	2;2[1] (10/22)	2;2[1] (17/25)
	'because'	Cause	3;2 (12/22)	4;1 (8/25)
-nuntey	'given that'	Circumstance	2;1 (15/23)	2;2 (5/26)
	'but'	Contrast	2;4 (7/23)	2;2 (21/26)
-nikka	'because'	Reason	2;1 (28)	2;5 (18)
-myen	'if/when'	Condition	2;2 (53)	2;4 (86)
-le	'(in order) to'	Purpose	2;2 (16)	2;7 (4)
-taka	'while doing'	Interrupted event	2;7 (12)	2;9 (6)
-eto	'though'	Adversity	2;11 (6)	2;11 (5)
-ulttay	'when'	Temporal frame	3;1 (6)	3;11 (12)
-teni	'when/as'	Initiating event	3;3 (26)	None
-myense	'while'	Simultaneity	3;4 (6)	2;10 (8)

[1]See the text for details of the developmental pattern of -ekaciko with a temporal function.

(9) JW (2;0) *-ko*, listing

yeki nolan pyel-to iss-ko   hayan pyel-to
here yellow star-also be.present-and white star-also

iss-e.
be.PRS-SE

'Here is a yellow star and (here) is also a white star.'

(10) KJ (2;2) *-ko*, manner

hyeng-to   piscalwu kaci-ko ssul-ess-ci.
brother-also broom   have-by sweep-PST-SE

'Brother also swept with (=having) a broom.'

(11) JW (2;2) *-ko*, manner

emma-hako   kicha tha-ko o-ass-e.
mommy-with train ride-by come-PST-SE

'I came with mommy, by riding a train.'

The sequential and contrastive functions of *-ko* "and then, but" appear a few months later (12–13). For the sequential function of *-ko* "and then," the non-main event [e.g., watching TV in (12)] happens first, before the main event takes place. However, it is important to note that a non-main event with the conjunction *-ko* is not a pre-requisite/pre-conditional activity for the main event to happen (Sohn, 2009). Furthermore, the non-main event can occur in space and time different from those

of the main event. The relationship between the non-main and the main event is somewhat "loose," to use Longacre's (1985) term (p. 177). As we will see, this relational aspect of -ko contrasts with the sequential function of -ese "and then."

(12) KJ (2;4) -ko, sequence

> telebi   po-ko,   pap   mek-eya-ci.
> TV   watch-and   meal   eat-intention-SE

> '(I) will watch TV and then eat.'

The contrastive function of -ko "but (instead)" is the last one to appear. It is also the least-frequently expressed function of -ko. In this function, the speaker juxtaposes two alternative activities/events with -ko on the medial clause, favoring one over the other (13). All of the children's -ko utterances with a contrastive function show such juxtaposition with a NEG particle in the medial clause. For example, in (13), JW juxtaposes the activities of watching TV and reading books, and suggests not watching TV but reading instead. The late appearance of this function may be due to its underlying concept being relatively more abstract than the other functions of -ko. More specifically, while the manner and sequential aspects of events are perceptually iconic, a contrastive aspect – with negation – between activities is more conceptual.

(13) JW (2;6) -ko, contrast/juxtaposition

> wuli telebi an po-ko,   chayk-man ilk-ca.
> we   TV   NEG watch-but   book-only read-HORT

> 'Let's not watch TV, but only read books.'

-ese expressing manner, sequence, and cause

The conjunction -ese is another major form in Korean. It specifies manner (14), sequential (15), and causal (16) aspects of the event in the main clause. In contrast to the developmental pattern of -ko, the children in both datasets use all three functions of -ese around the same time (**Table 4**). JW does so within a month, between 2;0 and 2;1, and KJ, the youngest child in Dataset 2, in the same session at 2;4.

(14) KJ (2;6) -ese, manner

> call-ase, mek-eya   tway.
> cut-by   eat-CONN become (AUX. obligation)

> '(One) must eat by cutting (it).'

(15) KJ (2;9) -ese, sequence

> emma-ka   cip-ey   o-ase,   yatanchi-lkke-ya?
> mommy-SBJ   home-LOC   come-then   scold-FUT-SE

> 'Will Mommy come home and scold (me)?'

Similar to -ko, the conjunction -ese expresses manner as well as temporal sequence. However, a closer look at the semantic relations they express with respect to the main event suggests that there is a division of labor between them. In fact, the two conjunctions are often not interchangeable. Regarding manner,

we have seen that the conjunction -ko specifies the tool or the vehicle used (10–11). In sharp contrast, none of the -ese clauses express such a function. Instead, with -ese, the medial clause specifies the manner of motion by which one achieves the main event, as in (14). It also specifies one's posture (e.g., lying, sitting) or the path (e.g., going around) to accomplish an action. The two conjunctions, -ko and -ese, also differ regarding their temporal sequence functions. The relationship between the non-main and main events is much tighter with the -ese conjunction than with -ko (see the section "-ko expressing list, manner, sequence, and contrast"). With -ese, the event in the non-main clause is a pre-condition for the main event, in that the main event takes place in the state produced by the event of the -ese clause (Kim, 1992; Sohn, 2009). For example, in (15), KJ asks his mother whether she'll scold him when she comes home, which means that the mother has to come home first for the scolding to take place.

The conjunction -ese also has a causal meaning as in the following examples. The causal meaning is prominent in JW's use of the form. In (16), JW's mother cries because JW is absent and in (17), BK wipes because he spilled something.

(16) JW (2;0) -ese, cause

> JW-i   eps-ese,   emma   wul-e.
> JW-SBJ   not.be-because   mommy   cry-SE

> 'Because JW is not present, mommy cries.'

(17) BK (3;10) -ese, cause

> mwe   hulli-ese,   takk-ass-e.
> something   spill-because   wipe-PST-SE

> 'Because (I) spilled something, I wiped (it) up.'

Notice that in all three functions of -ese (14–17), the non-main and main clauses have close temporal proximity. The main event follows almost right after the non-main event takes place. It is possible that this common feature of the three functions facilitates children's acquisition of all three functions at around the same time. On the other hand, as mentioned earlier, input frequency is another possible factor for the early acquisition of these functions. As we will discover later (section "Type and Token Frequency of Conjunctions by Age Group"), -ese is by far the most frequent conjunction that adults use to express manner, cause, and temporal sequence.

-ekaciko expressing sequence and cause

The form -ekaciko "and then" is a morphologically transparent form. It consists of the verb kaci-, which means "to have/possess." A literal translation of V-ekaciko would be "having done X." As a conjunction, it expresses temporal or causal sequence, quite similar to the functions of -ese "because, and then." In fact, the two forms, -ekaciko and -ese are often interchangeable. Thus, (18a) and (18b) below have same meaning and both are acceptable. But the developmental trajectory of ekaciko is different from that of -ese (**Table 4**). In both datasets, the children produce -ekaciko "and then" several times between 2;2 and 2;3 to express temporal sequence. However, after 2;3, there is a long period of absence of the form (with a temporal meaning) in their speech. Then, the sequential function of -ekaciko "and then"

reappears sporadically at around 2;8, and more consistently at 3;10 in dataset 1 and at 3;7 in dataset 2 (19). Also, the onset of -*ekaciko* "because" as a causal function is much later than -*ese* "because." The rather inconsistent and late uses of -*ekaciko* may have to do with the fact that the same functions can be expressed by -*ese*, which the children have already acquired. They may also have to do with input frequency in mothers" speech. Later in the section "Type and Token Frequency of Conjunctions by Age Group," the cross-sectional data will reveal that adults do not use -*ekaciko* in describing a series of motion events connected by cause and temporal sequence, whereas children do.

(18a) SH (4;1) -*ekaciko,* cause

> *yak   pal-akaciko,   ta nah-ass-e.*
> medicine apply-because all get.well-PST-SE

> 'Because I applied the medicine, (I) got all better.'

(18b) substitution of -*ekaciko* in (18a) with -*ese*

> *yak   pal-ase,   ta nah-ass-e.*
> medicine apply-because all get.well-PST-SE

> 'Because I applied the medicine, (I) got all better.'

(19) BK (4;4) -*ekaciko,* sequence

> *saykchilhay-kaciko, ikes-ul   pwuchi-e*
> color-and.then   this-ACC attach SE

> 'Color this and then attach (it).'

-nuntey expressing circumstance and contrast

The conjunctive form -*nuntey* "given that, but" has circumstantial and contrastive meanings. Circumstantial meaning refers to providing background or contextual information of the main event, thus are less tied to immediate action sequences. The children produce both functions before 2;6, but the frequency of the two functions differs in the two datasets. From 2;0, JW uses it for a circumstantial meaning (15 times out of 23, **Table 4**) as he describes events from a story book (20). It is worth noting that JW uses -*nuntey* in this way almost exclusively (13 out of 15 times) when narrating stories from story books (e.g., Pinocchio, Winnie-the-Pooh), the kind of activity he often engaged in with his mother. JW seems to have acquired the circumstantial function of -*nuntey* through book reading.

(20) JW (2;1) -*nuntey,* circumstance

> *yeki   kaykwuli   iss-nuntey,*
> here   frog   be-and

> *kaykwuli-ka phalccak-phalccak   ttwuie-ka.*
> frog-SBJ   hop-hop (onomatopoeic) jump-go

> 'Here is a frog and, the frog is going away jumping hippity-hop.'

JW starts expressing the contrastive function with -*nuntey* a few months later (2;4) and he expresses the function only

occasionally (7 times out of 23). In contrast, the four children in Dataset 2 show the opposite pattern. KJ, the youngest child in the dataset, uses -*nuntey* for a contrastive function from 2;2. He produces a total of seven utterances with -*nuntey* during the study period, and most of them — five out of seven — are contrastive (21). Similarly, SH (3;5–4;3) produces -*nuntey* six times, five of which are contrastive and only one circumstantial. In BK's speech (3;10–4;9), all six -*nuntey* utterances are contrastive (22). The oldest child, YJ (4;2–5;1), produces seven -*nuntey* utterances with five of them in contrastive meaning. Note that the contrastive function of -*nuntey* is different from that of -*ko*. In the case of -*ko*, the function is to juxtapose two alternatives (section "-*ko* expressing list, manner, sequence, and contrast"), but -*nuntey* signals that the main event is contrary to a customary assumption.

(21) KJ (2;2), -*nuntey*, contrast

> *appa ipwul-i-ntey,   emma-ka   teph-e.*
> daddy blanket-COP-but mommy-SBJ cover-SE

> '(It) is daddy's blanket, but mommy covers (herself with it).'

(22) BK (4;2), -*nuntey,* contrast

> *pakhwui-ka eps-nuntey,   kuli-l-lay.*
> wheel-SBJ   absent-but   draw-FUT-SE(intention)

> '(There) are no wheels, but I will draw (them).'

In both datasets the early utterances with -*nuntey* are sometimes not adult-like. In some cases, it was used for a listing or sequential function for which the form -*ko* "and then" would have been more appropriate. Example (23) illustrates such a case. Inappropriate uses of -*nuntey* at early stages suggest that the children do not fully acquire the relevant concept of circumstance until later.[8]

(23) JW (2;2), -*nuntey,* circumstance

> *horangi-nun   ehung hay-ss-nuntey, celi-lo   ka*
> tiger-TOP   roar   do-PST-nuntey there-to go

> *peli-ess-eyo.*
> away(AUX. completion)-PST-POL.SE

> 'The tiger roared and, (it) went away to there.'

-nikka expressing a logical reason

Although the semantic function of -*nikka* can generally be labeled as "cause" (Sohn, 2009), it is quite different from other conjunctions expressing "cause" (**Table 3**). For example, unlike -*ese*, which typically expresses a cause whose effect is spatially and temporally related to the main clause (15), -*nikka*

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[8]I thank a reviewer for pointing out that -*nuntey* may express an interactional component in conversation, namely, the speaker's own perspective ("my-side-telling" to borrow the term from Kim, 2018) that contrasts with a typical expectation or social norm (Park, 1999; Kim, 2018). This subtle relationship between the -*nuntey* and the main clauses may explain young children's difficulty in using the form appropriately.

expresses some logical reason that justifies an event. This is demonstrated in the children's use of the form in (24–26). JW starts using -nikka, at 2;1, KJ in Dataset 2 starts a little later at 2;5.

(24) JW (2;1) -nikka, reason

kwungtengi ttayli-nikka, aph-a.
Bottom   hit-because hurt-SE

'Because (you) hit my bottom, (it) hurts.'

(25) KJ (2;9) -nikka, reason

wuli   naymsaena-nikka, son   ssis-eya
we   smell-because   hands wash-CONN

tway.
become(AUX. obligation)

'Because we smell, we must wash hands.'

(26) SH (4;1) -nikka, reason

os-i   eps-unikka,   os   sa-yo.
clothes-SBJ absent-because clothe buy-POL.SE

'Since (we) don't have clothes, (let's) buy clothes.'

Although the concept of "reason" is abstract, interestingly, there are no inappropriate uses of -nikka. The concept of reason, which relates to that of cause, may be cognitively more accessible than the concept of circumstance.

-myen expressing condition

The children produce the conjunction -myen "if/when" from early on, 2;2 in JW's speech and 2;4 in Dataset 2 (**Table 3**). They produce it frequently and appropriately to express a condition for the main event, as in (27) and (28).

(27) JW (2;3) -myen, condition

ikes-ul   nwulu-myen, kulssi-ka   epseci-e.
this-ACC   press-if   letters-SBJ disappear-SE

'If (one) presses this, the letters disappear.'

(28) KJ (2;4) -myen, condition

na-to   hakkyo-ey   ka-myen,   kongpwuha-lkke-ya.
I-too   school-to   go-when   study-FUT-SE

'When I go to school, (I) will study, too.'

The early appearance of conditional expressions in Korean children has been well-documented in previous research. Akatsuka and Clancy (1992) report that Korean (and Japanese) children express conditionals as early as 2;0, and contrast their findings with a relatively later acquisition (2;6–3;0) of the conditional "if" in English (Bowerman, 1986; Reilly, 1986) and in Italian and German (Clancy et al., 1976). Akatsuka and Clancy (1992) explain that while the concept of condition is abstract, it may be more accessible to Korean children because the conditional conjunction in Korean, -myen, also occurs with a deontic modal verb, (an-)tway "(not-)good" to refer to social

norms as in (29), and mothers often appeal to children using this construction.

(29) From Akatsuka and Clancy (1992, p. 187)

(The child is sitting on the table)
ike   ancu-myen   an-tway.
this sit-if   not-good

'It's not good to sit here.'

-le expressing purpose

At 2;2, JW also produces -le "(in order) to" 16 times to express a purpose of an action, but in Dataset 2, KJ uses it three times at 2;7 and SH uses it only once at 3;6. In all cases, the conjunction is followed by a deictic motion verb, -ka "go" and -o "come" (**Table 1**), stating the purpose of going somewhere. This restriction also applies in the adult grammar (Sohn, 2009). The children begin to produce the morphologically more elaborate and syntactically less restrictive conjunctive form -lyeko "in order to" much later, after 3;6, to express purpose.

In summary, by 2;6 the children in this sample produce several major types of conjunctive forms that express cause, reason, manner, sequence, circumstance, contrast, and condition. Impressively, from the beginning young children use the forms appropriately according to the specific form–function relationship in the adult grammar.

Later-Acquired Conjunctions
From 2;7 to 3;11: acquisition of complex temporal concepts

From 2;7, children produce five new conjunctions, -taka "while doing," -teni "when/as," -myense "while, -ulttay "when," and -eto "though." Except for -eto "though," all conjunctions relate to temporal concepts and are qualitatively different from the earlier-acquired ones. These later-acquired conjunctions express some type of deviation from smooth successive actions/events. More specifically, the conjunction -taka "while doing" expresses a change of course in action/movement (30). As for -teni "when," it expresses an initiating event that is only loosely connected to the ensuing event. That is, the event that follows could be unrelated or unexpected (31) from the -teni event. The conjunction -myense "while" presents an event that overlaps in time with the main event (32), and -ulttay "when" sets up a general temporal frame for an event that is not tied to a specific event (33). I would argue that these notions are cognitively more demanding than the earlier-acquired temporal concepts, in that they connect disjunctive/interrupted actions (-taka, -teni), express a general temporal relation of two events that are not tied to the here-and-now (-ulttay), or convey the temporal overlapping of two events (-myense) that are woven into a single macro event (Slobin, 1995).

(30) KJ (2;9) -taka, change of course in action/movement

kong-i   hanul-ey ollaka-ss-taka,   naylyeo-ass-e.
ball-SBJ sky-to   go.up-PST-but.then come.down-PST-SE

'The ball went up, but then came down.'

(31) JW (3;3) -teni, initiating event

| *appa-ka* | *bai-kulay-ss-teni, aitul-i* | *tto* |
| dad-SBJ | bye-say-PST-then children-SBJ | again |

| *manna-ca-ko* | *kulay-ss-e.* |
| meet-HORT-COMP | say-PST-SE |

'When daddy said 'bye', the children said 'let's meet again.''

(32) KJ (2;9) -myense, simultaneity

| *wuli nolay tulu-myense, ca-ca.* |
| we song listen-while sleep-HORT |

'Let's sleep while listening to the song.'

(33) BK (4;2) -ulttay, temporal frame

| *ppalli ka-lttay, kicha-ka pwuditchi-l* | *swu-iss-e.* |
| fast go-when train-SBJ collide-COMP | possible-be-SE |

'When (they) go fast, the trains can collide.'

Toward 3;0, the children start using the conjunction -eto "although" which denotes concessive. In (34), JW expresses his brave and unexpected reaction to falling down. The concept of concessive expressed in -eto (i.e., despite a difficult situation, . . .) may be likened to that of change/disjunction mentioned above for the later-acquired temporal conjunctions, in that the reaction to an adverse situation does not follow the usual expectation.

(34) JW (3;0) -eto, concessive

| *na-nun nemeci-eto,* | *an* | *wul-e.* |
| I-TOP fall.down-even.if | NEG | cry-SE |

'I don't cry even when I fall.down.'

From 4;0 till 5;1

Here I briefly comment on the clause chaining data of the two oldest children in Dataset 2, BK and YJ, whose speech was recorded between 3;10 and 5;1. Essentially, there are no new developmental aspects that are qualitatively different from the younger children. The two children continue to produce the 12 conjunctions at similar rates as the younger children, except for using the general temporal frame marker, -(u)lttay "when" more productively (35). One new conjunction that appears in their repertoire is -key "so that," expressing permission, causation, or purpose (36), which they produce only three times in total. We will discover that the absence of significant development beyond 4 years converges with the elicitation data.

(35) BK (4;2) -(u)lttay 'when', general temporal frame marker

| *kicha-ka* | *mak ppalli ka-lttay-nun, pwuditchi-l* |
| train-SBJ | very fast go-when-top collide-COMP |

| *swu-iss-e.* |
| possible-be-SE |

'When trains go very fast, (they) can collide.'

(36) YJ (4;7) -key 'so that', goal/permission

| *amwu-to mos ha-key* | *ha-lkke-ya.* |
| nobody-SBJ can't do-so.that | do-FUT-SE |

'I will do (something) so that nobody can do (it).'

Topic Continuity Feature of Conjunctions

As mentioned in the section "Introduction," many of the clause chaining conjunctions in Korean have clear preferences in regards to whether or not the following clause has the same subject (SS). For example, the simultaneity conjunction -myense "while" has a strong tendency to maintain the SS in the main clause as in (32) above, whereas the circumstantial conjunction -nuntey "given that" freely allows a different subject (DS) in the main clause as in (37). In Kim's (1992) adult data the temporal conjunctions -myense "while," -taka "while doing," and -ese "and then" had a 90% rate of SS, whereas -nuntey "but" and -nikka "because" had only a 18.2% rate of SS.

(37) JW (2;8) -nuntey 'as/while', circumstance,

| *enu-nal twayci-ka* | *megi-lul chac-koiss-nuntey,* |
| one-day pig-SBJ | food-ACC look.for-PRS.PROG-nuntey |

| *saca-ka o-ass-e.* |
| tiger-SBJ come-PST-SE |

'One day while the pig was looking for food, a tiger came. '

An analysis of topic continuity was carried out to determine whether the children in the present study already use conjunctions with a clear preference for DS or SS, similar to the way adults use them. The result shows that children do so in large part. I should note here that in the children's speech, the subject of a clause was often omitted (zero anaphora) but identifiable, as the children talked about themselves, their mothers, or the things that they were playing with. (I will take up the issue of referential choices with cross-sectional data in the section "Referential Ambiguity of Subject Argument"). **Table 5** shows the conjunctive functions, the forms used, and their SS and DS frequency distributions in the children's speech. First, as in the adult narratives reported in Kim (1992), all the conjunctions expressing temporal sequence, simultaneity, and manner, e.g., -ko "and then," -myense "while," clearly prefer SS. In contrast, conjunctions marking a circumstance, contrast, condition, and reasoning prefer DS. The listing conjunction -ko "and" also allows the possibility of switching to a DS in the main clause. The events serving these functions are often external to the main event. By "external," I mean that events explaining circumstance, contrast, etc., are not integrated parts of what happens in the main event. Note that the preference for SS or DS, i.e., the topic continuity feature, depends on the conjunctive function, not the form. For example, the sequential function of -ko is predominantly associated with SS, but the listing function is associated more with DS than SS.

The third category of functions in **Table 5**, namely, -ulttay "when," -ese "and then, because," and -ekaciko "and then," do not show a clear preference. The two sets of data differ somewhat

TABLE 5 | Topic continuity of conjunctions: Frequency of different (DS) and same subject (SS).

Semantic function/ DS/SS preference	Conjunctive form	DS vs. SS (token frequency)	
		Dataset 1	Dataset 2
SS preferred			
Sequence/manner	-ko	DS (13) < **SS**[1] (97)	DS (9) < **SS** (89)
Sequence/manner	-ese	DS (3) < **SS** (43)	DS (4) < **SS** (33)
Sequence	-ekaciko	DS (2) < **SS** (8)	DS (0) < **SS** (17)
Simultaneity	-myense	DS (0) < **SS** (5)	DS (0) < **SS** (8)
Interrupted event	-taka	DS (0) < **SS** (12)	DS (0) < **SS** (5)
DS preferred			
Listing	-ko	**DS** (34) > SS (27)	**DS** (19) > SS (10)
Circumstance/contrast	-nuntey	**DS** (17) > SS (5)	**DS** (17) > SS (9)
Reason	-nikka	**DS** (22) > SS (5)	**DS** (13) > SS (5)
Condition	-myen	**DS** (33) > SS (17)	**DS** (61) > SS (24)
Initiating event	-teni	**DS** (16) > SS (4)	No data
Indeterminate			
Temporal frame	-ulttay	DS (3) = SS (1)	DS (2) < **SS** (10)
Cause	-ese	**DS** (43) > SS (29)	DS (11) = SS (14)
Cause	-ekaciko	**DS** (9) > SS (3)	DS (2) = SS (3)

[1]The boldface refers to the type (DS or SS) that is clearly preferred in the dataset.

in terms of their preference for SS or DS, and in some cases (i.e., -ulttay, -ekaciko), the amount of data is too small to make generalization. We will examine the topic continuity feature further in the cross-sectional study.

Non-finiteness Versus Finiteness of Medial Verbs

In the children's speech, non-finiteness of the verbs in medial clauses is well observed. Of all the verbs in medial clauses, only 8.5% (44/517) for JW and 3.9% (16/411) in Dataset 2 are finite. The finite verbs typically carry the past tense inflection, -ess (Kim, 2015). In the data, finite verbs in medial clauses are restricted to the following conjunctions: -teni expressing an initiating event (in all 20 cases), -nuntey expressing a circumstance/contrast (24 cases out of 50), -taka expressing an interrupted event (8/17), -nikka expressing a reason (8/45), and -ko (2/90). In JW's speech all the verbs with -teni "when/as" is finite, as in (31), repeated here. Also, half of the verbs with -nuntey "but" are finite (38).

(31) JW (3;3) -teni, initiating event

appa-ka   bai-kulay-ss-teni, aitul-i   tto
dad-SBJ   bye-say-PST-then children-SBJ again

manna-ca-ko   kulay-ss-e.
meet-HORT-COMP say-PST-SE

'When daddy said 'bye', the children said 'let's meet again'.'

(38) SH (3;10) -nuntey, contrast

(SH and M are talking about where scissors are).
ecey   chacapo-ass-nuntey, hana-to   epse-ess-yo.
yesterday look.for-PST-but   one-even not.be-PST-POL.SE

'I looked for them yesterday, but there were none.'

What these events with finite verbs have in common is that the medial, non-main clause is temporally not always continuous with the event in the main clause. In this regard, interestingly, the verbs with conjunction -ko in a listing function – which can connect individual events/states – are finite only in two cases out of 90 occurrences. A close look at the data show that with -ko the children typically list object names or various states of affairs that they observe at the time of speech, often with adjectival predicates, as in (9), repeated here. This may explain the scarcity of finiteness (2/90) in the verb with conjunction -ko in the children's speech.

(9) JW (2;0) -ko, listing

yeki   nolan pyel-to   iss-ko,   hayan pyel-to
here   yellow star-also be.PRS-and white star-also

iss-e.
be.PRS-SE

'Here is a yellow star and (here) is also a white star.'

Summary of the Longitudinal Study

The Korean children in this sample combine clauses from at least 2 years of age. Within 6 months, they acquire eight prominent types of conjunctive forms and use those linguistic devices appropriately to specify the cause, manner, sequence, contrast, and condition of the main clause. Several of the conjunctions are multi-functional and some functions can be served by more than one form, and yet, from this early stage, children are strikingly good at using specific forms for specific functions with few errors. At the beginning (2;0–2;6), many of the functions that children express are based on concrete and perceptual events having cause–effect and sequential relations, particularly with -ko "and" and -ese "and then, because." But during the next year or so, they produce temporal conjunctions that are cognitively more

demanding. They begin to express action sequences that have interruptions or a change of direction in the course of an action. They also express the concepts of the simultaneity of events and of having a general temporal frame for an event. By 5;0, children have a repertoire of as many as 25 conjunctions. Children's proportions of topic continuity feature for each conjunction are similar to those of adults. As in the adult grammar, the verbs in medial clauses are mostly non-finite, except with those conjunctions which convey an event that is temporally distinct from the main event.

I turn now to the second part of the paper and report further developmental aspects of clause chaining based on a cross-sectional elicitation study. I also compare the elicitation data to the longitudinal data.

THE CROSS-SECTIONAL ELICITATION STUDY

In this elicitation study, children of various age groups (from 3 to 10 years) and adults described short video clips of animated motion events that involve chains of events where one object affects another object in a particular way. As it is a controlled study with the same sets of stimuli, we can systematically investigate the following aspects in the development of clause chaining in Korean: type and token frequencies for temporal and causal conjunctions, the topic continuity feature of conjunctions, and the development of referential choices. We can also examine children's ability to segment a macro event into sub-events, which can be connected in a clause chain.

Materials and Methods[9]

Participants

A total of 80 monolingual Korean learners/speakers participated in the study as part of a larger study that was designed to elicit motion event expressions involving different manners (e.g., sliding, running) and paths (e.g., up, into) of motion. Of the 80 participants, data from eight child participants (three 3-year-olds, four 4-year-olds, and one 6-year-old) were excluded from analysis for one of the following reasons: (i) the child stopped describing after a few stimuli items due to apparent boredom (three 4-year-olds), (ii) the child did not want to talk to the experimenter from the beginning (two 3-year-olds and one 4-year-old), (iii) the child told stories from his/her own imagination that had nothing to do with the stimuli (one 6-year-old), and (iv) the child told the same sentence over and over again for all stimuli, e.g., "it went like this and like this" (one 3-year-old). As a result, data from 72 participants, 12 children in each of five age groups – 3, 4, 6, 8, and 10 years – and 12 adult speakers, were included in the analysis. The adult participants were university students between 22 and 30 years of age. All data were collected in Seoul, South Korea. The adult participants and parents/guardians of the child participants signed written consent forms. The adult participants were given

monetary compensation and the children were given stickers and books for their participation.

Materials and Design

For the present study, a total of seven video clips of animated motion events were created. Each video clip was 4 s long and consisted of three to five sub-events, which were temporally and causally related as in the following example: (see **Supplementary Appendix A** for a full description of all seven events).

(1) A ball rolls toward an object (e.g., vase, book, bowling pins).

(2) While rolling, the ball hits/pushes the object.

(3) As a result, the object undergoes (i) a change of state or (ii) a change of location.
   (i) The object (e.g., vase, bowling pins) tips over.
   (ii) The object (e.g., book) is pushed and moves forward and hits a wall.

(4) The object may undergo (i) a further change of state or (ii) a further change of location.
   (i) The object (e.g., vase) breaks.
   (ii) The object (e.g., book) bounces back from the wall.

Figure 1 illustrates the video event involving a ball and a vase. As shown, the connection from one sub-event to the next involves causal and temporal sequence. Each sub-event involves a movement or a change of state: for example, the ball rolls and the vase breaks. In the experiment, the seven video clips were interspersed with 32 other stimuli videos of animated motion events (e.g., A boy walks up the hill carrying a bag), which are not included in the present study.

Procedure

The participant was presented with one video clip at a time on a computer screen. After each clip, he/she was asked to tell what happened in the video. Adults and children in age groups of 6, 8, and 10 years were asked to describe the video events to an imagined friend who hadn't seen them. For 3- and 4-year-olds, a doll named Ppororo (a popular animated figure in a Korean TV series for children) was introduced. Ppororo had big dark sunglasses on. (In the TV show, Ppororo always wears big glasses). The child was told that Ppororo could not see the screen and would like to know what happened.
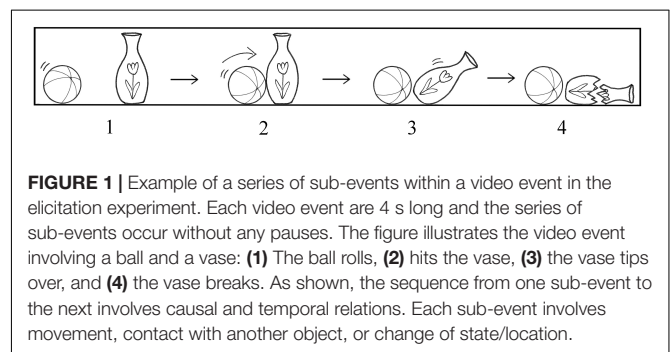
FIGURE 1 | Example of a series of sub-events within a video event in the elicitation experiment. Each video event are 4 s long and the series of sub-events occur without any pauses. The figure illustrates the video event involving a ball and a vase: **(1)** The ball rolls, **(2)** hits the vase, **(3)** the vase tips over, and **(4)** the vase breaks. As shown, the sequence from one sub-event to the next involves causal and temporal relations. Each sub-event involves movement, contact with another object, or change of state/location.

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[9]This experiment was designed by Prof. Maya Hickmann in University of Paris, and I collected the Korean portion of the data. Prof. Hickmann has permitted me to analyze the Korean data for research purposes and for publication.

TABLE 6 | Conjunction types and token frequency by age group: cross-sectional study.

Conjunctive form/gloss	3 years	4 years	6 years	8 years	10 years	Adults	Total	% usage
1. *-ese* 'and then, as'	20	26	37	40	70	86	279	50.20
2. *-ekaciko* 'and then'	1	16	12	24	14	0	67	12.10
3. *-taka* 'while doing'	4	7	7	7	9	11	45	8.10
4. *-ko* 'and then'	1	3	11	5	6	14	40	7.20
5. *-nuntey* 'but'	1	7	11	6	5	6	36	6.50
6. *-myense* 'while'	0	5	0	5	8	10	28	5.00
7. *-e(se)* 'and then, as'	1	0	0	1	3	19	24	4.30
8. *-teni* 'when'	2	8	0	3	0	3	16	2.90
Subtotal							535	96.20
9. *-ca* 'as soon as'	0	0	0	0	3	5	8	
10. *-nikka* 'because'	1	0	1	1	0	1	4	
11. *-ntaumey* 'after'	0	0	0	1	1	1	3	
12. *-myen* 'when'	1	0	1	0	0	0	2	
13. *-ko(na)se* 'after'	0	0	2	0	0	0	2	
14. *-nhwuey* 'after'	0	0	0	0	0	1	1	
15. *-npalamey* 'when, as'	0	0	0	0	0	1	1	
Subtotal							21	3.80
Grand total	32	72	82	93	119	158	556	100
Number of conjunction types	9	7	8	10	10	12		

Coding and Analysis

All descriptions were audio-taped and later transcribed by a Korean native speaker. The following are some examples.

(39) *kong-i   kkocpyong-ul mil-ese,   kkocpyong-i*
     ball-SBJ   vase-ACC   push-because vase-SBJ

     kkayci-ess-ta. (4-year-old)
     break-PST-SE

     'Because the ball pushed (it), the vase broke.'

(40) *kong-i   kwulle-ka-se,   kkocpyong-ul nemettuli-ko,*
     ball-SBJ   roll-go-and   vase-ACC   make.fall-and

     kkocpyong-i   kkayci-ess-ta. (10-year-old)
     vase-SBJ   break-PST-SE.

     'The ball rolled and knocked over the vase and the vase broke.'

(41) *kong-i   kwulle-ka-se, pyong-ul kentuli-ese, pyong-i*
     ball-SBJ   roll-go-and   vase-ACC touch-and   vase-SBJ

     nemeci-ese,   kkayci-ess-ta. (adult)
     fall.over-and break-PST-SE.

     'The ball rolled and touched the vase, and the vase fell over and broke.'

For each description, the number of clauses and the sub-events the clauses described were identified. For multi-clausal descriptions, the conjunction forms and their semantic functions were coded as well as their topic continuity feature. For each clause, the morphological nature of the subject argument – full NP, zero anaphora, or pronoun – was coded. Cases of zero anaphora were examined to determine whether they were used appropriately (i.e., clear vs. ambiguous reference) and whether the intended referent had been mentioned in a preceding clause. All verbs in medial clauses were coded with respect to their finiteness.

RESULTS

Type and Token Frequency of Conjunctions by Age Group

Table 6 shows the conjunction types and their token frequencies by age group. Regarding types, a total of 15 conjunction types are produced to link sub-events, ranging from 7 to 12 types per age group. Of the 15 types, the first eight make up 96.2% of all conjunctions. The conjunction *-ese* "and then, as" is by far the most frequent (279 out of 556 total conjunction tokens, 50.2%), not only for all age groups combined but also within each age group as well. The remaining seven types are used only occasionally by various age groups. Adults produce 12 different types, adding two new conjunctives (*-nhwuey* "after," *-npalamey* "as result of") to the children's repertoire, but those "new" types are each used only once. On the other hand, no adults use *-ekaciko* "and then" (expressing cause and sequence), while some children aged between 4 and 10 years do. As noted in the section "*-ekaciko* expressing sequence and cause," during an early period, the children in the longitudinal data use the conjunction *-ekaciko* "and, because" (literally, *-e + kaciko* "CONN + having done") only sporadically, and start using it again in their fourth year. The elicitation data suggest that the form becomes a less important one over time. Instead, adults express cause and temporal sequence with the morphologically opaque – thus more abstract – form, *-ese*, "and then, because" or its phonologically reduced form *-e(se)*.

As **Table 6** shows, 3-year-olds already use all the major types of clause chaining conjunctions to express cause and

temporal sequence, except *-myense* "while," which denotes simultaneity. The later appearance of *-myense* is consistent with the longitudinal data of the present study (see the section "Later-Acquired Conjunctions"). In the cross-sectional study, *-myense* appears in the 4-year-old group. Children in the longitudinal study begin using *-myense* at around 3 years of age (2;10–3;4), but they may need more time to have sufficient control over it to use it in a controlled study. While the repertoires of major conjunctive types are similar across the age groups, their token frequencies are noticeably different: Three-year-olds produce 32 conjunctions in total (all children combined) but 4-year-olds produce twice as many conjunctions. Ten-year-olds and adults each produce 119 and 158 tokens, respectively.

Figure 2 displays box plots showing the distribution of token frequencies of conjunctions (for the seven video events combined) produced per participant in each age group. As can be seen, most 3-year-olds produce four or less conjunctions while 4-year-olds produce more than four tokens. Then, we notice little change in the distribution from 4 to 8 years except that 8-year-olds show more individual variability than the younger children. Ten-year-olds are qualitatively different from 8-year-olds: They produce more conjunctions with less individual variation. Adults produce substantially more conjunctions but also show individual variation (between 7 and 20 conjunctions). A linear model analysis using R statistics (Version 3.5.1, R Core Team, 2018) shows that the difference in the amount of conjunctions between 3 and 4 years is significant (β = 3.091, SE = 1.375, t = 2.248, p = 0.028). The next two age groups, 6 and 8 years produce about the same amount of conjunctions as 4-year-olds (**Figure 2**). Then, from 8 years to adults, there is a steady increase in conjunctions, i.e., medial clauses (93, 119, and 158, respectively, **Table 6**). While the difference between 8- and 10-year-olds is not significant (β = 2.167, SE = 1.571, t = 1.416, p = 0.177), the difference between 10-year-olds and adults shows a strong trend of increase (β = 3.250, SE = 1.592, t = 2.041, p = 0.053). Also to note, 10-year-olds produce significantly more conjunctions than 4-year-olds (β = 3.916, SE = 1.391, t = 2.816, p = 0.006) and 6-year-olds (β = 3.083, SE = 1.472, t = 2.094, p = 0.042). Overall, the data show significant or substantial increases of conjunctions from 3 to 4 years, then at 10 years, and again for adults. The increases in number of conjunction tokens means that correspondingly, older children and adults produce many more medial clauses, hence express more sub-events than younger children. Given the finding that the major conjunction types are already present in 3-year-olds" descriptions (**Table 6**), the data suggest that their challenge is to put several events together into one utterance.

Topic Continuity Feature of Conjunctions: Cross-Sectional Study

In the section "Topic Continuity Feature of Conjunctions," we saw that the temporal conjunctions denoting sequence and simultaneity prefer SS whereas the listing and contrastive conjunctions prefer DS. But for the causal conjunctions, *-ese* "and then, because" and *-ekaciko* "and then," their topic continuity preference could not be determined (**Table 5**). To compare with

FIGURE 2 | Distribution of token frequencies of conjunctions (for the seven video events combined) per participant in each age group (*N* = 12). The median frequency in each age group is marked by a thick horizontal lines that typically falls within the box. The bottom and top of the box represent the first and the third quartile (Q1 and Q3), respectively, and the two ends of the whiskers (vertical lines) represent minimum and maximum number of tokens produced by a participant in that age group. The dots represent outliers. Token frequencies grew as a function of age. See text for statistical results comparing across age groups.

the longitudinal data, **Table 7** shows the DS and SS frequency counts of the relevant conjunctions in the cross-sectional data. Consistent with the longitudinal data, the temporal conjunctions prefer SS. Also consistent is the preference for DS for the circumstantial conjunction *-nuntey* "given that, but" and for the conjunction *-teni* "when/as" denoting initiating event. For the causal conjunctions, *-ese* and *-ekaciko*, the cross-sectional data clearly show a preference for DS. The DS and SS preferences of the conjunctions are consistent across all five child groups and between children and adults, with a few exceptions (e.g., adults' use of *-teni*), are hard to interpret due to their low token frequencies. Overall, together with the longitudinal data, the present study suggests that the topic continuity features of conjunctive functions develop from the onset of the acquisition of clause chaining.

An interesting difference between children and adults is in the total frequencies of DS and SS used to describe the seven events (see the "total" column in **Table 7**). In describing the video events, children of all age groups produce more DS than SS conjunctions overall, but the adults show the opposite pattern, producing many more SS (88 tokens) than DS (46 tokens). This was mostly due to the adults producing far more tokens with the "sequential" *-ese* conjunction and the simultaneity *-myense* conjunction than the children. Conversely, the children produced many more causal conjunctions (*-ese, -ekaciko*) with DS preference. We will examine possible sources of this difference in the section "Event Segmentation in Clause Chaining."

TABLE 7 | Topic continuity feature (DS vs. SS) of conjunctions: cross-sectional study.

	SS preferred						DS preferred								
	Sequence/manner		Simultaneity		Interrupted event		Circumstance		Initiating event		Cause		Cause		Total	
	-ese		*-myense*		*-taka*		*-nuntey*		*-teni*		*-ese*		*-ekaciko*			
Age group	DS	SS	DS	SS	DS	SS	DS	SS	DS	SS	DS	SS	DS	SS	DS	SS
3 years	1	9	0	0	1	3	1	0	2	0	10	1	1	0	**16**	13
4 years	2	3	1	4	4	3	6	1	8	0	15	6	10	0	**46**	17
6 years	2	1	0	0	3	4	9	2	0	0	27	7	2	2	**43**	16
8 years	0	11	1	4	1	6	4	2	3	0	25	5	21	0	**55**	28
10 years	2	11	3	5	0	9	2	3	0	0	49	11	4	2	**60**	41
Adults	0	37	0	11	0	9	3	3	0	3	43	25	0	0	46	**88**
Total	7	**72**[1]	5	**24**	9	**34**	**25**	11	**13**	3	**169**	55	**38**	4	266	203

[1]*Boldface refers to the preferred type (DS or SS) for the given conjunctive form/function for all age groups combined and the totals of each age group.*

TABLE 8 | Frequency and percentages of ambiguous anaphora (zero and pronoun) for subject reference.

Age group	Referential ambiguity type		Ambiguous anaphora	Clear use of anaphora	Full NP	Subject reference	% Ambiguous anaphora
	No prior mention of reference	Two prior-mentioned entities	Sub-total			Total	
3 years	42	6	48	9	55	112	42.86
4 years	21	21	42	9	103	154	27.27
6 years	14	17	31	22	115	168	18.45
8 years	1	22	23	21	134	178	12.92
10 years	0	4	4	42	156	202	1.98
Adults	0	3	3	102	154	259	1.16

Referential Ambiguity of Subject Argument

In Korean, subject or object arguments are typically expressed either as full NPs or zero anaphora (see the section "Non-finiteness/Finiteness of the Verb/Predicate of a Medial Clause"). Pronouns are infrequently used. In the present data, there are only 14 instances of pronoun use. All of them are used by 3-, 4-, and 6-year-olds, except for one used by an adult. This confirms that for adult speakers, zero anaphora is the preferred choice over pronouns for anaphoric reference (Kim, 1992).

In Korean, appropriate referential choices/forms would be achieved by (i) using a full NP when introducing an entity for the first time in the discourse or when differentiating the referent from several possible entities mentioned in preceding discourse, and (ii) using zero anaphora when the subject of the current clause has the same reference as the subject of the immediately preceding clause. Example (42a–c) shows appropriate referential choices. The 10-year-old follows the above "rules" and thus communicates the intended referents clearly in each clause: The child uses full NPs to introduce the ball and the bottle in the first clause (42a), then refers to the bottle with a full NP again in the second clause (42b) to disambiguate it from the ball. Then in the final clause (42c), the child uses zero anaphora to refer to the bottle, which is the only entity mentioned in the immediately preceding clause (42b), thus is the only candidate for the subject of *kkayci-ess-eyo* "broke."

(42) a. *kong-i*   *pyong-ul*   *chi-ese,*
       ball-SBJ   bottle-ACC   hit-and.so

   b. *pyong-i*   *nemeci-myense,*
       bottle-SBJ fall.over-while

   c. Ø   *kkayci-ess-eyo.*   (10-year-old)
               break-PST-POL.SE

   'The ball hit the bottle and, as the bottle was falling over, (it) broke.'

When the speaker does not adhere to the above rules, ambiguity would occur, as in the following examples (43–44). In (43a,b), the 3-year-old, who is describing the ball-bottle event as in (42), introduces the ball rolling (43a), but in the very next clause (43b) states that something broke using zero anaphora. The use of zero anaphora is not appropriate here – and would cause a communication break-down – as the child has never mentioned the entity (=vase) that broke.

(43) a. *kong-i* *kwulle-se,*
        ball-SBJ roll-and

   b. Ø   *kkayci-ess-e.* (3-year-old)
               break-PST-SE

   'The ball rolled and, (?) broke.'

In (44a,b), the child introduces two entities, a ball and a book, in the first clause (44a), but uses zero anaphora in the second clause (44b), not specifying which of the two objects ends up going to the wall. Note that while it is contextually more likely that the book – rather than the ball – propels forward to the wall as a result of it being pushed, in principle, either object could move toward the wall, hence there is potential ambiguity in the listener's understanding of the event.

(44) a. *kong-i*   *chayk-ul*   *mil-ekaciko,*
        ball-SBJ   book-ACC   push-and.so

     b. Ø   *pyek aph-ey*   *ka-ess-e.* (4-year-old)
                  wall front-LOC   go-PST-SE

'The ball pushed the book and so, (?) went to the front of the wall.'

As each event in this elicitation experiment has two entities that move and interact with each other, I examined the extent to which children make appropriate referential choices for the subject argument. **Table 8** shows the percentages of ambiguous subject reference in each age group. Three-year-olds clearly have difficulty referring to subjects, as 42.9% of their choices were ambiguous. In large part (42 times out of 48 ambiguity cases), the ambiguity derives from not introducing the intended referent in the description [e.g., (43)].

Four-year-olds also have difficulty clarifying subject referents (27.3%), but substantially less so than 3-year-olds. Furthermore, 4-year-olds introduce referents with a full NP more often than 3-year-olds do, thus specifying them more clearly. The ambiguity rate drops to 18.5% for 6-year-olds, but they still do not introduce the intended referent half of the time. Eight-year-olds show 12.9% of ambiguity for subject reference, and they are qualitatively different from the younger children in that, except for one instance, they do mention the intended referent in the preceding clauses. But overall, it is at 10 years that the rate of referential ambiguity drops to just 2%.

Non-finiteness Versus Finiteness of the Verb/Predicate of a Medial Clause

Of all the verbs with conjunctions (children and adult data combined), 12.4% (69 out of 556) have a finite verb form with the past tense marker *-ess*. Similarly to the longitudinal data, the conjunctions that attach to finite verb forms are predominantly *-nuntey* (34 finite out of 36 cases) and *-teni* (11/16), both of which express circumstance, and *-taka* (11/45), which encodes an interrupted action of an agent. Across the age groups, 4-year-olds use finite verbs most often (25%, 18/72) as they frequently use the three conjunctions, *-nuntey*, *-teni*, and *-taka*. The rates of the finite verbs in the other age groups range between 5 and 12%. One may interpret the high frequency of finite verbs in medial clauses among the 4-year-olds as result of their increasing understanding of the disjunctive nature of the three conjunctions.

Event Segmentation in Clause Chaining

In the present elicitation study, each video event sequence consisted of several sub-events that were temporally and causally sequenced. For example, in the ball-vase event sequence, first, a ball rolls forward and hits a vase which, as a result, tips over and then breaks (see **Figure 1**, section "Materials and Design"). The sub-events flowed from one to the next without pauses (i.e., no perceptual boundaries). In order to linguistically chain clauses, children first need to cognitively segment connected events into units (Baldwin et al., 2001; Levine et al., 2019), which can then each be expressed as separate clauses and be connected with specification of the semantic relation between them. Given the task of transferring perceptual events to clause chains, we can ask the following questions: which sub-event(s) do children pick out from a series of connected sub-events, and how many sub-events do children connect? To answer these questions, two types of analysis were conducted. In the first analysis, I examined the number of sub-events that participants in each age group expressed for a video event sequence. In the second analysis, I examined the types of sub-event children picked out in an event sequence.

For the first analysis, each video event sequence was broken down into sub-events (**Figure 1**). The seven video event sequences included 28 sub-events in total, each event sequence having from three to five sub-events (see **Supplementary Appendix A**). Then, each clause in a description was identified in terms of its corresponding sub-events, and the total number of sub-events expressed for a given video event sequence was counted. **Figure 3** shows the average number of sub-events expressed per participant (out of the total 28 sub-events) by age group. Three-year-olds describe about 9.3 sub-events per child. Four-year-olds describe 12.3 sub-events per child. A generalized linear model analysis (with Age as a fixed variable and Sub-event and Participant as random variables) using R statistics, Version 3.5.1 (R Core Team, 2018) shows that the difference between 3- and 4-year-olds is significant ($\beta = 0.866$, $SE = 0.316$, $z = 2.742$, $p = 0.006$). After 4 years, there are no sharp increases from one age group to the next in the children's data until 10 years. Ten-year-olds are significantly different from 6-year-olds. Also, as can be expected, adults provide significantly more sub-events

FIGURE 3 | Average number of sub-events expressed per participant by age group, out of the 28 total number of sub-events in the seven video events combined. The number of sub-events expressed by clauses grew as a function of age. See text for statistical results comparing across age groups.
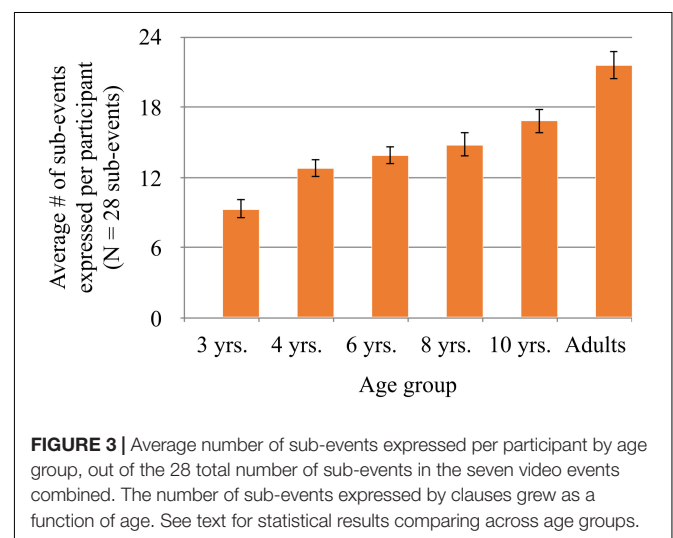
that 10-year-olds (β = 1.329, SE = 0.460, z = 2.887, p = 0.004). Some adults provide up to five and six events as follows:

(45) a. *kong-i*   *kwulle-ka-myense,*
        ball-SBJ   roll-go-while

     b. *chayk-ul*   *kentuli-nikka,*
        book-ACC   hit-since

     c. *chayk-i*   *olun-ccok-ulo*   *milye-ka-myense,*
        book-SBJ   right-side-toward   be.pushed-go-while

     d. *pyek-ey*   *pwuditchi-ess-taka,*
        wall-LOC   got.hit-PST-while.doing

     e. *tasi*   *thwuingki-ese,*
        again   bounce.back-and.then

     f. *kong*   *ccok-ulo*   *itongha-ess-ta.*   (adult)
        ball-SBJ   side-toward   move-PST-SE

     a. "As the ball rolled,
     b. it hit the book and so,
     c. the book was pushed to the right side and,
     d. got hit on the wall and then,
     e. (it) bounced back again and then,
     f. went toward where the ball was."

Another way to examine the growth of clause chaining is to compare the frequencies of single vs. multiple clauses in a description. **Table 9** shows the number of events that participants in an age group describe in a single clause, two clauses, three–four clauses, or five–six clauses. Out of the total of 84 events per age group (7 events × 12 participants), 3-year-olds describe 53 events in single clauses, each clause referring to one sub-event of a video event. In contrast, almost no adults describe the events with single clauses. The adults describe the events most frequently with three or four clauses, and some with five or six clauses as noted above. Between 4 and 10 years, two-clause descriptions are the most common type. At the same time, the rate of three to four clauses steadily increases from 4 to 10 years. Between 3-year-olds and adults, we observe a substantial decrease in single-clause descriptions at 4 years and again at 10 years. In sum, there are significant increases in the number of sub-events expressed at three age points, 4 years, 10 years, and adults.

In the second analysis, I examined the semantic types of sub-event the participants picked out in an event sequence. For this purpose, each sub-event was categorized into one of four event types: (1) object movement (ball rolls/book slides forward), (2) physical contact (ball hits/pushes vase), (3) change of posture (vase tips over), and (4) change of state (vase breaks). Then, each clause in a description was categorized into the corresponding event type, and the number of clauses that expressed a given type was counted per age group. **Table 10** shows the proportions of event type expressed by age group.

Overall, the type of motion event that participants – both children and adults – describe the most frequently is the perceptually salient change of state, i.e., an object breaking. The next most frequent types are about physical contacts and change of posture, that is, hitting and falling, respectively. The least frequently described sub-event is movement of a single entity, e.g., ball rolling. This overall ranking of frequency is consistent for all age groups. A more detailed look reveals a developmental change in the category of hitting, however (**Table 10**): There are noticeable increases from 3- to 6-year-olds for the hitting sub-events, such that 3- and 4-year-olds describe the hitting sub-events (0.36 and 0.53 respectively) less often than the falling sub-events (0.5 and 0.65 respectively), whereas children aged 6 years and older show the opposite pattern. Among the four types of events (**Table 10**), hitting is the only one that involves two entities, one affecting the other. Based on the results, we may hypothesize that younger children have more difficulty expressing two-entity events than one-entity events. This may relate to the earlier finding that younger children have difficulty in referring appropriately to two entities. But, further studies are necessary to test this hypothesis.

One other aspect should be noted. As mentioned earlier, in each group, the least frequently described sub-events are movements of an entity (i.e., the "Moving" event type) that do not involve contact or change of state, e.g., ball rolling. Comparing across the age groups, however, there is a big difference between children and adults: Children of all ages describe such movements <25% of the time, whereas adults express them 63% of the time. This suggests that adults consider a single entity's movement as an important event to describe, probably because it constitutes an initiating event that explains the ensuing event. For example, in the description (45a–f), (45a) describes the ball's rolling, which

TABLE 9 | Frequency distribution of number of clauses to describe an event by age group.

Age group	1 phrase	1 clause	2 clauses	3–4 clauses	5–6 clauses	Total
3 years	4	53	22	5	0	84
4 years	2	24	45	13	0	84
6 years	0	20	49	12	3	84
8 years	0	18	43	22	1	84
10 years	0	5	48	29	2	84
Adults	0	2	25	47	10	84

TABLE 10 | Proportions of event types expressed by a clause.

Age group	Event type			
	Breaking	**A hitting B**	**Falling**	**Moving**
3 years	0.83[1]	0.36	0.50	0.14
4 years	0.96	0.53	0.65	0.26
6 years	0.92	0.70	0.48	0.24
8 years	0.88	0.80	0.67	0.14
10 years	1.00	0.85	0.67	0.25
Adults	1.00	0.83	0.85	0.63
Average proportion	0.93	0.68	0.64	0.28

[1]Proportions are calculated by totaling the number of clauses expressing the given event type in each group's data, and dividing it by the total number of sub-events of the event type presented in the experiment.

explains how it hit the vase and made it tip over. In the present study, this resulted in adults producing many more clauses with SS compared to children (see the section "Topic Continuity Feature of Conjunctions: Cross-Sectional Study").

SUMMARY AND DISCUSSION

Summary

In this paper, I have reported general developmental aspects of clause chaining ability in Korean children, using both naturalistic and elicitation data. The longitudinal naturalistic data have shown that the Korean children in this sample produce clause chaining from at least 2;0. By 2;6, the children connect clauses productively, using many of the language's major conjunction types that express temporal, causal, conditional, and contrastive relations. For the next year and a half, they develop their clause chaining skills, connecting events that may have temporal and spatial disjunction or interruption. By 4;0, their clause chaining construction is adult-like, in terms of the conjunctive forms, the functions, and their morphological and syntactic features (i.e., finiteness of medial verbs and DS/SS preference of conjunctions). The cross-sectional elicitation data are supported by the findings of the longitudinal data and reveal further developmental aspects. They can be summarized as follows:

(1) Consistent with the longitudinal data, the cross-sectional data show that the major conjunctive types are already in place in 3-year-olds, the youngest age group (**Table 6**). Then, a significant development occurs from 3 to 4 years, particularly in three areas of clause chaining, conjunction frequency, length of clause chains, and referential choices.

(2) Further developmental milestones occur at 10 years and at adult age. From 4 to 8 years, development from one age group to the next in the three areas are gradual. Overall, the present study shows that clause chaining in Korean develop through adulthood.

(3) Three-year-olds often omit the subject of a clause (i.e., zero anaphora), and its reference is unclear most of the time (**Table 8**): They often use zero anaphora without having introduced the referent in a prior clause. The ability to appropriately use zero anaphora increases substantially at 4 years and again at 10 years.

(4) Perceptually salient events, such as physical effects of one object on another and change of state or location of an object, are expressed from 3 years. But movements of a single object that do not involve a physical effect or change are not expressed in clause chains until adulthood.

Discussion

The developmental trajectory from 2 years onward reported in this study suggests that by 4 years of age Korean children have built a solid foundation of the language-specific grammar for constructing clause chains, as they have acquired the major conjunctive form types and their functions. Detailed analyses of the forms and the functions in early years suggest that children

acquire them in steps, starting from linking closely related or closely sequenced events/states with the most frequent form (-*ko* "and, and then") – to expressing event relations that are more complex, including disjunctive events (-*taka* "while doing" and -*teni* "when, as"), events that provide temporal framework (-*ulttay* "when") and events that happen in parallel (-*myense* "while"). A similar developmental pattern is reported in Slobin's (1995) work for Turkish children.

What is still lacking in the 4-year-olds, however, is the ability to connect multiple medial clauses in a series, using several different conjunctions within a sentence. Four-year-olds also lack a full control of zero anaphora, albeit much better than 3-year-olds.[10] It is at 10 years when children use zero anaphora unambiguously most of the time. This suggests that 10-year-olds have a solid grasp of the function of zero anaphora. But adults still differ from 10-year-olds in that they use zero anaphora more extensively than 10-year-olds and do so with clarity. The results suggest that the development of clear anaphoric referencing is gradual and takes time. However, this developmental trajectory is based on experimental data. One needs to examine children's behavior of anaphoric referencing in diverse discourse genres (e.g., narrative, conversation) to fully understand how Korean children master the system, similar to Clancy's (1992) on Japanese.

With regard to event segmentation, the data show that while changes of state/location are well picked up on and described, movements of a single object are not expressed in clause chains till adulthood. This finding converges with well-known findings in developmental research that from early on children talk about change of state – as it is perceptually salient – more than on-going event or non-changing state (Antinucci and Miller, 1976; Aksu-Koç, 1998). Thus, children's early words typically include "broke" or "fell" (Slobin, 1985; Hickmann, 2003), or "gone" denoting disappearance of entity (Gopnik and Meltzoff, 1986). The finding also relates to more recent studies on the development of memory and linguistic expressions for source and goal (e.g., Papafragou, 2010; Lakusta and Carey, 2015; Lakusta et al., 2017): Infants, children, and adults alike, attend more, thus remember better, the goal than the source of an event. For example, having seen an event such as "a car drove from a gazebo into a garage," participants remember better and describe more often the goal (i.e., the car entering the garage) than the source (i.e., the car leaving the gazebo) (Papafragou, 2010). These findings can be compared to the present finding that children and adults alike describe the end result (e.g., vase falling and breaking) more than the initiating event that involve a single object moving (e.g., ball rolling). On the other hand, it is possible that children in the present study did notice the ball rolling event but were constrained by the number of clauses they can conjoin linguistically. A study that systematically contrasts the two possibilities would provide insight into the question.

While the present study examined the development of clause chaining in Korean in some detail, it has several limitations.

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[10]One could argue that 3- and 4-year-olds may rely on the listener's ability to retrieve the necessary information through contextual cue. For example, in natural conversation, the context is often familiar or set up between the child and the mother, such that even when the child uses zero anaphora ambiguously, the mother would understand. What the present elicitation data has shown is the lack of control in referential choices by 3- and 4-year-olds in a neutral unfamiliar setting.

First, the study could not systematically investigate the effect of input frequency effect. In this paper, I presented the developmental sequence from a cognitive perspective, but other factors, particularly input frequency, may explain the particular developmental pattern (Lieven, 2010). Second, the longitudinal database is limited in sample size and needs to be expanded to confirm the developmental trajectory reported in the present study. Third, the elicitation data are limited to a very short video-clips of temporally and causally related events. Further experiments can investigate more diverse relations, such as interruptions of events or contrastive events.

Within these limitations, however, the present study has demonstrated – based on both longitudinal case studies and experimental cross-sectional studies – that Korean children acquire major aspects of clause chaining from a young age. It has specified some details of how children develop clause chaining skills and has also laid out important milestones in the development of clause chaining in Korean.

DATA AVAILABILITY STATEMENT

The datasets generated for this study can be available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Yeungnam University and the San Diego State University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

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Ku Waru Clause Chaining and the Acquisition of Complex Syntax

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How do children learn to understand and use complex syntactic constructions? In English, Diessel (2004) shows that they do so in two different ways. Complex sentences with dependent clauses (e.g., "Peter promised that he would come") develop out of simple sentences that are gradually expanded into multi-clause ones. Complex sentences with coordinate clauses (e.g., "He tried hard, but he failed") develop by integrating two independent sentences into a single two-clause unit. Here we expand on that research by focusing on the acquisition of a kind of complex syntactic structure which involves both dependency *and* coordination—the clause chain—in Ku Waru, a Papuan language spoken in the Western Highlands of Papua New Guinea. Clause chains are constructions coordinating multiple clauses in sequence, where the non-final or "medial" clauses are in a dependent relationship with the final clause. One function of clause chains, which is often taken to be the prototypical one, is to refer to a series of events in sequence. Some Ku Waru clause chains do refer to sequential events. Other Ku Waru clause chains containing particular verbs refer to *single* events, sometimes with the particular verb providing aspectual or adverbial qualification ("keep doing," "do quickly," etc.). In this article, we track the acquisition of several different kinds of clause chains based on longitudinal recordings of four children acquiring Ku Waru as their first language between the ages of 1½ and 5. We show that, although there are differences among the children in the ages at which they acquire the various kinds of clause chain, all four of them follow the same series of steps in doing so. In conclusion, we compare our findings to Diessel's for English. We find that they are similar in some ways and different in others, which may be related to the differences between subordinate constructions, coordinate non-dependent constructions and coordinate-dependent constructions.

Keywords: child language acquisition, Papuan languages, clause chaining, switch-reference, event structure, Ku Waru, complex syntax

INTRODUCTION

This article focuses on children's acquisition of clause chaining in the Papuan language Ku Waru. We define a clause as a linguistic unit which: (a) expresses a proposition, and (b) consists of an explicit or implied subject and a predicate. Clause chains in languages like Ku Waru are constructions which contain: (a) one or more non-final clauses containing verbs that are either partially specified or otherwise marked as non-final; and (b) a final clause containing a verb that is fully specified (Haspelmath, 1995, p. 21; Longacre, 2007, p. 374–376; Sarvasy, 2015, p. 665–666).

For Ku Waru in particular it must be added that some of the non-final verbs in clause chains are fully specified for person and number, but not for their tense, which is determined by that of the final verb. As in other clause chaining languages such as the ones discussed by Foley and Olson (1985) and Van Valin and LaPolla (1997), non-final clauses in Ku Waru are linked to their final clause in a relationship that shows elements of dependency *and* coordination. Non-final clauses are dependent, because they depend on the final verb in the chain for their full inflectional specification (Roberts, 1988, p. 49–50). At the same time, non-final clauses show elements of coordination, because they behave somewhat independently. For example, in some clause chaining languages, question particles may have scope over only some of the clauses in a chain, which suggests that the clauses are in a coordinate, not subordinate relationship to one another (Foley, 2010, p. 30). From a Eurocentric perspective, this seems paradoxical because the dependency relation is usually thought to be associated with subordination rather than coordination. As Sarvasy (2015, p. 666) points out, this in-between status of clause chains presents a puzzle for formal theories of syntax.

The prototypical function of clause chains is often reported to be the narration of discrete, sequential events. For example, Thurman (1975) states that "[t]he emphasis of chaining…is on the conjoining of a number of clauses in chronological sequence" (p. 342). The length of chains is often emphasized. Weisser (2015, p. 4) begins his definition of clause chains by referring to them as "*long* sequences of a potentially infinite number of clauses within the same sentence" (italics our own). Dooley (2010, p. 13) does not consider languages "chaining" unless they have "long chains" that are "common in narrative" (p. 13). Sarvasy (2015, p. 666) cites metaphors regarding clause chains that emphasize both length and sequentiality, such as "an engine… [pulling] along a string of cars" (Longacre, 2007, p. 399) and "beads on a necklace" (Foley, 1986, p. 77). As we will show, the emphasis in some of the literature on length and event sequentiality in clause chaining does not hold as strongly for Ku Waru.

In this article, we have two aims. One is to provide a detailed account of how Ku Waru children learn to understand and produce clause chains. Clause chaining and similar multi-clause constructions are fairly common among the languages of the world, but not among commonly-studied languages. Clause chains have not yet been the object of any detailed acquisition studies (although cf. Sarvasy, 2019; and this collection). Our second aim is to develop some implications of those findings for the general understanding of the acquisition of complex syntax—an area of inquiry that has so far been based mainly on studies of English and a few other European languages. Before introducing the Ku Waru case in the next section, we will first provide a brief summary of an English-based study that provides our basis for comparison.

The Acquisition of Complex Sentences in English

The most detailed and influential study of the acquisition of complex sentences in any language is the English-based study by Diessel (2004). Diessel (2004, p. 1, 42–43) outlines a basic

distinction between complex sentences involving coordinate clauses (e.g., "He tried hard, but he failed") and complex sentences with a main or "matrix" clause and a subordinate clause (e.g., "Peter promised that he would come"). In the former example, the two clauses are independent and linked by "but"; whereas in the latter, the clause "that he would come" is subordinate to the matrix clause, "Peter promised." Diessel defines prototypical subordinate clauses as being "marked as dependent structures that are formally incomplete without the matrix clause" (p. 48). Diessel's study of thousands of instances of subordinate clauses from five children between the ages of 1;8[1] and 5;1 reveals a consistent pattern to the ways in which complex sentences with subordinate clauses are acquired. Namely, the children's early productions of them are based on "lexically specific," common exemplars of constructions containing subordinate clauses (p. 4–5). The children then use these sentences as a basis from which to produce and understand more innovative sentences (p. 142).

The first multi-clause structures that children produce that seem to consist of a matrix + subordinate clause actually "contain a single proposition (i.e., they describe a single situation)" (Diessel, 2004, p. 3). An example from the speech of a child at age 1;11 is "I wanna see it." Another example at 2:2 is "I think it's a little bear" (p. 3). Although the verbs "wanna" and "think" in these examples function grammatically like matrix verbs, both utterances designate only one state of affairs, not two (p. 175–176). The apparent matrix verbs in children's early productions of multi-clause structures function as modals, temporal markers, epistemic markers, attention getters, and markers which guide the hearer's interpretation of the associated complement clause (p. 175–176). Children then go on to use the "frame" they have acquired from these lexically specific exemplars (such as "I wanna…") and use them to construct multi-clause utterances which can represent two independent states of affairs (such as "Peter promised that he would come").

English-speaking children's learning of coordinate constructions follows a different path. Coordinate sentence constructions are ones in which two or more clauses, each of which in its full form could potentially stand on its own, are combined to form a single sentence that expresses some kind of logical or pragmatic connection between the clauses, e.g., "There's the lion and here's the kitty," "Don't touch the camera because it's broken." Diessel (2004, p. 158–169) shows that in English-speaking children's first productions of such sentences, the clauses are generally spoken as intonationally distinct units, often within separate conversational turns, e.g., Child: "Don't touch the camera"/Adult: "Why"/Child: "Because it's broken" (Diessel, 2004, p. 4). In short, as Diessel puts it, while subordinate clauses "evolve via *clause expansion*," coordinate clauses develop though a process of "*clause integration*" (Diessel, 2004, p. 4, italics in original).

Diessel's findings regarding the acquisition of complex sentences have been supported by other acquisition studies

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[1] Here and below, when giving the ages of children we follow the format which is standard in child language studies, where years and months are separated by a semicolon, e.g., "1;8" means one year and eight months.

focused on English (Diessel and Tomasello, 2005; Kidd et al., 2006, 2007; Brandt et al., 2009; Köymen et al., 2016) and German (Kidd et al., 2007; Brandt et al., 2008, 2009). Given that all these studies focussed exclusively on subordinate-dependent and coordinate-independent constructions, a question that arises is: how similar or different would the findings be if we focus on coordinate-dependent ones? In this paper, we investigate this question with regard to the acquisition of multi-clause, coordinate-dependent constructions in Ku Waru: namely, clause chains. Before doing so, we will first introduce the speakers of Ku Waru, relevant aspects of its grammar, and the methodology of the study.

THE KU WARU LANGUAGE AND ITS SOCIAL SETTING

Ku Waru is spoken by ∼10,000 people living in the rural Papua New Guinea Highlands. The language is still being robustly acquired as a first language by children. It belongs to the Trans New Guinea family of Papuan languages[2], and, more immediately, to a dialect continuum within the Chimbu-Wahgi branch of that family. This branch includes what Ethnologue[3] classifies as four distinct languages: Melpa, Mbo-Ung, Imbonggu and Umbu-Ungu (Eberhard et al., 2019). Ku Waru is a dialect of Mbo-Ung (ISO code *mux*). Tok Pisin, a largely English-based creole and one of Papua New Guinea's national languages, is spoken by most Ku Waru speakers aged 50 and younger. Children are exposed to Tok Pisin both at home and when they enter primary school.

For Ku Waru speakers who are living in their rural homeland, the local economy is largely a subsistence one, based on intensive cultivation of sweet potatoes, taro, and a wide range of other crops; raising of pigs; and use of locally grown materials for building houses and agricultural infrastructure. There is now also intensive engagement with the cash economy, based largely on growing of coffee for the world market and vegetables for sale to town dwellers.

RELEVANT ASPECTS OF KU WARU GRAMMAR

Introduction to Ku Waru Morphosyntax and Clause Chaining

Like many other Trans New Guinea languages, Ku Waru is rigorously verb-final: if there is a verb in the clause[4], it always

comes last. In clauses with both a subject (agent) and an object, the word order is usually agent-object-verb, but sometimes (about 10% of the time) it is object-agent-verb. Verb inflections fall into three distributional classes, depending on their possible position within clause chains: Final, Non-Final and what we call the "Chameleon" class, for reasons which will become clear below (see **Table 1**). Inflections in the Final class only occur in final clauses (with a partial exception that we will outline in section The Optative-Final Construction as a Clause Chain?). Inflections in the Non-Final class only occur in non-final clauses. Inflections in the Chameleon class may occur in either final or non-final clauses, with associated differences in meaning. Note that here, we break with the Papuanist tradition where all verbal inflections that occur in non-final position are referred to as "medial" (Sarvasy, 2015, p. 665). Instead, we use the term Medial in reference to a specific Ku Waru verbal inflection, which is the sole member of the Non-Final class. Hereafter, where we capitalize Final or Non-Final, we are referring to the Ku Waru verb class; where we leave final and non-final in lower case, we are referring to the clause position in the sentence. Medial will be capitalized throughout, as it refers to a specific Non-Final inflection in Ku Waru.

The class of Final verbs have suffixes that show the person and number of the subject, and suffixes that mark tense, aspect and mood (see **Table 1**). Many of the suffixes are portmanteau ones, expressing two or more categories in a single form (for example, the suffix *-bu* indexes first-person, singular subject, and future tense). Many verbal meanings are expressed by the combination of an inflected verb and a non-inflecting "preverb" that carries most of the lexical meaning. Examples of this construction may be found in (2), (38), and (48). Case relations are expressed by markers that attach to the last word of the noun phrase. These include the ergative marker *-ni* as in (8), the genitive marker *-nga* as in (1), and the comitative marker *-kin* as in (9)[5].

Trans New Guinea languages like Ku Waru and Nungon (Sarvasy, this collection) are characterized by clause chaining (see section Introduction), verb-final word order, and switch-reference (Pawley and Hammerström, 2017). Example (1) presents an adult Ku Waru clause chain.

(1) *ab-ayl*   *pu-pa*   *yunu-nga*   *kolya*
     woman-DEF[6]   go-MED.3SG   3SG-GEN   place
     molu-rum.
     stay/be-RP:3SG
     "The woman went home to her place and she stayed there."
     or, more literally, "The woman, having gone, stayed at her place."

This sentence contains two clauses, "the women went" and "[she] stayed." The verb in the first clause, *pupa,* takes a Medial suffix.

TABLE 1 | Some representative Ku Waru verb paradigms.

Class		Final					Non-final	Chameleon		
Root	Subject	Imperative-Hortative	Present Progressive	Perfective	Remote Past	Habitual	Medial	Future/Imminent	Subjunctive/Switch-reference 1	Optative/Switch-reference 2
pu- "go"	1sg	–	pukur	pud	purud	pulyo	pup	pubu	pulka	pab
nyi- "say"			nyikir	nyid	nyirid	nyilyo	nyib	nyibu	nyilka	nyab
to- "hit"			tokur	tud	turud	tolyo	top	tobu	tolka	tab
pu- "go"	2sg	pa	pukun	pun	purun	pulto	puk	nyini	pulkuna	pan
nyi- "say"		nya	nyikin	nyin	nyirin	nyilto	nyik	puni	nyilkuna	nyan
to- "hit"		to	tokun	tun	turun	tolto	tok	toni	tolkuna	tan
pu- "go"	3sg	–	pukum	pum	purum	pulym	púpa	puba	pulka	púpiyl
nyi- "say"			nyikim	nyim	nyirim	nyilym	nyíba	nyiba	nyilka	nyípiyl
to- "hit"			tokum	tum	turum	tolym	tópa	toba	tolka	túpiyl
pu- "go"	1du	pábul	pukubul	pubul	purubul	pulybulu	pup	pubulu	pulkubula	pábiyl
nyi- "say"		nyábul	nyikibul	nyibul	nyiribul	nyilybulu	nyib	nyibulu	nyilkubula	nyábiyl
to- "hit"		tábul	tokubul	tubul	turubul	tolybulu	nyib	tobulu	tolkubula	pábiyl
pu- "go"	2/3du	payl	pukubil	pungl	puringl	pulybeli	pul	pungli	pulkubela	pangl
nyi- "say"		nyayl	nyikibil	nyingl	nyiringl	nyilybeli	nyil	nyingli	nyilkubela	nyangl
to- "hit"		tayl	tokubil	tungl	turingl	tolybeli	tol	tongli	tolkubela	tangl
pu- "go"	1pl	pámul	pukumul	pumul	purumul	pulymulu	pup	pumulu	pulkumula	pámiyl
nyi- "say"		nyámul	nyikimul	nyimul	nyirimul	nyilymulu	nyib	nyimulu	nyilkumula	nyámiyl
to- "hit"		támul	tokumul	tumul	turumul	tolymulu	top	tomulu	tolkumula	pámiyl
pu- "go"	2/3pl	pai	pukumil	pung	purung	pulymeli	puk	pungi	pulkumela	pang
nyi- "say"		nyai	nyikimil	nying	nyiring	nyilymeli	nyik	nyingi	nyilkumela	nyang
to- "hit"		tai	tokumil	tung	turung	tolymeli	tok	tongi	tolkumela	tang

Like all Ku Waru Medial verbs, it has the same subject as the final verb, in this case the woman. The Medial verb is specified for person and number but not for tense, aspect or mood (TAM). For those it is dependent on the verb in the final clause, which is inflected for Remote Past in addition to third person singular person/number. This construction satisfies our definition of a clause chain in section Introduction, in that the verb in the non-final clause is partially specified and the verb in the final clause is fully specified. The verb in the non-final clause is *dependent* on the verb in the final clause for its full TAM specification.

As suggested by our use of "and" in the free translation of (1), the semantic relation between the two clauses is similar to that in an English *coordinate* construction. The main semantic difference between Ku Waru and English in this respect is in the understood temporal relation between the two coordinands. In English clause sequences, the use of "and" between two clauses does not by itself specify any particular temporal relation between them. However, in Ku Waru clause sequences which refer to two distinct events, if the first clause has a Medial verb and following clause has a Final verb, the event referred to in the first clause is categorically understood to have taken place before the one referred to in the following clause.

The following example presents a longer Ku Waru clause chain, and one that is typical of narrative contexts:

(2) *olyo*   *med*   *maket-ma-nga*   *pu-p*
    we (1PL)   down.there   market-PL-GEN   go-MED.1
    kalyip   *baim*   *te-p*
    peanut   buy   do-MED.1
    no-b   *pilawa*   *lyi-p*   *no-b*
    eat-MED.1   flour.balls   get-MED.1   eat-MED.1
    pu-mulayl
    go-FUT.1PL:DEF
    "We'll go down to the markets and buy peanuts and eat them, and get some flour balls and eat them and then we'll go."

Note that in terms of coordination, as in (1) each event in (2) is understood to have occurred in the same sequential order as the clauses that refer to them. Returning to dependency, note that the *-p* suffix on the Medial verbs in (2) is underspecified for number; it may refer to a first-person, singular subject ("I"); a first-person, dual subject ("the two of us"); or a first-person, plural subject ("we") (see **Table 1**). In (2), the Medial verbs are dependent on the Final verb for not only their TAM marking, but their full person-number marking too. In (2), the pronoun *olyo* does clarify this at the beginning of the sentence, but subjects are not always overtly specified in Ku Waru. In keeping with this example and others below, and with other treatments of clause chains such as those in Foley and Olson (1985) and Van Valin and LaPolla (1997), we characterize clause chains in Ku Waru as both coordinate and dependent.

The paradigms shown in **Table 1** include all the forms for three of the most common Ku Waru verbs. The verbs shown there are representative in that they show how the forms of the suffixes differ depending on the last vowel in the root[7].

In addition to the verb forms shown on **Table 1**, there is a single Jussive form that is used for infinitive-like complements of verbs of speaking (3) and for "polite" commands.

(3) *pu-i*   *nyi-rim*
     go-JUS   say-RP:3SG
     "He said to go."

The Jussive is marked by a suffix -*i* that is added to the verb root (with small associated changes to the form of some roots)[8].

The Chameleon Class

We now turn to the third verb class, the Chameleon class. We show how the three inflections of this class differ systematically in meaning depending on their syntactic environment. When occurring in final position, the Subjunctive/Switch-Reference 1 inflection has a modal meaning "should," "would, "could," etc., as exemplified in (4).

(4) *el-ayl*   *nanu*   *te-lka*
     fight-DEF   I.myself   do-SBJV/SR1:1/3S
     "I myself should fight."

When used in non-final position, Subjunctive/Switch-Reference 1 inflection has a switch-reference meaning. In this position, the form indicates a switch of subject between the verb that is marked that way and the following one. Example (5) illustrates this.

(5) *tripela*   *nyi-lkuna*   *na-n*   *tupela*
     three   say-SBJV/SR1:2SG   I-ERG   two
     nyi-kir
     say-PPR:1SG
     "You have said three and I say two."

Like the temporal relation between a Medial and Final verb in (1), the event that is expressed by a Switch-Reference 1 (hereafter "SR1") verb precedes the one that is predicated by the Final verb. Given the different meanings of Subjunctive and SR1, we consider these to be two distinct grammatical categories within Ku Waru. Throughout the rest of this article, we accordingly gloss them as SBJV or SR1, depending on whether the verb occurs in final or non-final position.

There is a parallel difference in function between Optative and Switch-Reference 2 (hereafter "SR2"). In final position, the Optative/SR2 form expresses optative modality, expressing a wish or desire. An example is (6).

(6) *na   ola   mol-ab*
     I   up   be/stand-OPT/SR2:1SG
     "I want to stand up."

In non-final position, the SR2 forms mark a switch of subject, but with a different temporal relationship than for SR1 verbs (as in 5) and Medial verbs (as in 1). The event or state of affairs expressed by an SR2 verb encompasses the one that is predicated by the following verb. An example is (7).

(7) *na   naa   mol-ab*   *tiring*
     I   not   be/stay-OPT/SR2.1SG   do:RP:2/3PL
     "When I wasn't there, they did it [fought]."

Switch-reference is widespread in Papuan languages (Foley, 1986). However, unlike in other Papuan languages, the use of switch-reference in Ku Waru is extremely rare (see sections Adults' and Older Children's Speech to the Target Children in Ku Waru and The Emergence of Clause Chaining on adult and child switch-reference production, respectively). A far more common way of expressing the meanings of (5) and (7) would be to either break them into two sentences, as in (8), or to rephrase with a subordinate clause marked with the comitative ("with") marker, as in (9).

(8) *tripela   nyikin.*   *na-n*   *tupela   nyi-kir*
     three   say-PPR:2SG   I-ERG   two   say-PPR:1SG
     "You say three. I say two."

(9) *na   naa   molu-rud-kin*[9]   *tiring*
     I   not   be/stay-RP:1SG-COM   do:RP:2/3PL
     "When I wasn't there, they did it."

The third verbal inflection in the Chameleon class is the Future/Imminent. In final position it indicates future tense and/or intention on the part of the subject.

(10) *napilya   nekid   yunu   pu-ba*
      Nebilyer   other.side   he.himself   go-FUT/IMM.3SG
      "He himself will cross/wants to cross the Nebilyer River."

In non-final position, the Future/Imminent inflection specifies that the action/process/event referred to by the Future/Imminent verb is imminent in view of that referred to by the verb that follows. The two verbs have the same subject. If it is a sentient one, the usual sense is that he or she performed the action referred to by the second verb with the intention of thereby (or thereafter) performing the first. An example is (11).

(11) *nu   nabolka   ul   tini*   *u-n*
      you   what   thing   do:2SG:FUT/IMM   come-PRF:2SG
      "What have you come here to do?"

As can be seen, while the difference in meaning between Subjunctive and SR1 and between Optative and SR2 is stark, there is an obvious connection between the meanings of Future and Imminent. Nevertheless, we treat Future and Imminent as distinct verb categories. This is because the Future is a true tense-mood category, directly expressing the tense and/or mood of a verb in relation to the time of speaking, and/or avowed intention of the speaker; whereas the Imminent can be analyzed as indicating the time of an event in relation to the event that is referred to in the following clause, and/or its purposive relation to that event.

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[7]For roots in which the last vowel is *a* or *e*, the suffixes take the same for as the roots *pu*- and *nyi*-, respectively.
[8]For details see Merlan and Rumsey (1991, p. 343, 334).

[9]Note that the comitative suffix -*kin* here marks this verb along with the two preceding words as a subordinate temporal clause, in this case with the same temporal relation of encompassment as is realized with the SR2 form in (7).

In section Introduction, we stated that clause chains are constructions which contain two components: (a) a series of non-final clauses containing verbs that are either partially specified or otherwise marked as non-final; and (b) a final clause containing a verb that is fully specified. When occurring in non-final position, SR1, SR2, and Imminent verbs are fully specified for person and number, but not for their tense, which is determined by that of the final verb. Moreover, they are linked to the final clause in another way, namely, they mark a switch of subject and/or a particular causal and temporal relation between their host clause and that of the final clause. Hence, by our definition, constructions containing these verbs in non-final position are clause chains.

Clause Chains vs. Serial Verb Constructions in Ku Waru

The most common category of verb found as predicate of non-final clauses in Ku Waru clause chains is Medial. While the Medial verbs in (1) and (2) clearly refer to distinct events in sequence, this is not always true of Medial verbs. Some combinations of particular verbs have idiomatic meanings in which they predicate a single event. For example, the combination of the verb *nyi-* "say" with Medial marking followed by the verb *pilyi-* "hear" means "think" or "believe." The combination of *kud-* "pull" with Medial marking followed by *nyi-* "say" means "tell." It could be argued that these combinations are more serial verb-like than clause chain-like, because they predicate single events (Aikhenvald, 2018). But consider such cases in Ku Waru as the frequently occurring combination *lyi-* "get" with Medial marking, followed by *me-* "carry" with Medial marking, followed by *pu-* "go," which gives the meaning "take." It is unclear whether we should treat "get," "carry," and "go" in this combination as single events or as component sub-events in sequence. Indeed, in previous publications (e.g., Merlan and Rumsey, 1991, 2017; Rumsey, 2017), we have used the term "serial verb construction" in reference to what for present purposes are being treated as "clause chains." However, because these lexicalised combinations are structured like clause chains, and because of the difficulty in determining if some (like "take") constitute single or multiple events, here we treat them all as clause chains, privileging form over semantics for current purposes.

Besides the lexically specific uses of particular verb combinations, there are other combinations in which a particular verb combines with an open-ended range of others to convey a grammaticalized aspectual meaning. The verb that is most commonly used that way is *mol-* ("stay," "be"), which combines with a preceding Medial verb to convey the durative aspectual meaning "do at length." An example is (12).

(12) *nu   kana-k   molu-run?*
      you   see-MED.2   be/stay-RP:2SG
      "Were you watching?"

In (12), the seeing is durative. Compare this to (13) which does not have a following *mol-* ("stay," "be"), and hence where

the seeing could have been instantaneous or fleeting rather than durative.

(13) *nu   kana-run*
      you   see-RP:2SG
      "Did you see?"

In other cases, the Medial verb conveys a meaning of the kind that in English would be expressed by an adverb. Examples are *alte-* "do again," *laka-* "do vigorously or forcefully" and *lkisi-* "do quickly." An example is (14).

(14) *alte-pa   tim*
      again-MED.3SG   do:PRF.3SG
      "He did it again."

Most of such adverb-like modifying verbs occur only as Medial verbs, not as Final ones. Where they do appear as Final verbs, these verbs have a different but clearly related meaning. For example, when *lkisi-* appears in Medial form, it means "do quickly," and when it appears in Final form, it means "run."

What the adverbial uses of these verbs and the aspectual ones in final position (such as *mol-*) have in common with each other, and with the lexicalized clause chains, is that all such cases involve sequences of two or more verbs that refer to a single event. We will show that this is particularly pertinent, given the stage at which Ku Waru children acquire these in comparison to the stage at which English-speaking children acquire single-event, multi-clause constructions (Diessel, 2004).

Presence vs. Absence of Medial Verb Marking

Uniquely among all Ku Waru verb inflections, suffixes of Medial verbs are sometimes omitted, leaving the root only, without any apparent difference in meaning. This happens occasionally in adult speech (see section Presence or Absence of Medial Marking in the Adults' Speech on adult Medial verbs), and more commonly in children's speech (section The Presence vs. Absence of Medial Verb Marking on children's Medial verb productions). Even without their suffixes, such verbs are still identifiable as Medial because they are in non-final position and because Medial verbs are the only ones that can occur in unsuffixed form. For that reason, we treat the absence of a suffix as morphologically distinctive in that environment, positively marking it with the null sign *-ø*, which is glossed as MED:

(15) *kibul-n   to-pa   konji-pa*
      stick-INST   hit-MED.3SG   kill-MED.3SG
      kangla-ø   me-pa   i
      clasp-MED   come-MED.3SG   DEM
      nosa-ø   mo-lum
      put-MED   be/stay-PRF.3SG
      "He killed it with a stick, clasped it to himself, came, put it there and kept it there."

The Optative-Final Construction as a Clause Chain?

In addition to their use described in section The Chameleon Class, Optative verbs can be used in a particular kind of

two-clause construction identifiable on the basis of intonation, grammatical features, and the semantic relation between the two clauses. The intonational pattern involves separate, high-falling pitch contours for each clause, with a larger fall and lower terminus for the second one. Grammatically, the first clause in this construction must have an Optative verb with a first-person dual or plural subject, and the second clause must have an Imperative or Jussive verb, or an Optative one with a first-person dual or plural subject. We term this an Optative-Final construction. The semantic and temporal relation between the two clauses is that the action enjoined by the second clause is meant to be preparatory to the action enjoined by the first. Examples are (16) and (17).

(16)(=21) *pabiyl*   *wa*
           go:OPT:1DU   come.IMP.SG
           "Come and let's you and I go"

(17)   *kanamiyl*   *pamiyl*
           see:OPT:1PL   go:OPT:1PL
           "Let's go and see."

The Optative verb in an Optative-Final construction functions differently from the morphologically identical, Non-Final SR2 verb as described in section The Chameleon Class, which does not have an Optative meaning. The Optative in an Optative-Final construction also differs from the SR2 verb in that the latter marks a change of subject, whereas the subjects of the two verbs in an Optative-Final construction must be identical or overlapping, as described above. We do not designate the Optative-Final construction as a clause chain, because the Optative/SR2 form in this construction retains its canonically Final Optative meaning; it does not have the usual switch-reference function that would be expected in non-final position. Therefore, we do not include Optative-Final constructions in our counts of clause chains in this article. However, because Optative-Final constructions are a kind of clause linkage that emerges along with the earliest clause chaining by children, we do include examples of them when discussing and exemplifying the latter below (section Patterns in the Kinds of Two-Clause Chains that Children Produce).

METHODOLOGY AND DESCRIPTION OF THE DATA

The research on which the article is based was carried out in accordance with the principles of the Basel Declaration and recommendations of the Australian National University Statement on Ethical Conduct in Human Research. It was approved by the Australian National University Human Research Ethics Committee, protocol 2013/055. The article includes data from four children living in the Ku Waru-speaking Kailge region of Western Highlands, Papua New Guinea. We refer to them as Jesi, Enita, Jacklyn, and Philip.

These children can be divided into two sets based on the years when they were recorded and the different methodologies used for the two cohorts. The first cohort, Jesi and Enita, were recorded by Ku Waru field assistant John Onga between 2004 and 2006, between the ages of 1;8 and 2;11, and 1;8 and 3;0 respectively.

The sessions were conducted on an *ad hoc* basis, between 1 and 8 months apart during the overall period. The sessions were 37–45 min long. Jesi and Enita were recorded on Uher cassette recorders with Audio-Technica ATR25 microphones, in their respective homes, conversing with their parents and older siblings. Although the recording schedule was patchy, the material from Jesi and Enita is nevertheless valuable as it starts from a younger age compared to the second cohort.

The second cohort, Jacklyn and Philip, were recorded during 2013–2016, within the context of a large project on children's language socialization with dedicated funding from the Australian Research Council. Jacklyn and Philip are two of five children for whom we have longitudinal recordings during this period. These recordings were carried out by Ku Waru field assistants John Onga and Andrew Noma. Jacklyn and Philip were recorded in their homes, on a stricter recording schedule than the first cohort, for 1 h per month. Philip was recorded from 2;2 to 4;9, while Jacklyn was recorded from 2;9 to 4;10. Jacklyn and Philip were recorded with Olympus LS14 digital audio recorders and simultaneously filmed with Canon HFM52 digital video recorders. Jacklyn was normally recorded conversing with her mother and/or her uncle, John Onga, and Philip with his father. The samples used in this study include the entire Philip corpus (from age 2;2 to 4;9) and 1 year of the Jacklyn corpus, from 2;8 to 3;8.

After completing the recording sessions, John Onga and Andrew Noma transcribed their respective recordings by hand and translated them into their own idiosyncratic English. We asked them to render the children's utterances exactly as spoken, rather than correcting them to adult versions; and, where the children's utterances were understandable, to add a free translation into Ku Waru adult speech. Onga's earlier, hand-written transcripts of Enita and Jesi were typed up by Rumsey and Merlan and drawn upon for studies of the acquisition of certain types of verb construction by Merlan and Rumsey (2017) and Rumsey (2017), and the acquisition of ergative case marking (Rumsey et al., 2013). The transcripts of Jacklyn and Philip were typed by Appen Language Services into a plain-text format. They were then processed by corpus managers Tom Honeyman and Charlotte van Tongeren in OpenRefine to fix regular scribe and typist spelling errors.

The authors of this article exported the transcripts of Jacklyn and Philip into Excel. Almost every line in the transcript corresponds to an interactional turn. Lines with verbs were coded by the authors according to the protocol below. The files pertaining to Jesi and Enita were converted from Word tables into comparable Excel sheets and coded by the authors, using the same protocol as for Jacklyn and Philip. In order to take full account of adult and other interlocutor input to the children's language learning, it would have been good to code all of the interlocutors' conversational turns along with the children's. But that was precluded by time contraints. Instead, to get a sample of that input, research assistant Siva Kalyan extracted all adult turns that immediately preceded a child's turn for six Philip and five Jacklyn files. These eleven files were selected by choosing the earliest and latest sessions for which we had coded child data, and spreading remaining sessions evenly. The adult lines were exported to Excel and coded in the same way by the authors. In

total, the following analysis of children's and their interlocutors' speech relies on the analysis of 40 individual sessions of 39–60 min each, which involved the authors' review of 32,760 lines.

Our coding protocol for this study was as follows:

1. If there were two or more verbal constructions on one line, we selected the most complex; i.e., if a line had both a two-clause chain and an independent clause, we only coded the two-clause chain in that line.
2. If an interactional turn was split over more than one line, we coded on the basis of the turn, not the typographical line (i.e., if the scribe had written a particularly long utterance over several lines, we coded the verbs as part of one utterance, not over several lines).
3. Because the differences among verb categories within the Final class were not relevant for our study of clause-chain acquisition, all verbs in the Final class were coded with a single superordinate category of Final.
4. All Medial verbs were coded as Medial. In addition, because the presence or absence of Medial suffixes is important for our study (see section The Presence vs. Absence of Medial Verb Marking on children"s Medial verbs), we coded all Medial verbs as either suffixed or non-suffixed.
5. In keeping with the discussion in section The Chameleon Class, all instances of the verbs in the Chameleon class were coded according to their syntactic position as either: Subjunctive or SR1; Optative or SR2; Future or Imminent.
6. We coded the Optative-Final construction as Optative Final.
7. As we were focused on clause chains, we did not specifically code other kinds of clause linkage such as the subordinate clause in (9). In these cases, we coded the main clause only.

All the files coded by Reed and Merlan were also checked by Rumsey, meaning that around 90% of all coding went through two coders. Inter-coder accuracy was determined by Reed and Rumsey coding the same file, and decisions compared. This was done for two files, and inter-coder accuracy was found to be, on average, 91%. After coding was done, research assistant Siva Kalyan ran analyses and generated bar graphs using R (R Core Team, 2018) and packages tidyverse (Wickham et al., 2019), eeptools (Knowles, 2019), openxlsx (Schauberger and Walker, 2019), and readxl (Wickham and Bryan, 2019).

THE EMERGENCE OF CLAUSE CHAINING

In this section we will trace the emergence of clause chaining among the four target children in our study, and later in section Adults' and Older Children's Speech to the Target Children in Ku Waru, compare it with the incidence of clause chaining in the speech by adults to the children. As we shall see, there is considerable variation among the children in the ages at which clause chaining first emerges, and at which various *kinds* of chains emerge and develop. However, there are some quite consistent patterns regarding the order in which kinds of chains emerge and develop.

Before we discuss these results, it is important to address the issue of prompting and imitation. As is probably true of all fairly extensive child language corpora, some of the Ku Waru children's utterances in our corpus are partial or full repetitions of what has been said to them by an adult in the previous turn or a few turns back, sometimes in response to explicit prompting in the form "Say '___'." It is important to take careful account of this, especially when looking for the earliest instances of given clause-chain types. To that end, we examined all instances of clause chains in the children's speech within their interactional contexts, coding them as either "prompted" or "unprompted," where "prompted" is a cover term that includes not only responses to explicit prompts, but any utterances which fully or partially reproduced what has been said to the child within the previous two turns. The results are as follows:

- There is no prompting in any of the clause chains from Jesi or Enita.
- There is very little prompting in the clause chains from Philip. His first two-clause chains at 2;7 and 2;8 are unprompted. At 3;0, the ratio of unprompted to prompted two-clause chains is 1/1; at 3;1–9/2; at 3;7–6/5; at 3;9–6/1. None of the clause chains in any of the other months is prompted.
- The incidence of prompting is much higher in the samples from Jacklyn, with the majority of her two-clause chains from 2;8 to 2;11 being prompted ones. The incidence of prompted two-clause chains drops off sharply after 3;2, with none after 3;3[10].

In the remainder of this article, we have not attempted to take account of the difference between prompted and unprompted utterances, or to exclude the former. That would have been unfeasible given the size of the corpus. The aforementioned qualitative review reassures us that prompting is not excessive. There is one exception to this which pertains to Jacklyn's first two-clause chains, which we discuss in the next section.

Two-Clause Chains

As a first step, let us consider the emergence of clause chaining *per se*. This is shown in **Figure 1**. Note that in this graph, "Chain length: 1" denotes an independent clause [as in [6] and [13]]. In this graph and all the others in this article, the numbers in the middle of each bar indicate the sample size. Note that, in order to increase the visibility of the very small bands at the top of the bars in **Figure 1**, only the top 35% of the range is shown. Other graphs throughout the paper have been similarly magnified where possible. In every case the lower portions of the bars are to be read as extending the leftmost category all the way down to 0%.

Two-clause chains are first attested from Jesi at 1;9 and from Enita at 2;0. For Philip they do not appear until considerably later, at 2;7. This is a reliable finding, given the availability of four samples for Philip at younger ages going back to 2;2 which include no two-clause chains. Jacklyn produces only two two-clause chains at 2;8, both of which are prompted. We chose to

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[10]The ratios of unprompted two-clause chains to prompted ones in the months when the latter occur in Jacklyn's speech are: 2;6–0/2, 2;8–4/5, 2;9–7/11, 2;11–7/4, 3;0–5/3, 3;1–15/1.
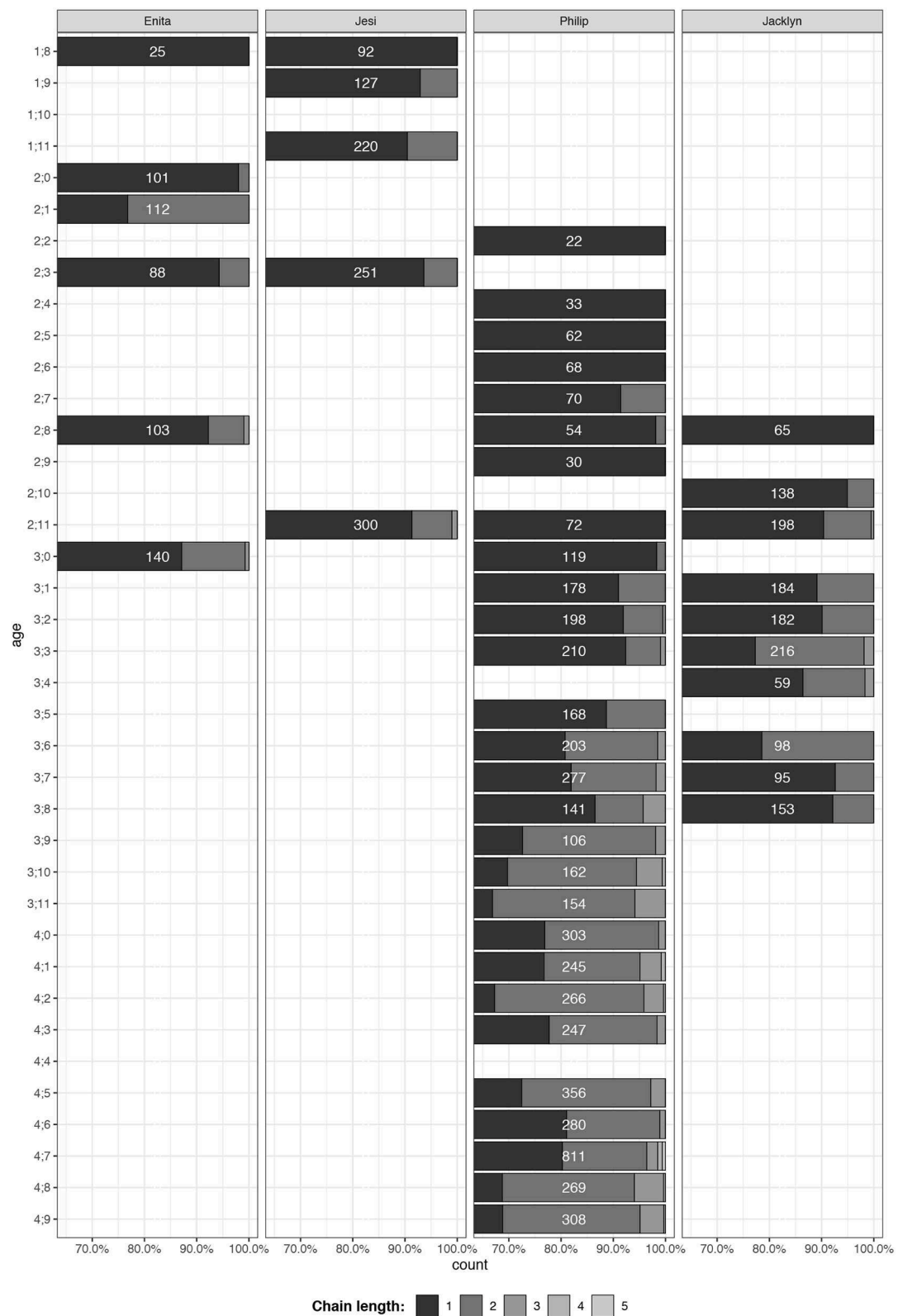
FIGURE 1 | Lengths of clause chains in longitudinal samples from four Ku Waru children.

omit these from **Figure 1**, as their inclusion would have given a misleading impression of the age at which the ability to produce such chains is first attested in her speech. For each of the other three children, the first attested instances of two-clause chains are unprompted. By the age of 3;1 (and earlier for Jesi and Enita) all four children are using two-clause chains regularly, albeit much less frequently than independent clauses. Of note, the very high number of two-clause chains for Enita at age 2;1 is because, in a fit of enthusiasm over tossing coins, she repeats the same two-clause chain (19) 23 times in the course of the session.

Patterns in the Kinds of Two-Clause Chains that Children Produce

In section Two-Clause Chains we began to discuss the emergence of clause chaining solely in terms of their length. Bearing in mind from section Relevant Aspects of Ku Waru Grammar that there are four different inflections that can occur in non-final position and hence make up a chain, we will now consider which of those inflections appear in the children's earliest attested clause chains, and how they are used. As data for that examination, the first five instances of two-clause constructions to appear in each of the four children's speech are shown in (18)—(37)[11]. Note that, for reasons discussed in section The Optative-Final Construction as a Clause Chain?, in addition to clause chains proper, this sample includes two instances of the Optative-Final construction, (21) and (25). We include these constructions to show that they first emerge at around the same time as clause chains.

Enita at 2;0

(18) | das | no | mom |
| gras | no-ø | molu-rum |
| grass | eat-MED | be/stay-RP:3SG |

"It [the cow] was eating grass."

Enita at 2;1

(19) | to | muda |
| to-ø | mud-a |
| hit-MED | send-IMP:SG |

"Throw it [the coin]!"

(20) | papa | tawa | paim | ti | um |
| papa | tauwu | baim | te-ba | pum |
| daddy | banana | buy | do-IMM.3SG | go:PRF:3SG |

"Daddy went to buy bananas."

Enita at 2;3

(21) | pabla | wa |
| pabiyl | wa |
| go:OPT:1DU | come:IMP:SG |

"Come and let's go."

(22) | kela | pa |
| kela-ø | pa |
| quit-MED | go:IMP:SG |

"Go away!," "Leave!."

Jesi at 1;11

(23) | nok | mului |
| nosu-k | molu-i |
| keep-MED.2 | be/stay-JUS |

"Keep it."

(24) | to | muda |
| to-ø | mud-a |
| hit/do-MED | send-IMP:SG |

"Throw it."

(25) | tabiyl | wa |
| hit/do:OPT:2DU | come:IMP:SG |

"Come and let's you and I do it [catch it]."

(26) | mek[12] | pabi |
| me-p | pab-i |
| carry-MED.1 | go:OPT:1SG-Q |

"Shall I take you?"

(27) | me-k | ui-o |
| carry-MED.2 | come:JUS-VOC |

"Please bring it"

Philip at 2;7

(28) | alte-k[13] | te |
| do.again-MED.2 | do:IMP:SG |

"Do it again."

(29) | alte | ne |
| alte-ø | nya |
| do.again-MED | say:IMP:SG |

"Say it again."

Philip at 2;8

(30) | alse | te |
| alte-ø | te-ab |
| do.again-MED | do-OPT:1SG |

"Shall I do it again?"

Philip at 3;0

(31) | me | pum |
| me-ø | pu-kum |
| carry-MED | go-PPR:3SG |

"He is taking it."

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[11]Here and below, in all the examples where there is a second line of Ku Waru beneath the top line, the second line is one that has been provided by our Ku Waru-speaking field assistants as what they take to be the adult equivalent of the child's utterance. We have only accepted these "equivalent" forms as such when they seem phonetically similar enough to the posited adult forms and/or when they match up with responses by the caregivers in their responses to the children. As can be seen below, the posited adult forms are generally quite similar to the children's, the main exceptions being cases where the children use "incorrect" verb forms, which are changed to contextually appropriate adult ones, e.g., (26), (37), and (39).

[12]This is an incorrect second-person form, which was corrected to first-person *mep* by our field assistant as shown in the second line.

[13]There were four other instances in this session of an alternative version of this same expression without the Medial suffix *-k* on the first verb, i.e., *ate te* (in one instance pronounced as *ati ti*). As we shall see in section The Presence vs. Absence of Medial Verb Marking, omission of the suffixes on Medial verbs is quite common in children's speech.

(32) *gisi*	*ui*
lkisi-ø	*ui*
run/do.quickly-MED	come:JUS
"Come quickly."

Jacklyn at 2;10

(33) *ta*	*lata*	*mom*
ga	*kala-ø*	*molym*
sweet.potato	cook-MED	be/stay:HAB:3SG
"She is cooking sweet potatoes."

(34) *kal*	*me*	*pupal*
kapola	*me-ø*	*pu-bayl*
Okay	carry-MED	go-FUT:1SG:DEF
"Okay, I'll take it."

(35) *na*	*pu*	*lep*
na	*pu-ø*	*lyi-bu*
I	go-MED	get-FUT.1SG
"I'll go and get it."

Jacklyn at 2;11

(36) *dyna*	*o-ba*	*pu-m*
dyna	come-MED.3SG	go-PRF:3SG
The Dyna [truck] has come and gone. [literally: "…
having come, has gone."]

(37) *pun*	*tel*
pu-ni	*te-kin*
go-IMM.2SG	do-PPR:2SG
"Are you about to go?"

Now let us consider the kinds of verbs that are found in the non-final clauses of these two-clause chains, and the kinds of meanings that are expressed by the combination of those clauses with the final ones. Among the 20 non-final clauses in the sample, the verbs in two of them are of the Imminent inflection, expressing imminence or intentionality as described in section The Chameleon Class. Those are in examples (20)—"Daddy went *in order to* buy bananas"—and (37)—"Are you *about to* go/*intending to* go." Two of the other verbs in non-final clauses are Optative ones, occurring in the Optative-Final construction described in section The Optative-Final Construction as a Clause Chain?, which is used for proposing a joint action. Those are examples (21)—"Come and let's go"—and (25)—"Come and let's do it."

In the other 16 two-clause chains in the sample, the verbs in the non-final clauses are all Medial ones. But interestingly, only a small minority of them are used for what is often taken to be the prototypical function of clause chains, i.e., predicating a series of events in sequence (see section Introduction). Instead, the verb combinations in 14 of those 16 clause chains are grammaticalized or lexicalized ones of the kinds discussed in section Clause Chains vs. Serial Verb Constructions in Ku Waru which jointly refer to a single event. The types of combinations involved are:

- the verb *mol-* used in final position with a durative aspectual meaning in (18), (23), and (33);

- the verb *to-* (literally "hit") used in a lexicalized combination with the verb *mud* ("send," "dispatch") to mean "throw" in (19) and (24);
- the verb *alt-*, used in adverbial function with its usual meaning of "(do) again" in (28), (29) and (30);
- the verb *lkis-* (literally "run") used in non-final position with one of its common, adverbial functions there to mean "do quickly" in (32);
- the verb *me-* "carry" used non-finally in lexicalized combinations with the verb *pu-* "go" to mean "take" in (26), (31), and (34), and in combination with the verb *o-* "come" to mean "bring" in (27);
- the verb *kel-* "quit" used in combination with verb *pu-* "go" to mean "Go away," "Leave" in (22).

In the whole sample of 20 two-clause constructions (18 of which are clause chains) there are only two that refer to two distinct events in sequence. Both of those examples are by Jacklyn, at 2;10 and 2;11. They are: (35) "I'll go and get it" (literally "I, having gone, will get it.") and (36) "The Dyna [truck] has come and gone." All the rest of the Ku Waru children's first two-clause chains are lexically specific ones that refer to a single event.

There is a parallel here with English-speaking children's acquisition of multi-clause sentences (Diessel, 2004). Just as English children first learn the structure of multi-clause constructions through common, lexically specific exemplars that refer to single events, Ku Waru children learn the structure of clause chains by recourse to common, lexically specific clause chains that refer to single events. All of the verb sequences in the utterances examined here are very frequently-occurring ones in the speech of adults and older children, as evidenced by Rumsey and Merlan's experience with the language.

To continue investigating the emergence of clause chaining, let us now consider which of the four verb types that occur in non-final position are used by children in their clause chains (**Figure 2**).

Strikingly, as shown in **Figure 2**, there is not a single instance of SR2 in any of the children's two-clause chains, and there are only three instances of SR1 (all from Philip at 4;7). The overwhelming majority of verbs that appear in penultimate position in these data are Medial and Imminent ones. **Figure 2** also shows that, for all four children, Medial verbs are the first verbs to emerge in non-final position. Imminent verbs follow, emerging at ages ranging from 1;11 for Jesi to 3;1 for Philip. Interestingly, once they have emerged, the ratio of Medial verbs to Imminent verbs remains relatively constant for all the children across the sampled age ranges, or, at least, without any clear directionality of change.

Is the children's delay in using Imminent, SR1, and SR2 verbs due to their delay in acquisition of the form of these verbs, or to delay in acquisition of their function in non-final position? To investigate this, we looked at when the parallel final-position inflections Future, Subjunctive and Optative emerged in the children's speech. If this is roughly simultaneous with their emergence in non-final postion, it could be taken to suggest that the hurdle for the children is acquisition of the
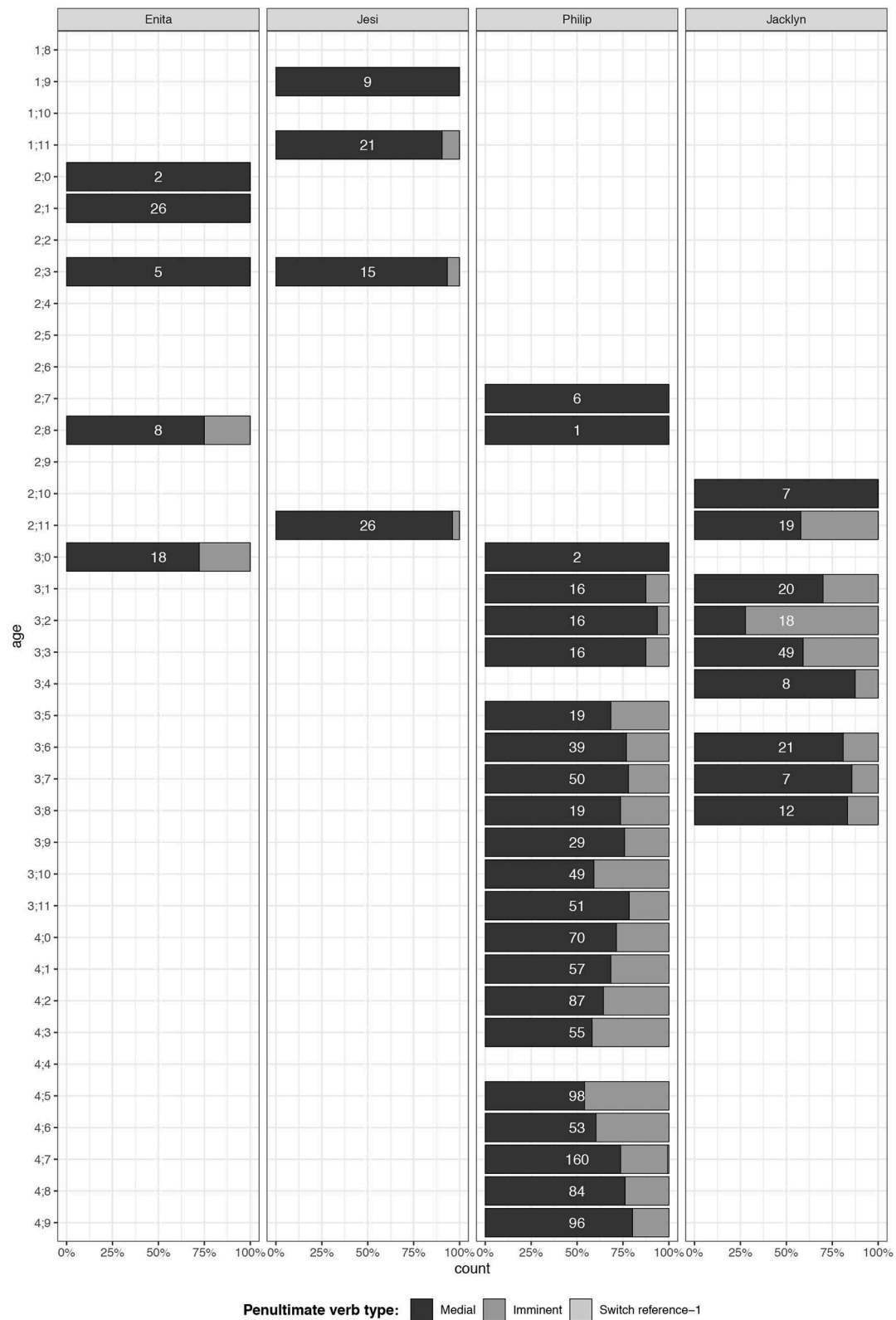
FIGURE 2 | Proportions of verb types in the next-to-last clauses of the children's clause chains.
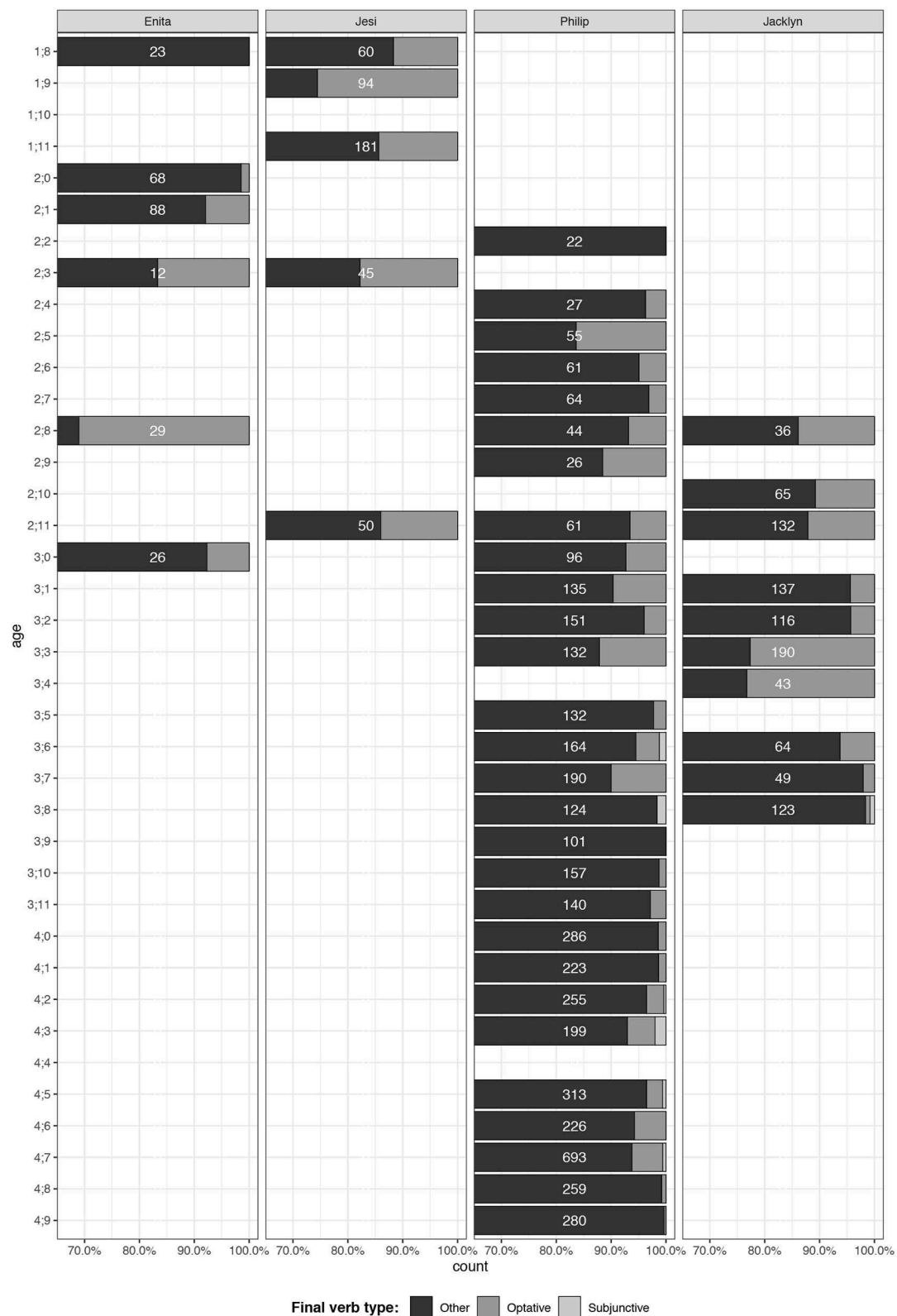
FIGURE 3 | Proportions of Optative and Subjunctive vs. other clause chain-final verbs in the children's speech.

forms. If, however, there is a discrepancy between the emergence of the forms in final vs. non-final positions, it suggests that the hurdle is the acquisition of the *function.* **Figure 3** shows the results of our comparison. Note that in **Figure 3**, "Final" denotes all the verb categories that are designated that way in the top row of **Table 1**, as opposed to Future, Subjunctive and Optative verbs which are the object of our comparison in this particular analysis.

As can be seen from **Figure 3**, Optative verbs are fairly well-attested, occurring in the earliest samples from two of the four children, and remaining fairly frequent for the rest of their age ranges. Perhaps rather surprisingly, the proportion of Optatives does drop off noticeably for Philip after 3;3 and for Jacklyn after 3;4, but this can perhaps be related to a concomitant increase in the use of less common Final-class verb inflections such as Habitual and Remote Past. Note that, in contrast to the Optative, the Subjunctive emerges much later—at 3;8 for Jacklyn and 3;6 for Philip—and remains very infrequent right through to the end of Philip's range at 4;9.

Comparing **Figures 2**, **3**, it is clear that the children's low production of SR1 forms and absence of SR2 forms is not based on any inability to learn their forms. The Optative is used infinitely more frequently then its SR2 counterpart, given that no SR2 forms are produced at all. Uses of the Subjunctive, although rare, greatly outnumber the three instances of its counterpart SR1 (by Philip at 4;7). Before drawing final conclusions, we consider Future and Imminent, the other pair of inflections that involve identical forms but different functions when in final and non-final position.

The incidence of Imminent verbs in two-clause chains has been displayed and discussed above in relation to **Figure 2**. The overall incidence of Future verbs in the child corpus, and its frequency relative to that of the Imminent class, is shown, among other information, in **Figure 4**. To produce this graph, we determined the overall frequency of any clausal construction in the data that included a verb (independent clauses, the Optative-Final construction, and clause chains). The key of **Figure 4** shows the five most common constructions. Three of these are independent clauses: Other final (denoting all verbs in the Final class with the exception of Future ones); Future, as a predicate in independent clauses; and Optative, as a predicate in independent clauses. The other two most common constructions are clause chains, namely the chain Medial-Final (where Final denotes any verb of that class); and the chain Imminent-Final (where Final denotes any verb of that class). "Other" denotes constructions that do not fall into these five categories, such as Medial-Future. The final designation in the key is "Uncoded final." For some of the Enita and Jesi sessions, some of the verbs in single-clause utterances were not extracted from the transcripts and hence did not feature in the data that we coded for this project. However, while the exact utterances were not extracted and hence not coded for Final inflection, the number of independent clauses was counted. These numbers are included as "Uncoded Final" verbs.

Figure 4 shows that Future verbs emerge very early in all the children's speech. They are present in the first samples from three of them—Enita and Jesi at 1;8, and Jacklyn at 2;8—and in all the subsequent samples from each of them, in varying

proportions. Despite this early emergence, for all the children there is a considerable delay before they begin to use Future-form verbs in non-final position as the Imminent (**Figure 2**). Despite using the Future at 2;4, Philip does not begin to use this form in non-final position in a clause chain until 3;5. In the transcripts we have, which go up to 2;11, Jesi never produces any Imminent-Final clause chains, despite using the Future as early as 1;9.

From the above discussion of **Figures 2–4**, a conclusion we draw is that the children's learning of the Optative, Subjunctive and Future forms provides part of the basis on which they master the grammar of the two switch-reference inflections and the Imminent inflection, by putting the same forms to different uses in non-final position, as in adult speech. The other, more difficult prerequisite for the mastery of the switch-reference categories which may delay their acquisition is the cognitive capacity to hold two distinct person/number categories and/or events in mind at once, in order to treat them relationally, one with respect to the other.

The Emergence of Longer Chains

Returning to **Figure 1**, three-clause chains begin to emerge from all the children between the ages of 2;8 and 3;3. They remain very infrequent for Enita, Jesi and Jacklyn throughout the periods for which we have samples for these children—up until 3;0, 2;11, and 3;8, respectively. In all of those samples, the proportion of three-clause chains never exceeds 2% of the total number of clause chains. The same is true of Philip up until the age of 3;8 when the proportion of three-clause chains increases to about 4%, and stays between 3 and 5% in most of the rest of the samples for him, up to 4;9.

The first instances of three-clause chains from each of the children are shown in (38)—(48). These include the *only* attested three-clause chains for Enita and Jesi, and the first three of them from Philip and Jacklyn.

Enita at 2;8
(38) *kapo go*[14]   *bo*   *puku*
   *ga*   *bo*   *puku*
     sweet.potato   cutting   break.off
     toba   *liba*   *pom*
     to-pa   *lyi-ba*   *pu-m*
     hit/do-MED.3SG   get-IMM.3SG   go-PRF:3SG
     "She went to collect sweet potato cuttings for planting."

Enita at 3;0
(39) *pup*   *lip*   *purun*[15]
     pu-p   *lyi-p*   *pu-bu*
     go-MED.1   get-MED.1   go-FUT.1SG
     "I will go get it and go."

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[14]Though the overall sense of this utterance by Enita seemed clear to our field assistants within its context, it is unclear which of the words *kapo go* corresponds to *ga* "sweet potato." The word *kapu* in adult speech means "big," so it could be that the overall sense of Enita's *kapo go bo* is to be taken as "big sweet potato cuttings."
[15]This verb has "incorrect" person and tense marking, *-run,* which in adult speech is second person singular remote past (as shown in **Table 1**). Given the first-person subject marking on the preceding Medial verbs and the context of use, our field assistants took Enita's intended meaning to be "*I will* go and get it' and accordingly corrected the final verb to *pubu.*
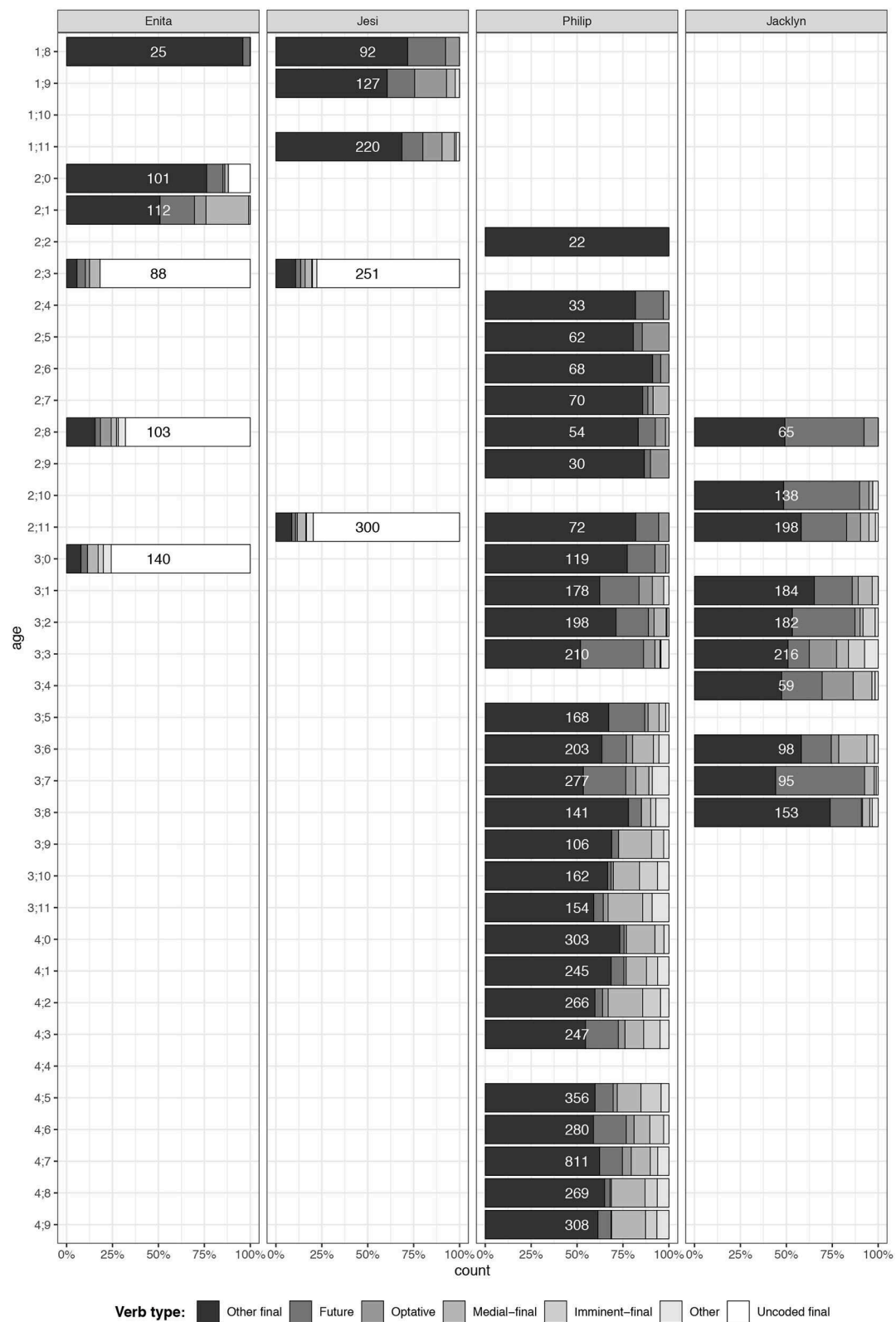
FIGURE 4 | Incidence in the children's speech of common clause chain types.

Jesi at 2;11

(40)　ti　　　kak　　　　　nok　　　　　muku[16]
　　　ti　　　kal-kuk　　　no-k　　　　molu-i
　　　one　　cook-MED.2SG　eat-MED.2SG　be/stay-JUS
　　　"Cook one [sweet potato] and eat it."

(41)　top　　　　koip　　　　nob
　　　to-p　　　koi-p　　　no-bu
　　　hit/do-MED.1　roast-MED.1　eat-FUT.1SG
　　　"I'll kill, roast and eat them [the puppies]."

(42)　alni　　　　　to　　　　　　koiya
　　　aki-yl-n　　　to-ø　　　　koi-pa
　　　that-DEF-ERG　hit/do-MED　roast-MED.3SG
　　　sirim
　　　si-rim
　　　give-RP:3SG
　　　"That one [my uncle] killed it [a dog], roasted it and
　　　gave it [to me]."

Philip at 3;3

(43)　me-k　　　　　o-k　　　　　　sa
　　　carry-MED.2SG　come-MED.2SG　give.IMP.SG
　　　"Bring it [the fish] here and give it [to her]."

Philip at 3;6

(44)　na　　　kung　　　　　kap　　to
　　　na　　　kung　　　　　kap　　to-ø
　　　I　　　pig　　　　　　big　　hit(/kill)-MED
　　　koi　　　nobal
　　　koi-ø　　no-bayl
　　　roast-MED　eat-FUT.1SG:DEF
　　　"I'll kill, roast, and eat the big fat pig."

(45)　jepoya　　　　　　to　　　　　　me
　　　Jekob Poya　　　　to-ø　　　　me-ø
　　　(boy's name)　　　hit/do-MED　carry-MED
　　　umal
　　　um-ayl
　　　come-PRF:3SG-DEF
　　　"Jekob Poya killed it and brought it home."

Jacklyn at 3;3

(46)　abuku　　　　kan　　　　　ter
　　　abulu-p　　　kanu-bu　　　te-kir
　　　hold-MED.1　see-IMM:1SG　do-PPR:1SG
　　　"I want to hold it and look at it."

(47)　is　　　　　　　　abulup　　　　mulab
　　　isi-ø　　　　　　abolu-p　　　mol-ab
　　　doing.like.this-MED　hold-MED.1　be/stay-OPT.1SG
　　　"I'll keep holding it like this."

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[16]This three-clause chain was actually embedded with a reported
speech construction:

na　　ti　　kak　　　　　nok　　　　　muku　　　　ni
na　　ti　　kal-kuk　　　no-k　　　　molui　　　nyi-m
I　　one　cook-MED.2SG　eat-MED.2SG　be/stay:JUS　say-PRF.3SG
"She told me to cook one [sweet potato] and eat it."

(48)　to-ø　　　　　pora　　　si-pa　　　　　lim
　　　hit/do-MED　finish　give-MED.3SG　be:PRF.3SG
　　　"She finished doing it [playing] and stayed there."

Four- and five-clause chains are attested only in the speech of
Philip, during an age range for which we do not have samples
from any of the other children: 3;10–4;9. Of note, sentences (50)
and (52) were spoken by Philip when looking through a wordless
picture-story book that he was being shown by field assistant
Andrew Noma. These sentences are in reference to a series of
pictures in which a man had fallen asleep beside his hat, which
is then stolen by an eagle who swoops down on it, grabs it in its
talons, and flies away with it. Examples of four-clause chains are
shown in (49) through (51).

Philip at 4;7

(49)　ilyi　　　　　　oba　　　　　　ite
　　　ilyi　　　　　　o-ba　　　　　ite-ø
　　　that one　　　come-MED.3SG　do.like.this-MED
　　　puba　　　　　tirim
　　　pu-ba　　　　tirim
　　　go-IMM:3SG　do:RP:3SG
　　　"That one [girl] had come like this and was about to go."

(50)　wana　　　kanuwa　　　le　　　　　me
　　　wanya　　kanu-wa　　lyi-ø　　　me-ø
　　　hat　　　that-DEF　　get-MED　carry-MED
　　　pulka　　　wis　　　niring
　　　pu-lka　　wis　　　nyi-ring
　　　go-SR1:1/3　hey　　say-RP:2/3PL
　　　"It [the eagle], having taken the hat and carried it away,
　　　they said 'Hey!'"

Philip at 4;8

(51)　mo　　　　top　　　　　abulup
　　　mo　　　　to-p　　　　abolu-p
　　　conceal　hit/do-MED.1　hold-MED.1
　　　me　　　　purubulal
　　　me-ø　　　pu-rubul-ayl
　　　carry-MED　go-RP:1PL-DEF
　　　"We hid it and took it away."

Examples of five-clause chains are shown in (52) and (53).

Philip at 4;7

(52)　wana　　　torulupa　　　lyipa
　　　wanya　　torulu-pa　　lyi-pa
　　　hat　　　grab-MED.3SG　get-MED.3SG
　　　mepa　　　　lkisa　　　　　　　　um
　　　me-pa　　　lkisi-ø　　　　　　um
　　　carry-MED.3SG　run/do.quickly-MED　come.PRF:3SG
　　　"It [the eagle], having grabbed the hat, took it away and
　　　swiftly brought it."

(53)　nan　　　torulup　　　　lip
　　　na-n　　torulu-p　　　lyi-p
　　　I-ERG　grab-MED.1SG　get-MED.1
　　　ka　　　tolkakin
　　　ka　　　to-lka-kin
　　　rope　　get-SR1.1/3-COM
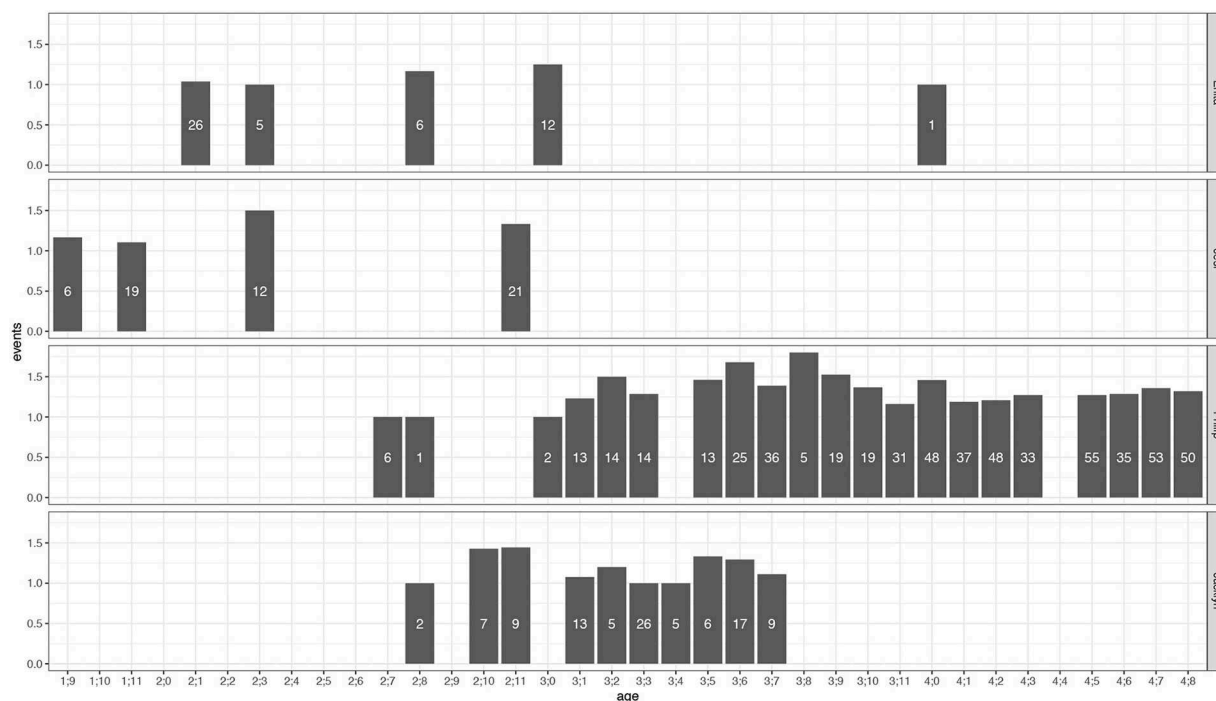
FIGURE 5 | Mean number of events referred to in the children's two-clause chains.

no	daip	te
no	daip	te-ø
water/river	dive	do-MED

mulurum

mulu-rum

be/stay-RP:3SG

"When I grabbed it and tied it up he was diving into
the river."

Examples (38–53) are all fully adult-like in their syntax, but have
some morphological errors as evident from the corrections in
gloss lines and relevant footnotes. The three-, four-, and five-
clause chains that the children go on to produce after the intial
two-clause stage almost all make use only of verb inflections that
the children are already producing in their two-clause chains.
The only exception to this is switch-reference marking, which
emerges only in the speech of Philip, at 4;7, as exemplified by
(50) and (53). Its emergence at that stage is consistent with the
surmise we made in section Patterns in the Kinds of Two-Clause
Chains That Children Produce that the children's learning of
the SR1, SR2, and Imminent inflections is supported by their
prior learning of the formally identical Subjunctive, Optative,
and Future ones. For example, Philip first used the Subjunctive
inflection at 3;6 (as shown in **Figure 3**), long before he first uses
its counterpart SR1 inflection at age 4;7.

Clause Chains and Event Structure in the Children's Speech

In section Patterns in the Kinds of Two-Clause Chains
That Children Produce we discussed the first five two-clause

constructions to be used by each of the four children, and showed
that 18 of these were clause chains and two were instances of
the Optative-Final construction. We showed that only two out
of the eighteen clause chains (11%) were used for what is often
taken to be the canonical function of clause chains: reference
to multiple events in sequence. The rest of the 18 clause chains
are particular grammaticalized or lexicalized constructions for
expressing meanings such as durative aspect, intentionality, or
event qualifications such as "do quickly" or "do again," which
all refer to single events. Given that such regular pairings are
probably easier for children to learn than novel clause chains
referring to events in sequence, the paucity of the latter in those
early clause-chain productions raises the question of whether
there might be a trend in the children's later speech toward multi-
event reference in chains of given lengths. To test that hypothesis,
we looked through *all* of the children's two-clause chains, coded
them as one-event or two-event ones, and computed the average
number for each sample. The results are shown in **Figure 5**.

As can be seen in **Figure 5**, there is no consistent increase or
other big change across time in the average number of events
referred to in the children's two-clause chains. Given that result,
the question arises of whether there might be more of a tendency
for multiple events to be referred to in the children's three-
to five-clause chains. Might there be a tendency for the ratio
of events-to-clauses to increase over time when we consider
longer chains?

To address those questions, we focused exclusively on Philip,
as his are the only samples with significant numbers of
three-clause chains, and the only ones with any four- or five-
clause chains. We inspected all of those three- to five-clause
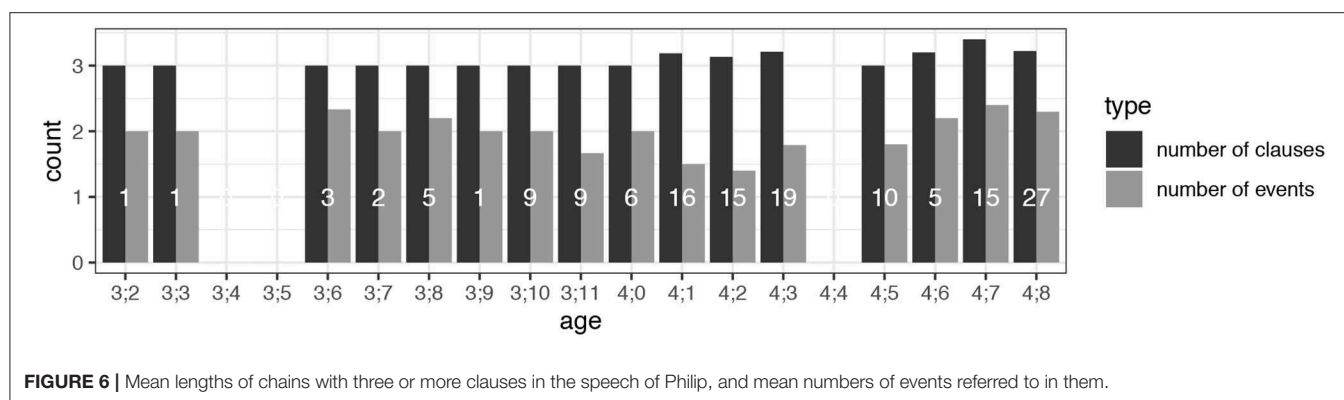
FIGURE 6 | Mean lengths of chains with three or more clauses in the speech of Philip, and mean numbers of events referred to in them.

chains, coded them for the number of clauses and the number of events in each, and computed the mean for each month in each sample. The results are shown in **Figure 6**.

Paralleling the results for two-clause chains in **Figure 5**, the ratio of number of events to number of clauses remains fairly constant throughout the sample in **Figure 6**, especially in the first 2 months and the last four. Even as the mean chain length increases in most of the months after 4;0, there is no corresponding increase in the ratio of events to clauses.

The Presence vs. Absence of Medial Verb Marking

Before comparing the children's clause chain production to their adult interlocutors', we consider the phenomenon of dropping of Medial verb morphology. As introduced in section Presence vs. Absence of Medial Verb Marking, Ku Waru Medial verbs sometimes occur without the Medial suffixes in adult speech. As can be seen in examples (18)–(35), the unsuffixed forms are frequent in most of the children's early speech. The following analyses compare the children's production of Medial verbs with specific reference to whether or not they are suffixed. This is of interest, as the Ku Waru children's use of Medial/medial verbs differs sharply from that in Nungon, another Trans New Guinea language (Sarvasy, 2019). We will return to this shortly.

As shown in **Figure 7**, the children differ greatly in their use or non-use of Medial suffixes over time. Enita has a fairly clear pattern in which she moves from using unsuffixed forms to suffixed ones. Jesi, on the other hand, shows a relatively high proportion of the suffixes from the beginning of his use of Medial verbs at 1;9, and no clear overall pattern of increase or decrease in the use of the suffixes over the next 14 months. The same is true of Jacklyn's incidence of suffixed forms over the 13-month span of samples. Over the much longer timespan for which there are samples from Philip, he shows an overall increase in suffixation, with rates at or above 50% from 4;2 to 4;9.

In assessing the significance of these findings one must bear in mind that they pertain to only a small subset of the utterances counted in **Figure 1**, namely the ones consisting of clause chains which include Medial verbs. That means that the sample size for each month in the counts for **Figure 7** (as shown in the middle of each bar) is much smaller than for each of the corresponding

samples shown in **Figure 1**. This no doubt accounts in part for the apparently greater degree of random fluctuation in Medial suffixation from month to month in **Figure 7**.

Very occasionally the Ku Waru children in our sample use Medial verbs in independent clauses (that is, in an utterance that contains only one verb; not a clause chain). This is relevant to note in connection with discussions in the child language literature of an "optional infinitive stage" of language acquisition, in which infinitives function as predicates in independent clauses (Rizzi, 1994; Hoekstra and Hyams, 1998; Wexler, 2011; Grinstead et al., 2014; Sarvasy, 2019). Across the entire Ku Waru child corpus for this study, such independent Medial verbs account for only 0.59% of the number of children's verbs[17]. Given this very low frequency, the use of independent Medial verbs (whether suffixed or unsuffixed) cannot be said to be a stage in Ku Waru children's acquisition of the language. In this respect our results regarding Ku Waru children's acquisition of Medial verbs— whether independent, or dependent but without suffixes (see section Presence vs. Absence of Medial Verb Marking)—differ from those in the root-infinitive literature.

In addition, clauses with standalone or chain-final Medial verbs account for only 0.46% of all adult verbal utterances in our corpus, and are regarded by Ku Waru speakers as incorrect or incomplete. This contrasts sharply with another Trans New Guinea language, Nungon, where it is relatively common for chains to end in a Medial verb. Sarvasy (personal communication) found that in Nungon adult narratives over 3 min in length, 4–20% of all clause chains end in a Nungon medial verb. Of note, though, in Nungon, medially marked verbs in final position have grammatical and discourse-related functions, including functioning as imperatives, summarizing a previous clause chain, or marking perfect aspect (Sarvasy, 2015, p. 679). Ku Waru has no such strategies which would license chains ending in Medial verbs. We now turn to adult child-directed speech, showing a slice of the input that children receive.

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[17] A referee has questioned whether unsuffixed Medial verbs when occurring in *non-final* position might also be considered candidates for "optional infinitive" status. We think not, because, as discussed above, even unsuffixed verbs in Ku Waru are positively specified as Medial because they are the only verbs in Ku Waru that may optionally occur in unsuffixed form. Accordingly, when occurring in non-final position, even when unsuffixed, these verbs, and the clauses in which they occur, are syntactically dependent rather than independent.
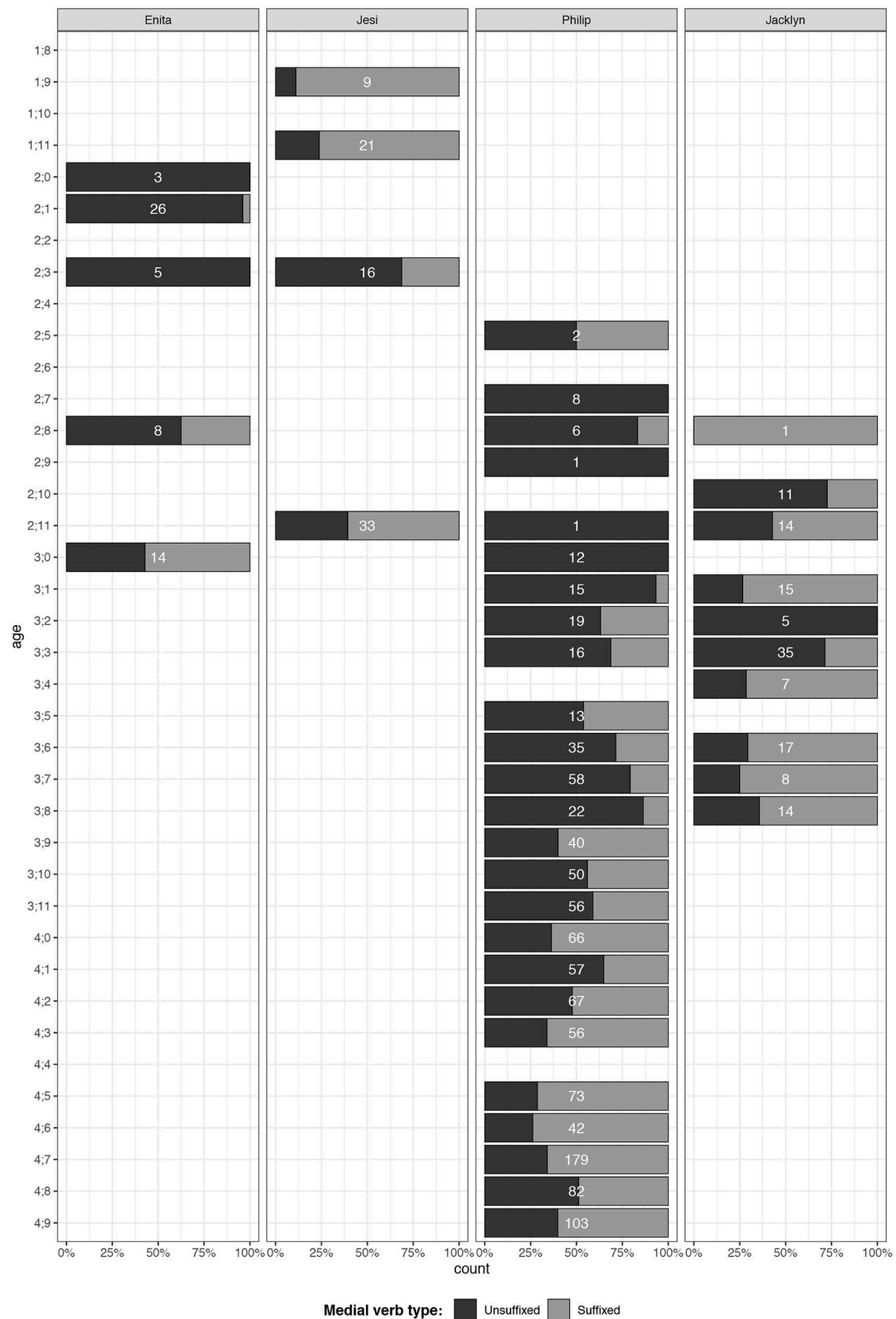
FIGURE 7 | Incidence of presence vs. absence of suffixes on Medial verbs used by the children.

ADULTS' AND OLDER CHILDREN'S SPEECH TO THE TARGET CHILDREN IN KU WARU

As described in section Methodology and Description of the Data, we coded a sample of adult input to Philip and Jacklyn. It is important to note that this input is representative of only a small proportion of the speech that the children are exposed to. In particular, the recording situation was an unusual kind of context for both adult and child Ku Waru speakers, insofar as it involved more-or-less continuous, focused interaction centered on a single child, and a single adult caregiver (albeit with some additional input from older children and other adults in some of the sessions). Nonetheless, there do seem to be some clear overall patterns which are evident from the data, and contrast interestingly with the nature of child-directed speech that has been studied elsewhere.

In their child-directed speech, Ku Waru speakers do have distinct "baby talk" ways of simplifying some of the language's particularly difficult phonological features for children (Rumsey, 2017). There is a certain amount of baby talk lexicon that is used with very young ones, but not nearly as much as in some languages, such as the Australian Aboriginal language Warlpiri (Laughren, 1984). In addition, Rumsey and Merlan's observations over some 40 years of working with Ku Waru speakers are that adults do not slow down their speech nor use exaggerated intonation contours, as has been found in middle-class Western settings (Lieven, 1994). We will go on to show that Ku Waru adult caregivers do not simplify their clause chains or Medial verb morphology for children. In the next sections, we repeat each analysis in section The Emergence of Clause Chaining for the adults, in order to compare the children's production with their input.

Chain Lengths in Adult Speech

As addressed in section Two-Clause Chains, the children begin to produce unprompted two-clause chains between 1;9 and 2;7; three-clause chains at 2;8–3;3; and four-clause chains not until 4;7 (based on one child, Philip, for whom we have data extending into his fourth year). In terms of clause chain length, adults do not appear to "scale down" their speech to match the child's productive capacity (cf. Bohannon and Marquis, 1977 in Soderstrom, 2007; Sarvasy, 2019). Consider **Figure 8**, which shows clause chain length of adults' child-directed speech (in the top 42% of the range only, for greater resolution) (note that in **Figure 8**, as in **Figure 1**, that "Chain length: 1" in the legend denotes independent clauses). There may be some small increase in chain length production by adults that is associated with the children's increasing age. However, the overall impression is that Ku Waru children are not receiving a "baby talk" version of clause chains tailored to their own productive capacity. Philip's adult interlocutors (mainly his father) and Jacklyn's adult interlocutors (mainly her mother and uncle) maintain fairly steady proportions of chain lengths over the sample period. These even include four-, five-, and six-clause chains, despite the fact that Jacklyn never produces chains that long, and Philip only begins to produce

four-clause chains at 3;10; five-clause ones at 4;7; and produces no six-clause chains at all.

It is interesting to note in **Figure 8** the different linguistic styles of the adults in Philip's household vs. Jacklyn's. Multi-clause chains make up, on average, 25% of utterances to Philip, but only 13% to Jacklyn. But, as can be seen from **Figure 1**, this does not result in a higher overall incidence of multi-clause chains from Philip during the age range for which samples are available for both children (2;8–3;8).

The Kinds of Clause Chains Used by the Adults

In section Patterns in the Kinds of Two-Clause Chains That Children Produce we presented an account of the kind of clause chains used by children, drawing in part on the data displayed in **Figures 2–4**. With reference to **Figure 2**, we pointed out that of the four Ku Waru inflections that occur in non-final position, only three of them were attested in the samples: Medial, Imminent, and SR1. The corresponding adult data are shown in **Figure 9**, showing the verb inflection in the next-to-last clause in any clause chain. Five things which stand out about the data there in relation to the data in **Figure 2** are:

- As in the children's speech, Medial verbs are by far the most frequently occurring ones in non-final position.
- In non-final position, Medial verbs are followed in frequency by Imminent ones, in roughly the same proportions of Medial-to-Imminent as in the children's speech after they turn 3.
- The adults maintain their proportions of Imminent verbs across the children's entire range of samples, including the earliest ones.
- Like the children, SR1 is very rare.
- SR2 is present in the speech of both Philip's interlocutors and Jacklyn's, albeit very infrequent in both cases; it is entirely absent in the children's production.

Turning now to the final-position counterparts of the Chameleon class inflections (Imminent, SR1, and SR2), with reference to **Figure 3** in section Patterns in the Kinds of Two-Clause Chains That Children Produce, we pointed out that Optative verbs are fairly well-attested in the children's early recordings, but that the Subjunctive emerges much later and remains very infrequent right through to the end of Philip's range at 4;9. The corresponding adult data with regard to the Optative and the Subjunctive are shown in **Figure 10**. As in the children's speech, "other Final" class verbs are by far the most frequent. The proportion of Optatives in speech to Jacklyn remains quite constant throughout the range, in contrast to the widely fluctuating rate of Optatives from Jacklyn herself during that period. By contrast, the post-3;3 drop-off in their use by Philip that was noted in section Patterns in the Kinds of Two-Clause Chains That Children Produce is closely matched by a similar drop-off by his interlocutors after 3;5. The most surprising thing about the data in **Figure 10** is that the Subjunctive does not occur at all in adult speech to Philip, whereas there are multiple instances of it from Philip himself; namely, six in his sample between 3;5 and 4;7. This must be related to the fact that Philip
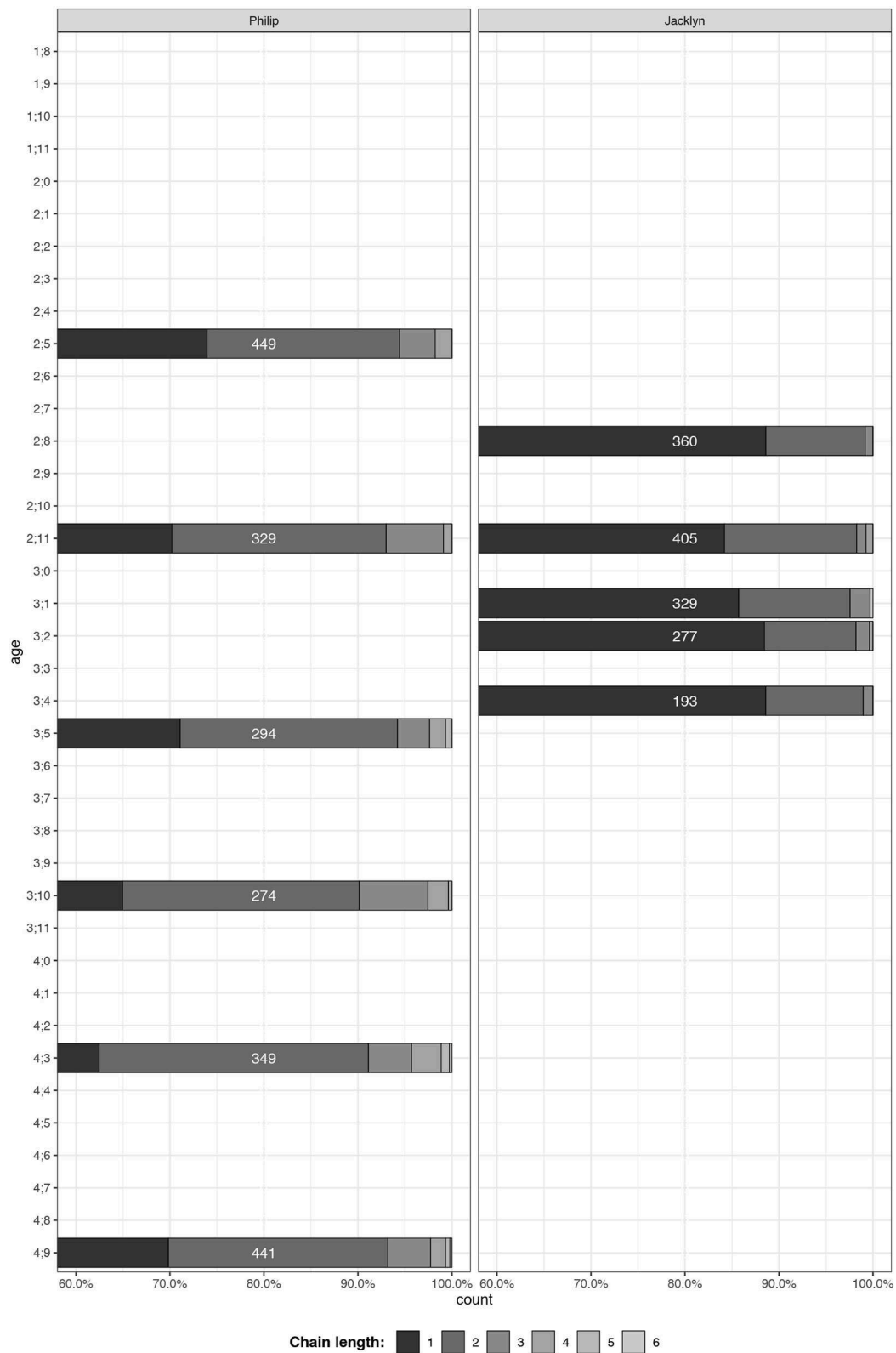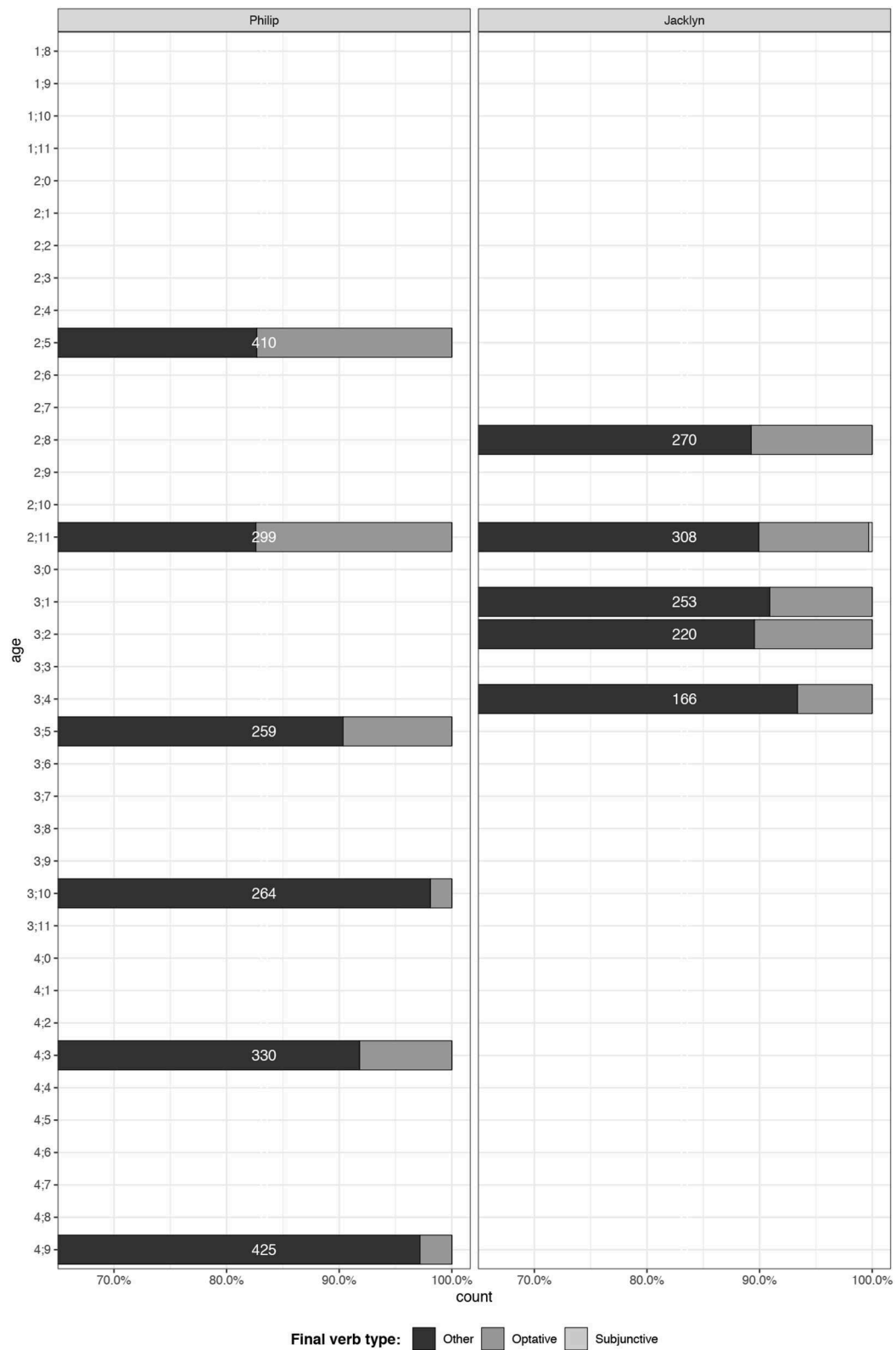
FIGURE 8 | Lengths of clause chains in speech of adults to Philip and Jacklyn.
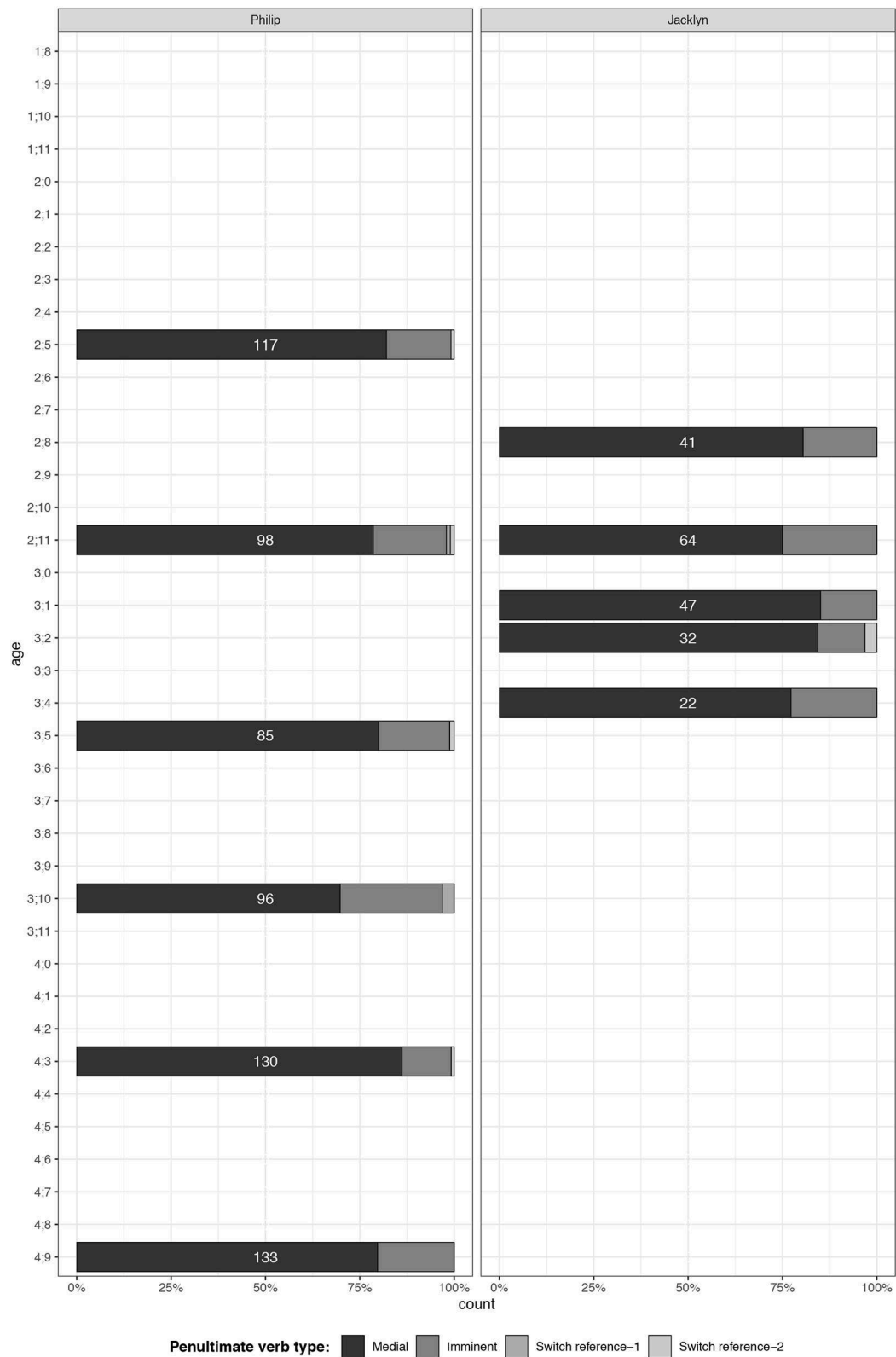
FIGURE 9 | Proportions of verb types in the second-to-last clauses in speech of adults to Philip and Jacklyn.

FIGURE 10 | Proportions of Optative and Subjunctive vs. other clause chain-final verbs in speech of adults to Philip and Jacklyn.

in his everyday life experiences a wide range of other kinds of interaction besides the kind of dyadic conversational ones with his father that comprised most of the recording sessions on which the samples are based.

With reference to **Figure 4** in section Patterns in the Kinds of Two-Clause Chains That Children Produce we discussed the incidence in the children's speech of the most common kinds of constructions, whether clause chains or independent clauses. The corresponding data for Philip's and Jacklyn's adult interlocutors are shown in **Figure 11**. The most notable point of comparison between **Figures 4**, **11** is that the most common kinds of two-clause chains and independent clauses are present from the start in the adult sample, and remain there in a consistent mix through the entire range, especially in the case of Philip's interlocutors. This contrasts with the children's production of these most common constructions, which show a mix that gradually increases in complexity.

Clause Chains and Event Structure in Adult Speech

In section Clause Chains and Event Structure in the Children's Speech in **Figure 5**, we presented data concerning the ratio of clauses to events in the children's two-clause chains, showing that this ratio does not change markedly for any of the four children over time. **Figure 12** shows the corresponding data for Philip's and Jacklyn's adult interlocutors. As can be seen there, the same pattern holds true for them, with roughly the same overall proportion of clauses to events.

In **Figure 6** in section Clause Chains and Event Structure in the Children's Speech, we showed the mean number of clauses in the three- to five-clause chains in each sample from Philip across the age range when he produces them (3;2–4;8). We established that the ratio of chain length to number of events does not change markedly over that time. **Figure 13** shows that the same pattern holds true for Philip's adult interlocutors; that is, ratio of chain length to number of events does not change markedly over time.

Presence or Absence of Medial Marking in the Adults' Speech

As discussed in section The Presence vs. Absence of Medial Verb Marking, and displayed in **Figure 7**, when the children first begin to produce Medial verbs, they vary as to whether these verbs are suffixed or unsuffixed. To recap, Jacklyn and Jesi are fairly consistent in their proportions of suffixed vs. unsuffixed Medial verbs, whereas Enita and Philip show a slow progression from unsuffixed verbs to suffixed ones. In terms of adult input, **Figure 14** shows that adults are not adopting the children's greater tendency to produce unsuffixed Medial verbs. Philip receives very consistent input in terms of Medial morphology, with an average of 95% of Medial verbs with suffixes. The first session for Jacklyn has a lower proportion of unsuffixed Medial verbs—65%—but the adults interacting with her become fairly consistent in the later sessions, averaging 81% of verbs with suffixes. Again, it is interesting to note the difference between Philip and Jacklyn's linguistic environments, with Philip's carers being more canonical in terms of full morphological marking on

Medial verbs. But just as we have seen in section Chain Lengths in Adult Speech regarding adults' clause chaining, this is not matched by a higher rate of suffixation by Philip than by Jacklyn. That is, while Jacklyn is exposed to a much lower incidence of clause chains (vs. single verb clauses) than Philip in these samples, she produces them at roughly the same rate as Philip across her sample period. Correspondingly, although Jacklyn is addressed with lower rates of Medial suffixation, she does not produce it at lower rates than Philip. On the contrary, she produces it at higher rates across most of the age range for which there are samples from both children (2;8–3;8).

To conclude this section, there is an overall correspondence between the children's and the adults' clause chain production in terms of the relative frequency of shorter vs. longer chains (**Figure 8**), and of certain kinds of chains as compared with others (**Figures 9**, **10**). However, there are big differences between the relative consistency of the adults' speech over time, and the changes in the children's speech as it 'catches up' with that of the adults. That is, the adults address the children when they are toddlers in much the same way as they do at the later ages in our samples, when the children's clause chaining becomes more like that of the adults. In order to better understand the children's progress in these respects from 2;5 to 4;9, it would be important to include a far larger sample of children's interaction with other children than is present in the corpus for this study[18]. What we can say with confidence based on the data examined in sections Clause Chains and Event Structure in the Children's Speech and Clause Chains and Event Structure in Adult Speech is that throughout the course of the children's acquisition of clause chaining, there is a sizeable proportion of clause combinations that refer to single events; that this proportion remains fairly constant over that period; and that it closely matches that of the adult interlocutors at all stages.
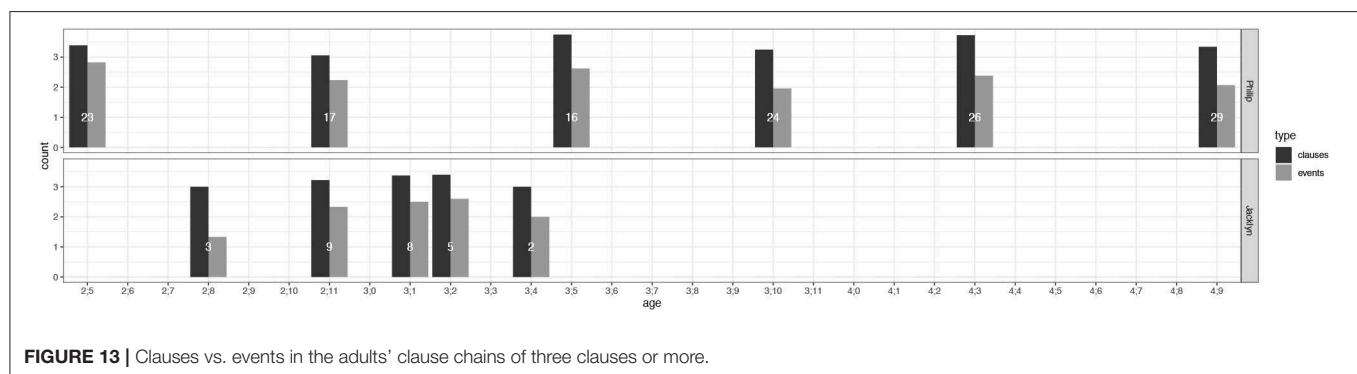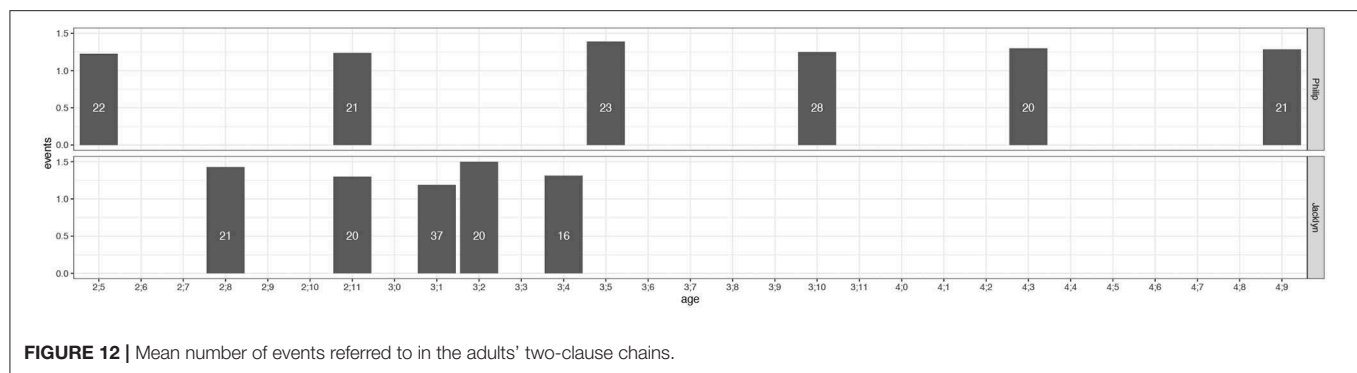
CONCLUSIONS

In this article we have traced the development of clause chains in the speech of four Ku Waru-speaking children between the ages of 1;8 and 4;9. Our data have been drawn from a longitudinal corpus of 40 sessions of recorded and transcribed interaction between the children and their adult caregivers, which comprise a total of 32,760 reviewed lines. The speech of the children in all of those sessions has been coded for relevant verb types, and analyses drawn from this coding. In order to study possible effects of the caregivers' speech on the children's learning of clause chaining, we have applied the same coding protocols to adult input in a temporally spaced subset of the sessions involving two of the children.

As shown by the discussion in section The Emergence of Clause Chaining, there are differences among the children in the ages at which they acquire the various aspects of clause chaining discussed there. However, all the children follow the same series of steps in doing so, with regard to: (i) the length

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[18]We hope to be able to do so in the future, based on ~30 h of interaction that we have recorded, using chest-mounted GoPro video cameras, of children interacting with each other without any adults on the scene.
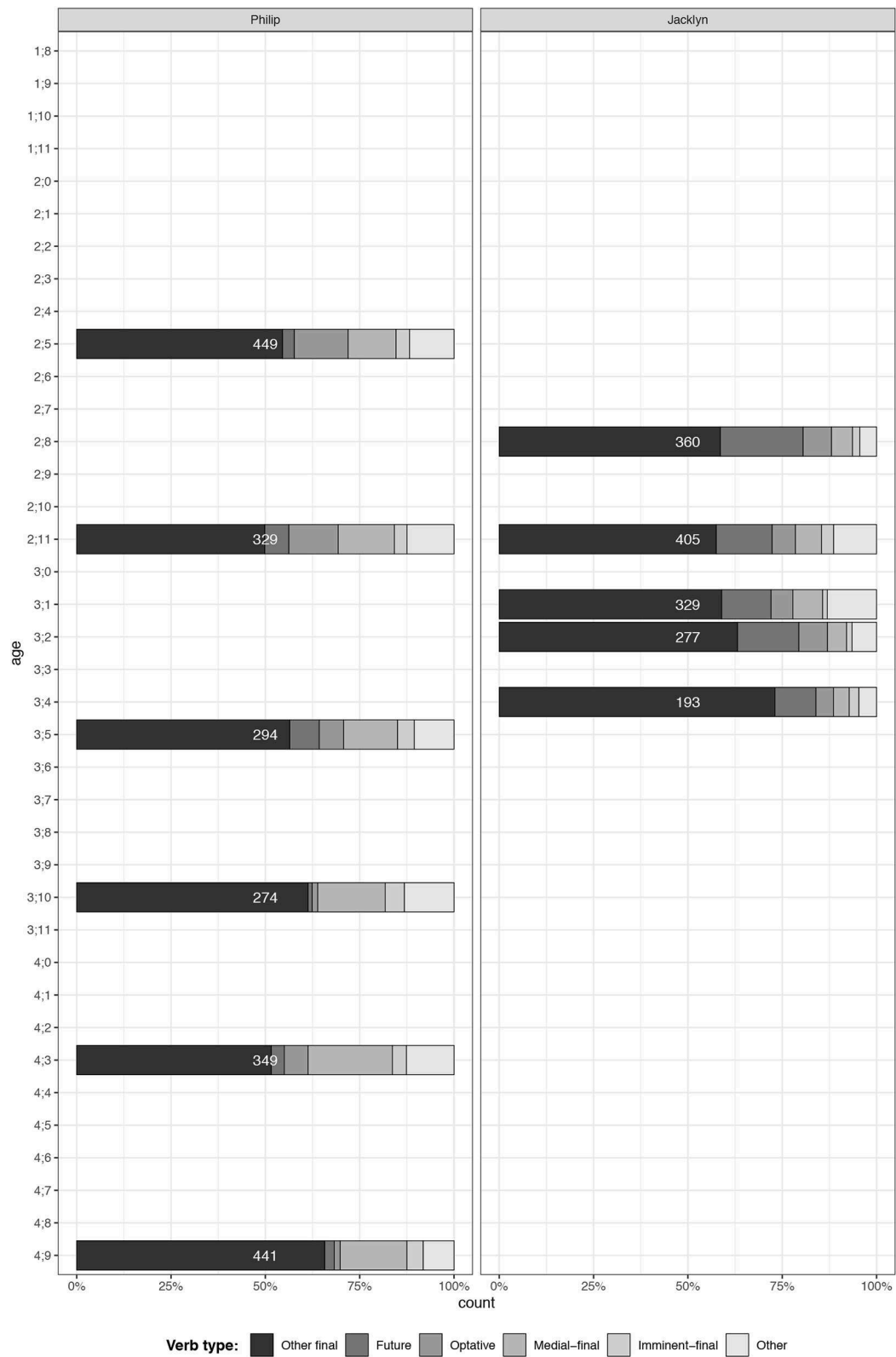
FIGURE 11 | Incidence of common construction types in adults' speech to Philip and Jacklyn.

FIGURE 12 | Mean number of events referred to in the adults' two-clause chains.

FIGURE 13 | Clauses vs. events in the adults' clause chains of three clauses or more.

of the chains (**Figure 1**), (ii) the verbal inflections that feature in chains (**Figures 2**, **3**), and (iii) the proportions of common types of clause chains and independent clauses that they produce (**Figure 4**). Although the samples for some of the children in our study are not as numerous or frequent as in many longitudinal studies, we think that having four children does lend added credibility to our findings regarding that uniform sequence of developmental stages.

As discussed in section Adults' and Older Children's Speech to the Target Children in Ku Waru, the adults provide rich input that generally runs well-ahead of what the children are producing at the time of the sample. There is little or no apparent attempt on the part of the adults to scale down their speech in order to accommodate the children's current stage of development. Our findings in that respect are consistent with those of Schieffelin in her (1990) monograph on the language socialization of children among the Kaluli people in the Bosavi region to the southwest of Ku Waru. Schieffelin reports that there is no distinct "baby talk" register among the Kaluli. Indeed, the Kaluli believe that the right way to teach children to talk is by addressing them with "hard language" that will model fully competent adult speech for them (Feld and Schieffelin, 1982). In the speech to Ku Waru children, Ku Waru caregivers use adult-like morphosyntactic features that are perhaps the functional equivalent of Kaluli "hard language."

There are three other aspects of our findings that we think raise especially interesting questions for comparative study. One is the acquisition of switch-reference marking. It seems remarkable that none of our four target children began using this before 4;7. But that becomes far less remarkable in light of our

findings concerning the scarcity of switch-reference marking in all of the adult speech in our samples. Indeed, this is consistent with low rates of usage in Ku Waru adult-to-adult speech that Merlan and Rumsey have experienced over the years, and noted in our extensive adult Ku Waru text corpus. Given that very limited adult input, it is not clear whether the special cognitive demands of switch-reference marking that we noted in section Patterns in the Kinds of Two-Clause Chains that Children Produce *necessarily* preclude children's mastering it at earlier ages than 4;7. That is an open empirical question which could be better studied in a setting where switch-reference marking is far more common than among Ku Waru speakers.

A second especially interesting comparative issue raised by our study concerns the nature and functions of clause chaining itself. As noted in section Introduction, it is often assumed that the prototypical function of clause chaining is reference to multiple events in sequence. However, as shown by our data in sections The Emergence of Clause Chaining and Adults' and Older Children's Speech to the Target Children in Ku Waru, clause chaining serves many other functions in Ku Waru, including durative aspect marking, adverbial qualification, expression of intentionality, and the lexicalized expression of basic concepts such as "bring," "take," "tell," and "think" through the regular combination of particular verbs in particular orders. That being the case, as shown by the extensive data summarized in sections Clause Chains and Event Structure in the Children's Speech and Clause Chains and Event Structure in Adult Speech, and exemplified in sections Patterns in the Kinds of Two-Clause Chains that Children Produce and Kinds of Clause Chains Used
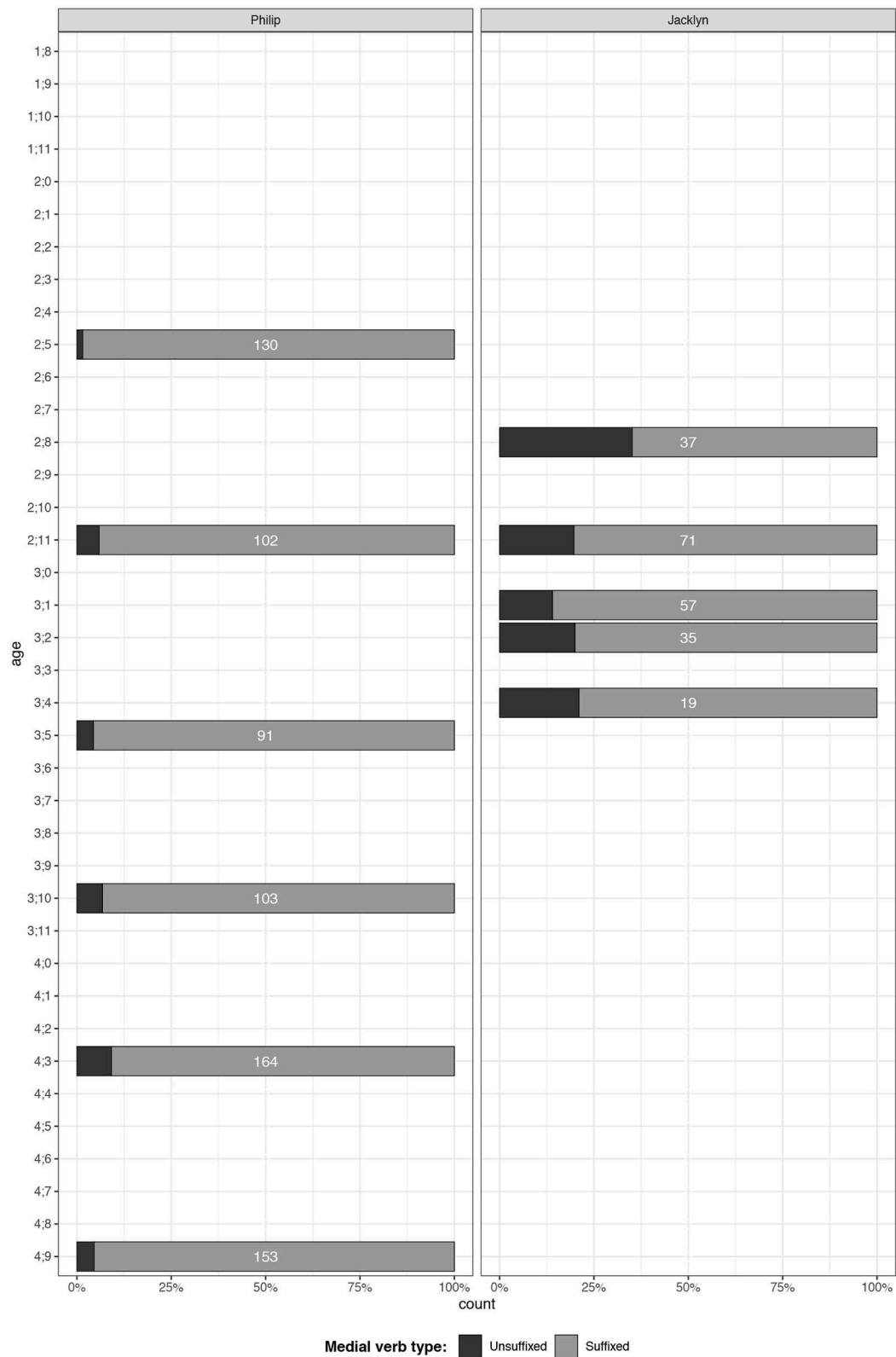
FIGURE 14 | Presence vs. absence of suffixes on Medial verbs in speech of adults to Philip and Jacklyn.

by the Adults, most occurring clause chains in Ku Waru refer to fewer events than the number of verbs in them. It is mainly in narrative contexts such as in (15), (50), and (52) that speakers construct long clause chains referring to multiple events in sequence. It is not surprising that Ku Waru children do not begin to construct long, multi-event clause chains like this until they are 4–5 years old, given the cross-linguistic finding that children's narrative skills begin to develop strongly only at around that age (Clark, 2009, p. 331–335).

Hence, this study raises the question of the extent to which the principal function of clause chaining in the world's languages is to refer to multiple events in sequence—a question that pertains to adults' speech as much as to children's. Other subsidiary questions are the following:

- To what extent are clause chains in other languages used for grammatical or lexical functions, such as the Ku Waru aspectual and adverbial functions of certain lexicalized and grammaticalized chains?
- At what age do children begin to regularly produce long clause chains, and what do they use them for?
- To what extent are long clause chains limited to narrative contexts, or other registers (both for children and adults)?

We hope this article will have helped to establish a useful framework for investigating those questions in other languages where clause chaining is found.

The third comparative issue is the main one in terms of which this article is framed: the comparison of our findings with those of Diessel (2004) for English. Before turning to that issue we will attempt to account for some of the differences between the two cohorts in our study: Enita and Jesi during 2004–2006 and Philip and Jacklyn during 2013–2016. As noted in section Two-Clause Chains, Enita and Jesi produce two-clause chains much earlier than Philip and Jacklyn. As discussed in section Patterns in the Kinds of Two-Clause Chains That Children Produce, Jesi uses the Imminent inflection at 1;11, whereas Philip does not do so until 3;1. A difference between the two time periods that may have played a role in this developmental difference is that by 2013, most children in the study area at Kailge were learning Tok Pisin in addition to Ku Waru from the start of their language learning[19]. By contrast, in 2004–2006 children were not learning Tok Pisin until later on, at the age of four or five. Based on the same transcript data used in this article for Philip at 2;4–2;6 and Jacklyn at 2;11–3;1, Merlan and Rumsey (2015) show that some Tok Pisin is used by both children and their parents in all six of the sessions, in ∼6% of the conversational turns in the sessions with Philip, and in rates of 16–32% across the three sessions with Jacklyn. By contrast, in the 2004–2006 sessions with Jesi and Enita, there is almost no Tok Pisin used. Studies of bilingual language learning elsewhere (Hoff et al., 2012) have shown it to be correlated with initially delayed language development in

both languages, relative to that of monolingual language learners. Accordingly, the later acquisition of clause chaining by Jacklyn and Philip may be due in part to their bilingual language learning. But this is unlikely to have been a major factor, given that Jacklyn's Ku Waru development is on par with that of Philip, notwithstanding the fact that she uses Tok Pisin at approximately four times the rate that he does.

Returning now to the comparison of our results with Diessel's regarding English-speaking children's acquisition of complex sentences, there are both similarities and differences between our findings and his, which may be related to the differences between the kinds of constructions being acquired. Recall that one of Diessel's conclusions for subordinate constructions in English was that children's early ones "are organized around concrete lexical expressions, and although they consist of two clauses, they only contain a single proposition" (Diessel, 2004, p. 174–175). The same is true of Ku Waru children's acquisition of clause chaining, as shown by the discussion of the children's first two-clause chains in sections Two-Clause Chains and Patterns in the Kinds of Two-Clause Chains That Children Produce. As discussed in section Patterns in the Kinds of Two-Clause Chains That Children Produce, the majority of them are lexicalized or grammaticalized combinations (e.g., with a "stay" verb in final position used to mean "keep doing"). In line with Diessel's findings, most of the Ku Waru children's first two-clause chains do not refer to two different events or states of affairs, but to single ones.

However, contrary to Diessel's finding regarding English subordinate constructions, Ku Waru children do not develop their mastery of clause chaining as a process of "clause expansion," whereby single-event multi-clause constructions expand from within to become complex sentences. Rather, they do it through a process of what can be called clause *chain* expansion. This works as follows. Firstly, children acquire the clause-chain formal framework via lexicalized or grammaticalized clause chains; that is, they acquire Medial and non-final Chameleon class marking by learning it through comprehension and production of clause chains which refer to single events. This framework can then be applied to produce novel constructions which refer to multiple events and are more diverse with regard to the lexical verbs that occur in them. As shown by the data in section Clause Chains and Event Structure in the Children's Speech, this involves an increase in the number of distinct events that the children are capable of linking up into a sequence within a single clause chain (here we are not referring to the ratio of clauses to events, but rather to the number of events alone). In that respect, the acquisition process is like the one for English coordinate constructions, which Diessel describes as one of "integration."

With respect to all of the processes referred to above, the Ku Waru children's developmental trajectories conform closely to what they are exposed to in the speech of adults and older children, as shown in section Adults' and Older Children's Speech to the Target Children in Ku Waru. Of particular relevance here is our finding that, within clause chains, the unexpectedly low ratio of events to clauses that is evident in the children's speech is closely matched in that of the adults. Moreover, it

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[19]This was due at least in part to a conscious decision that had been made by some parents to address their children partly in Tok Pisin from the onset of their language learning, on the assumption that it would give the children a head start toward learning English when they went to school. For details see Merlan and Rumsey (2015).

remains relatively constant, both across the children's age ranges and within the speech of adults to the children across those ranges. This contrasts with Diessel's findings for the acquisition of English subordinate constructions. Diessel shows the acquisition of those constructions to be in part a process of moving from largely single-event constructions to one-event-per-clause constructions. By contrast, at least after the initial two-clause period described in section Patterns in the Kinds of Two-Clause Chains That Children Produce, Ku Waru children do not increase their ratio of events-to-clauses over time.

We hypothesize that this developmental difference may be conditioned in part by the structural and functional differences between subordinate constructions and coordinate-dependent ones. That is, as a variety of the latter, clause chains involve reference to multiple events as one of their functions, as do the coordinate-non-dependent constructions studied by Diessel. But clause chains also involve particular combinations of clauses that refer to single events. In that respect they are unlike either subordinate constructions or coordinate-non-dependent ones, and this is reflected in the developmental pathways by which children learn them. Investigation of that hypothesis would require further research on the acquisition of clause chaining in other languages, along the lines that we have pursued here with respect to Ku Waru.

DATA AVAILABILITY STATEMENT

The datasets for this article are not yet publicly available because they are in the process of being archived with PARADISEC (the Pacific and Regional Archive for Digital Sources in Endangered Cultures). This will be completed over 2020. Requests to access the datasets should be directed to Alan Rumsey, alan.rumsey@anu.edu.au.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Australian National University Human Research Ethics Committee, protocol 2013/055. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

AR and FM facilitated participant and research assistant recruitment, recording and transcription of the data for this study, and located and glossed the Ku Waru examples in the text. AR and LR conceived of coding protocols for verbs, and statistical analyses and worked with a research assistant to run these and produce associated graphs. AR, LR, and FM coded the data for verbs and wrote the manuscript. FM conceived of coding protocols with respect to prompting and event structure, and coded the data for those. All authors contributed to manuscript revision, and read and approved the submitted version.

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Acquisition of Pitjantjatjara Clause Chains

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In Pitjantjatjara, a central Australian Indigenous language, speakers typically describe sequences of actions using clause chaining constructions. While similar constructions are common among the world's languages, very little is known about how children acquire them. A notable exception are the converb constructions of Turkish, which have been relatively well-studied. The present paper examines the acquisition of Pitjantjatara clause chaining constructions and compares this with the acquisition of Turkish converb constructions. Data is drawn from a naturalistic corpus recorded between 2016 and 2019. The corpus contains over 4000 utterances from 23 children aged between 10 months and 10 years, five of whom are recorded at multiple ages. The corpus also includes approximately 1600 utterances from 21 adults, aged between 16 and 70. Results show that the acquisition of Pitjantjatjara clause chains consists of three stages. Stage 1 features juxtaposition of finite verb forms. In Stage 2, children make regular use of clause chain morphology, but primarily for modification purposes. In Stage 3, clause chains are the preferred strategy for sequential actions as well as modification purposes. The initial use of verb juxtaposition followed by increasing use of dedicated morphology is consistent with findings for Turkish converb acquisition, with speakers of both languages utilizing dedicated forms from around 2;6 onwards. A notable difference between the acquisition of Pitjantjatjara clause chains and Turkish converbs is in the order of acquisition of semantic functions. In Turkish, children acquire temporal functions, such as sequential actions, before modifying functions, such as manner specification. In Pitjantjatjara, the order is reversed, with children first using clause chaining constructions for modification and simultaneous aspects of events before utilizing them to combine sequential actions. This raises questions regarding the distribution and relative timing of event combination and modification strategies.

Keywords: Pitjantjatjara, language acquisition, clause chain, clause combining, converb, Australian languages

INTRODUCTION

Speakers of the Australian Indigenous language Pitjantjatjara often describe connected sequences of actions using clause chains (Goddard, 1988). These clause chain constructions consist of one or more non-finite verbs and one finite verb inflected for tense, aspect, or mood. The finite verb is typically chain final. The non-finite verbs are marked with a distinctive clause chain suffix and their tense, aspect, and mood values are inferred from those of the finite verb. A classic example can be seen in (1), with verbs marked in bold.

1.

Munu	kuka	*nyuti-ra*	*tjali-ra*
and.ss	meat	tie-MV	lift.onto.head-MV
ma-tjarpa-ra		*wani-ra*	*tjararpu-ngkula*
away-enter-MV		throw-MV	dig.pit-mv
ma-kati-ra		*ngura-ngka*	
away-bring-MV		camp-LOC	
pau-ra		*wanti-ngu*	
cook-MV		leave-PST[1]	

'And/then he tied up the meat (with sinew), put it on his head and carried it (to camp), he entered the camp and threw it down and dug a cooking pit, cooked it and waited.'

(Eckert and Hudson, 1988, p. 220)

Pitjantjatjara clause chaining constructions bear similarities to the clause chaining constructions of Papuan languages such as Nungon (Sarvasy, 2015) and Yimas (Foley, 1991, 2010). They also resemble the converb constructions of languages like Turkish (Slobin, 1995) and Japanese (Alpatov and Podlesskaya, 1995). They do not resemble the similarly named coverb constructions frequently reported in northern Australia. Coverbs refer to a distinct word class used in combination with verbs to create complex predicates (Baker and Harvey, 2010). Converb and clause chaining constructions are not widespread among Australian languages.

In this paper, I follow Haspelmath (1995) in viewing syntactic subordination as the distinguishing characteristic of converb as opposed to clause chaining constructions. Since the Pitjantjatjara constructions do not typically involve syntactic subordination – as discussed below – they are best viewed as clause chaining constructions. I then follow the Papuan terminology in referring to the non-finite verbs in the clause chain as *medial*.

Unfortunately, vanishingly little is known about the acquisition of converb or clause chaining constructions crosslinguistically. The notable exception to this is Turkish, which has been the focus of several studies (e.g., Slobin, 1982, 1995; Aksu-Koç and Slobin, 1985; Çapan, 2013). As Haspelmath (1995) notes, converb and clause chaining constructions share many common properties and are largely comparable. These strong similarities and the current data limitations motivate the present comparison between Pitjantjatjara clause chains and Turkish converbs.

The research on Turkish has found that children first juxtapose verbs, without converb morphology, in order to achieve converb-like functions (Aksu-Koç and Slobin, 1985). Then, from around the age of 2;6 onwards, Turkish speaking children begin to use converb morphology, as well as conjunctions, for expressing temporal and causal sequences (Aksu-Koç and Slobin, 1985). Temporal uses remain dominant until around 5 years

of age, when children begin to use converbs for a broader range of semantic functions including manner modification (Çapan, 2013). Finally, Slobin (1995) reports that the use of the converbs to combine elements into a single composite event, rather than a sequence of distinct events, is not acquired until approximately 7 years of age.

The present paper provides an initial account of how children acquire Pitjantjatjara clause chain constructions and to what extent this resembles the patterns observed in the acquisition of Turkish converbs. Before turning to the details of the study it is necessary to introduce the Pitjantjatjara language and its clause chains in more detail.

BACKGROUND

Introduction to Pitjantjatjara

Before colonization, 250 or more Indigenous languages were spoken throughout Australia. Today, approximately 120 of these are still spoken, with only 13 being learnt by children (Marmion et al., 2014). Pitjantjatjara (Glottocode: pitj1243, ISO 639-3: pjt) is one of these few Indigenous Australian languages still being learnt as a first language. It is currently spoken by roughly 3000[2] people, living primarily around the tristate region where the states of Western Australia and South Australia meet the Northern Territory, in the desert region of central Australia.

The language is classified as part of the Wati-Nyungic branch of Pama-Nyungan (Bowern and Atkinson, 2012) and forms part of the Western Desert dialect chain which extends across much of central and western Australia. Pitjantjatjara and its closest sister dialect, Yankunytjatjara, are largely mutually intelligible and are both described in one grammar (Goddard, 1985) and dictionary (Goddard, 1996).

Pitjantjatjara has relatively free word order, although the order Subject Object Verb has been reported as occurring more frequently (Bowe, 1990). Grammatical relations are indicated by case marking according to a tripartite case system common amongst Australian languages (Goddard, 1982). The three core cases, nominative (subject of intransitive verb), ergative (subject of transitive verb), and accusative (object of transitive verb), are marked differently for pronouns, common and proper nouns. There is a split case-marking system, where pronouns are marked according to a nominative-accusative pattern and other nominals are marked according to an ergative-absolutive pattern.

Verbs are divided into four four conjugation classes with distinct inflectional paradigms (Goddard, 1985). Verb class membership is largely based on phonology (specifically the number of morae) and transitivity. The two major conjugation classes consist primarily of verbs with an even number of morae and are either predominantly intransitive (class -Ø), e.g., *nyina* 'sit' and *pitja* 'come,' or transitive (class -l), e.g., *mantji-l* 'get' and *ngalku-l* 'eat.' The other classes (-n and -ng) consist of verbs with an odd number of morae, e.g., *tju-n* 'put' and *nya-ng* 'see.' Both these

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[1] Abbreviations used: 1 '1st person,' 2 '2nd person,' 3 '3rd person,' ACC 'accusative,' ANAPH 'anaphoric,' DS 'different subject,' DU 'dual,' ERG 'ergative,' FUT 'future,' GEN 'genitive,' HAB 'habitual,' IMP 'imperative,' INCHO 'inchoative,' INF 'infinitive,' INST 'instrumentative,' INTEREST 'particle indicating that there is something more to be said about this or something to follow as a result of this,' IPFV 'imperfective,' LOAN 'loan verb,' LOC 'locative,' MV 'medial verb,' NEG 'negative,' NOM 'nominative,' NOML 'nominalizer,' PL 'plural,' PRS 'present,' PST 'past,' PURP 'purposive,' QUOT 'quotative,' REDUP 'reduplication,' SEQ 'sequential,' SG 'singular,' SS 'same subject'.

[2] The latest census reports 3125 speakers (Australian Bureau of Statistics, 2016). However, census reports can be inaccurate (e.g., Morphy(ed.), 2007; Simpson, 2013; Dixon and Angelo, 2014). My own estimates place speaker numbers at a minimum of 2000.

classes contain many transitive verbs, though the -ng class is used for intransitives derived with the inchoative -ri, e.g., paku-ri-ng 'become tired.' Finite verbs are inflected for tense, aspect, and mood with the following distinctions: past (perfective or imperfective), present, future, habitual, imperative (perfective or imperfective) (Goddard, 1985).

Pitjantjatjara Clause Chains

Pitjantjatjara employs a clause chain construction in which a string of one or more non-finite verbs occurs with one finite verb. The chain typically describes sequential or simultaneous actions. All verbs typically share a single subject. Transitive verbs can, but do not necessarily, share objects. All verbs in the chain are understood to share the same broad temporal frame, made explicit in the tense, aspect, mood marking of the finite verb. The finite verb may also be nominalized in which case it does not carry tense, aspect, mood information. The most frequent example of this is in the negative, which is a nominal category in Pitjantjatjara and requires verbal nominalization. The form of the non-finite medial verb suffix varies only according to the conjugation class of the verb root. The finite verb is typically chain-final, as in (1) and (2), but not always, as in (3) and (4). Chains commonly consist of only two verbs, as in examples (2–4), but longer chains are often reported, for instance the eight verbs in example (1) above.

2. *kungka* *panya-ngku* *panya* *palunya*
woman ANAPH-ERG ANAPH.ACC 3.SG.ACC
mantji-ra *kati-ngu*
get-MV carry-PST
'The woman (you know the one) brought him.'
     PITJACQ_ O'Shannessy-narrative-
Sander[3]_20180411_N-adult:00:01:54[4]

3. *palunya* *kati-ngu* *mantji-ra* *kungka*
3.SG.ACC carry-PST get-MV woman
panya-ngku *panya*
ANAPH-ERG ANAPH.ACC
The woman (you know the one) brought him.'
     PITJACQ_ O'Shannessy-narrative-
Sander_20180411_N-adult:00:01:49

4. *nyura* *walkatju-nanyi* *pitja-la*
2.PL.ERG draw-PRS come-MV
'You come and draw.'
     PITJACQ_ Rachel_20161007_U-adult:00:36:17

The verbs in Pitjantjatjara clause chains typically share a subject, as in (1–4). This co-reference is typically full co-reference but may at times be partial, as shown by Goddard (1988) for Pitjantjatjara's sister dialect Yankunytjatjara. In (5), the subject of

the first verb is included in the subject of the second, and in (6) we see the reverse, where the subject of the second verb is a subset of the subject of the first.

5. *wanyu=na* *wapar* *walkatju-ra*
just let=1.SG.ERG story.ACC write-MV
wiya-ri-ngkula-mpa,
nothing-INCHO-MV-INTEREST
ngali-lta *yana-nyi-lta*
1.DU.NOM-and.then go-PRS-and.then
mutaka-ngka
car-LOC
'Just let me finish writing, and then we'll go (together) in the car.'

6. *nyuntu* *ngananana* *ya-nkula,* *ngayulu*
2.SG.NOM 1.PL.NOM go-MV 1.SG.ERG
nyuntu-la *watja-nma*
2.SG-LOC say-IMP.IPFV
'(If) you and I were going (together), I would tell it (a message to convey to father-in-law) to you.'
(Goddard, 1988, p. 179)

It is also possible for the verbs to have distinct subjects. Subject switch in Pitjantjatjara clause chains is typically marked with *ka*, as in example (7). *Ka* is also used to coordinate clauses with distinct subjects, as in (8). I have observed that speakers do not always mark the switch of subject when the context is sufficiently clear, for example see (9) and (10). At present, the only examples of unmarked subject switch I have observed from adults occur in narratives and with verbs which Goddard (1985, p. 106) described as denoting an "ambient change," for example (10). It is possible that unmarked switch-subject is a feature of child, rather than adult, Pitjantjatjara clause chaining.

7. *a-nkula* *a-nkula* *ka* *kutju* *punka-nu*
go-MV go-MV and.DS one fall-PST
'(They) were going and one of them fell.'
     PITJACQ_O'Shannessy-narrative-
Sander_20180411_N-adult:00:01:33

8. *NAME[5]* *tuwa* *ala-la* *ka* *nyangatja*
NAME door.ACC open-IMP and.DS here
punka-ni *kuwari*
fall-PRS now
'NAME open the door! (He) is about to fall.'
     PITJACQ_Andrew_20170506_H-adult:00:17:20

9. *kuwari=na* *kantu-ra* *ula-nyi*
now=1.SG.ERG kick-MV cry-PRS
'I'll kick (you), (you) cry.'
     PITJACQ_Winfred_20160929_U-7;7:00:20:22

---

[3] All names used in this paper are pseudonyms.

[4] Examples from my own data are referenced with PITJACQ(for the Pitjantjatjara Acquisition corpus)_Filename(which consists of the focus child id or other recording reference with primary speaker name_date of recording in YYYYMMDD format)_Speaker reference(if not described in text):time reference in HH:MM:SS format.

[5] Personal names quoted in examples are replaced with NAME.

10. *munga-ri-ngu*   *alatjitu*   *kita*
   night-INCHO-PST   completely   guitar.ACC
   wangkatjinga-ra   *wangkatjinga-ra*
   play-MV   play-MV
   'He played and played the guitar until it became night.'

   PITJACQ_O'Shannessy-narrative-
   Sander_20180411_N-adult:00:03:17

The order of verbs does not necessarily match iconic event order. This can be seen in (3), (4), and (10), where the action referred to by the finite verb occurs after that referred to by the medial verb, even though the finite verb precedes the medial verb. There is a strong tendency for the action described by the finite verb to temporally follow or overlap with actions described by medial verbs. This is not a strict rule, however, as can be seen for instance in example (25). The pattern of chain-final medial verbs with non-iconic event ordering resembles the postposed medial clauses of Nungon (Sarvasy, 2015).

The examples in (2) and (3) show some of the word order variations possible in Pitjantjatjara. Here we have the same speaker referring to the same event in consecutive utterances first with the order Object Verb_FINITE Verb_MEDIAL Subject, in example (3), and then Subject Object Verb_CONVERB Verb_FINITE, in example (2). This second order is possibly more common, but the first ordering is equally acceptable. According to Stassen (1985) and Givón (1990), finite-final clause chains are typologically associated with Object-Verb basic word order whereas finite-initial clause chains are typologically associated with Verb-Object basic word order. Since Pitjantjatjara word order is free, it would be plausible for the position of the finite verb to also vary freely. However, this is not the case. Bowe (1990) presents evidence suggesting that the position of the finite verb reflects two distinct syntactic subtypes. When the chain is finite-final, as is most frequent, the case of the shared subject is determined by the chain as a whole – if any verb in the chain is transitive, the subject is marked ergative, as in (11) and (12). However, if the chain is finite-initial, the case of the subject is determined by the finite verb alone. This can be seen in (13) where the subject is nominative if the intransitive verb is finite, but ergative if the transitive verb is finite.

11. *nyanga-ngku*   *mutupaiki-tjara-ngku*   *panya*
    this-ERG   motorbike-having-ERG   ANAPH
    wati-pitja-la   *nya-ngu*
    across-come-MV   see-PST
    'This one with the motorbike, you know, came across and saw.'

    PITJACQ_O'Shannessy-narrative_Sander_20180411_
    N-adult:00:08:38

12. a.   *minyma-ngku*   *mai*   *mantji-ra*
         woman-ERG   food.ACC   get-MV
         ngalya-pitja-ngu
         this.way-come-PST
         'Having got food, the woman came back.'

b.   *minyma   *mai*   *mantji-ra*
        woman.NOM   food.ACC   get-MV
        ngalya-pitja-ngu
        this.way-come-PST

c.   *minyma-ngku*   *ma-pitja-la*   *mai*
        woman-ERG   away-come-MV   food.ACC
        mantji-nu
        get-PST
        'Having gone out, the woman got some food.'

d.   *minyma   *ma-pitja-la*   *mai*
        woman.NOM   away-come-MV   food.ACC
        mantji-nu
        get-PST

(adapted from Bowe, 1990, p. 91)

13. a.   *minyma*   *ngalya-pitja-ngu*   *mai*
         woman.NOM   this.way-come-PST   food.ACC
         mantji-ra
         get-MV
         'The woman came back, having got food.'

b.   *minyma-ngku   *ngalya-pitja-ngu*   *mai*
        woman.ERG   this.way-come-PST   food.ACC
        mantji-ra
        get-MV

c.   *minyma-ngku*   *mai*   *mantji-nu*
        woman-ERG   food.ACC   get-PST
        ma-pitja-la
        away-come-MV
        'The woman got some food when she went out.'

d.   *minyma   *mai*   *mantji-nu*
        woman.NOM   food.ACC   get-PST
        ma-pitja-la
        away-come-MV

(adapted from Bowe, 1990, p. 91)

These case marking patterns suggest that the finite-initial chains involve syntactic subordination while the finite-final chains do not. In the finite-initial cases, the transitivity of the medial verb does not impact on the case marking of the matrix clause subject. This indicates that the medial verb phrase is syntactically subordinate to the matrix clause. In contrast, with the finite-final chains, the transitivity properties of both verbs impact on the case marking of the subject, indicating that neither is syntactically subordinate.

Pitjantjatjara clause chains may also be divided according to their clausality. Goddard (1985, 1988) distinguishes these as Tight versus Loose constructions. The Loose constructions are those such as (1), (5), (6), (7), and (11). They can contain two or more verbs; arguments and other elements may occur between the verbs; and the verbs may have distinct or shared arguments. These are multiclausal constructions – chains of clauses. In contrast, Goddard's Tight constructions are like those in (2), (3), and (4). These constructions contain only two verbs. The arguments are shared and are expressed to either side of the verbs, with

no elements occurring between the verbs. The verbs refer to actions with a tight semantic link and work together to form a single predicate within a single clause. While this distinction is important for the syntactic description of Pitjantjatjara clause chains, it is often difficult, or impossible, to determine in practice whether a particular example consists of multiple clauses or not. Most Pitjantjatjara clause chains consist of two verbs only and, given argument ellipsis and word order variations, the two verbs are often adjacent. In these cases, Goddard (1985, 1988) relies on the typicality of the verb pairing. There is, however, evidence to suggest that individual verb pairings can occur in both multi- and monoclausal chains. For instance, the verbs 'go' and 'gather' are identified by Goddard (1985, 1988) as a typical Tight construction verb pair, as seen in (14). However, these same verbs frequently occur in my data with the object intervening and therefore as a Loose construction, as seen in (15). Given the difficulties in consistently distinguishing multiclausal and monoclausal chains, I will not attempt to make the distinction in the present analysis.

14. | *paluṟu* | *nyiinyii* | *ya-nkula* | *ura-ṉu* |
    |---|---|---|---|
    | 3.SG.ERG | zebra.finch.ACC | go-MV | gather-PST |

'She went and gathered zebra finch (droppings).'

(Goddard, 1988, p. 180)

15. | *a-nkula* | *puli* | *tjuṯa* | *ura-la* |
    |---|---|---|---|
    | go-MV | rock.ACC | PL.ACC | gather-IMP |

'Go gather rocks!'

PITJACQ_Tabitha_20180407_S-adult:00:03:43

While Pitjantjatjara clause chains are predominantly used to refer to sequences of actions, as described above, some Pitjantjatjara clause chains can be used for modificational, rather than sequential, functions. Possibly the most common of these is the repetition of a verb in the medial form to indicate that the event was repeated or extended over a long time. The number of repetitions indicates the degree of repetition or extension. The example in (16) shows one of these repetitions within a sequential action clause chain.

16. | *tjawa-ra* | *tjawa-ra* | *palu* | *nya-ngu* |
    |---|---|---|---|
    | dig-MV | dig-MV | 3.SG.ERG | see-PST |
    | *kapi* | *ngari-nyi* | *uru-ngka* | *panya* |
    | water | lie-PRS | waterhole-LOC | ANAPH |

'He dug and dug then saw water lying in that waterhole.'

PITJACQ_O'Shannessy-narrative_
Sander_20180411_N-adult:00:10:50

A subset of verbs, such as *wiru* 'make beautiful' and *alatji* 'do like this,' can be used as adverbials in their medial form. In these cases, the finite verb is semantically and syntactically dominant and determines the case marking of the subject, as can be seen in example (17).

17. | *minyma* | *kutjara* | *wiṟu-ra* | *nyina-ngi* |
    |---|---|---|---|
    | woman | two.NOM | make.nice-MV | sit-IPFV.PST |

'The two women were sitting nicely.'

PITJACQ_Narrative-K-U_20171003_K-adult:00:01:03

Conversely, there is a set of verbs which can be used as finite verbs in clause chains with an aspectual function. For instance, in example (18), it is the intransitive medial verb *ngara* 'stand' which controls the nominative case marking of the subject, while the transitive finite verb *waṉi* 'throw' indicates that the action, or stance in this case, is distributed. Note that these medial and finite modifying verbs are often semantically bleached.

18. | *puluka* | *tjuṯa* | *ngaṟa-la* | *waṉi-nyi* |
    |---|---|---|---|
    | cattle | PL.NOM | stand-MV | throw-PRS |

'The cattle are standing all spread out.'

(adapted from Goddard, 1985, p. 105)

Finally, while clause chains are a preferred way to describe sequential actions in Pitjantjatjara, there are alternatives: clause juxtaposition; coordination; and subordinate circumstantial clauses. Clause juxtaposition and coordination involve sequences utterances each with phrase final intonation patterns, marked here by a comma, as can be seen in the excerpt of a narrative provided in (19). The subordinate circumstantial constructions combine a maximum of two actions and make a same- versus different-subject distinction. The different-subject form -*nyangka* can be seen in example (20a) and the same-subject form -*nytjatjanu* can be seen in (20b). The same-subject form is more semantically restricted and can only be used when there is a strictly sequential temporal relationship between the actions, in other cases a clause chain is used. The order between subordinate and finite clauses varies and does not necessarily relate to iconic event order, as can be seen in examples (21) and (22). Bowe (1990) convincingly argues for the subordinate status of these clauses based in part on the fact that they do not influence the case marking of the matrix clause subject, as can be seen in example (23).

19. | *mutuka-li* | | *kati-ku,* | |
    |---|---|---|---|
    | car-1.SG.ERG | | drive-FUT | |
    | *munu* | *pula* | *kati-ngu,* | |
    | and.SS | DU | drive-PAST | |
    | *punu* | *tjuta* | *ngapartji* | *pula* |
    | wood | PL | in.turn | DU |
    | *ila-ningi,* | | | |
    | make.close-PST.IPFV | | | |

'We two will drive the car, and two drove, took turns collecting wood.'

PITJACQ_O'Shannessy-narrative_
Sander_20180411_N-adult:00:05:12

20. a. | *nyuntu* | *a-nkunyangka* | *ngayulu* |
    |---|---|---|
    | 2.SG.NOM | go-INF.DS | 1.SG.ERG |
    | *nya-kuku* | | |
    | see-FUT | | |

'You having gone, I shall see.'

   b. | *a-nkuntjatjanu* | *ngayulu* | *nya-kuku* |
    |---|---|---|
    | go-INF.SS | 1.SG.ERG | see-FUT |

'Having gone, I shall see.'

(Adapted from Trudinger, 1943, p. 215)

Clause chain					Subordinate circumstantial		
		Sequential		**Modifying**	**Switch subject**	**Same subject**	
					-nyangka	*-nytjatjanu*	
Finite-initial	**Finite-final**	**Loose**	**Tight**				
		(Distinction collapsed for present study)					
Finite verb controls case marking Medial verb clause is subordinate	All verbs influence case marking	One or more medial verbs Arguments and other elements can occur between the verbs Loose connection between actions	No more than one medial verb No arguments between verbs Tight connection between actions	Adverbial, postural, aspectual modification Finite verb plus maximally one lexically distinct medial verb	Temporal sequence or overlap, as well as causal interpretations Main clause plus maximally one subordinate clause	Temporal sequence only Main clause plus maximally one subordinate clause	

21. *punka-nu*   *panya*   *palu*   *punu*
     fall-PST   ANAPH   3.SG.NOM   tree
     katakati-nyangka
     break-INF.DS
     'He fell, when/because the branch broke.'
                           PITJACQ_O'Shannessy-narrative_
                           Sander_20180411_N-adult:00:08:00

22. *uwa,*   *dry-ri-ngkunyangka*   *nyura*   *painta-mi-ni*
     yes   dry-INCHO-INF.DS   2.PL.ERG   paint-LOAN-PRS
     'Yes, you paint while it dries.'
                           PITJACQ_Winfred_20170427_E-adult:00:33:54

23. a. *minyma-ngku*   *mai*   *pulka*
         woman-ERG   food   big.ACC
         mantji-nu   *ngura-ngka*
         get-PST   place-LOC
         wirka-ntjatjanu-ngku
         arrive-INF.SS-ERG
         'When the woman arrived at the right place, she got
         lots of food.'
     b. **minyma*   *ngura-ngka*
         woman.NOM   place-LOC
         wirka-ntjatjanu   *mai*   *pulka*
         arrive-INF.SS   food   big.ACC
         mantji-nu
         get-PST
         ≠ 'When the woman arrived at the right place, she
         got lots of food.'
     c. **minyma*   *mai*   *pulka*
         woman.NOM   food   big
         mantji-nu   *ngura-ngka*
         get-PST   place-LOC
         wirka-ntjatjanu-ngku
         arrive-INF.SS-ERG
         ≠ 'When the woman arrived at the right place, she
         got lots of food.'
     d. *minyma*   *mai*
         woman.NOM   food

mantji-ntjatjanu   *ngalya-pitja-ngu*
get-INF.SS   this.way-come-PST
'When she had got some food, the woman came back.'
                           (Bowe, 1990, p. 87)

Pitjantjatjara clause chains and related constructions are summarized above in **Table 1**. There are many similarities with Turkish converbs and related constructions, but also some differences. Both languages employ chains of non-finite verbs together with a finite verb form to combine sequential and simultaneous actions, as well as using non-finite for more modifying, adverbial-type functions. However, while Pitjantjatjara has a single medial form, which is used with all converb functions, Turkish has a range of converb forms, a more generic form *-ip* resembling the Pitjantjatjara medial verb form as well as several others with more specific semantics (Slobin, 1995). Pitjantjatjara clause chains are predominantly used in same-subject situations, where there is a single, shared subject for all verbs in the construction. In contrast, individual Turkish converb markers can either be same-subject, different-subject, or used in both contexts (Slobin, 1995). Turkish also makes a morphological distinction between converbs which are specialized for 'looser' temporal linkage, such as *-ince* and *-erken*, and a converb form *-erek*, which is used to bind elements together into a single composite event (Slobin, 1995). Both languages also employ nominalized verbs in subordinate clauses as alternative strategies for linking sequential and simultaneous actions.

If Pitjantjatjara children acquire these constructions in a similar way to Turkish children, we might expect: an initial stage of verb juxtaposition before use of dedicated morphology; use of clause chain based strategies before subordinate strategies; and the use of clause chains for loose temporal linkage before adverbial modification and finally tighter binding of sequential elements into a single event.

MATERIALS AND METHODS

Participants

The present research is based on data collected in Pukatja (also known as Ernabella), one of the largest communities in the Anangu Pitjantjatjara Yankunytjatjara (APY) lands of central Australia and home to approximately 500 people. Pitjantjatjara

FIGURE 1 | Number of utterances per age group.
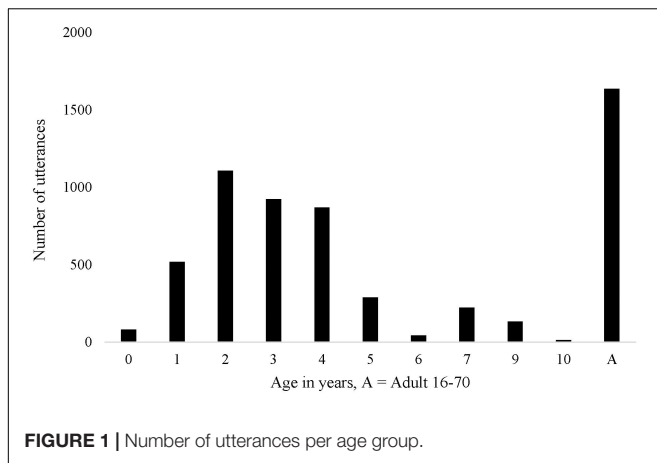
is the primary language of the community and the first language of the majority of children, some of whom also speak other languages, including Warlpiri and Yolngu Matha, in the home. All children subsequently learn English at school, typically from 3 years of age onwards.

The data for this study comes from an ongoing longitudinal investigation of Pitjantjatjara language acquisition. This broader study includes 13 focus children aged between 10 months and 4 years at time of first recording. Ideally, focus children are recorded at least once every 6 months over 3 years, however, the tendency for families to travel means there are many missing timepoints in this dataset. The ongoing process of transcription means there are yet more gaps in the currently available dataset. For the purposes of this study, I include all currently transcribed speech from the corpus. This includes approximately 4200 utterances from 28 children aged 10 months to 10 years and 1600 utterances from 21 female adults between the ages of 16 and 70, see **Figure 1** for an overview of the data distribution across the ages. The majority of the child utterances (67%) are produced by five focus children: Simon (age range 1;4–2;11[6]), Andrew (1;9–4;3), Daniel (2;8–5;3), Rachel (2;11–3;6), and Emily (2;11–3;11). The other 23 children have either been transcribed in one session only or are non-focus children who appear in the recordings. Given the current gaps in the longitudinal data, I first analyze the data cross-sectionally, including the speech of all children at similar ages and stages of development. Finally, I check that the cross-sectional findings are consistent with the individual trajectories of these five focus children.

Data Collection

Data was recorded in naturalistic settings with the focus child freely interacting with one or more adult caregivers and, in most cases, other children as well. Individual recording sessions range between 30 min and 3 h in duration. The focus children wore a small bag with a microphone which recorded their own speech, as well as that of others nearby. Most sessions were also video recorded. Adults and children were aware that the focus of the activity was the child's speech and in some cases adults

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[6] Ages given in year;month format.

encouraged children to talk, at other times adults left the children free to determine how they engaged with the recording session, including how much, or whether, they talked, what they talked about, and what activities they engaged with.

Data Analysis

Recordings were transcribed in ELAN (Wittenberg et al., 2009) with the assistance of Pitjantjatjara native speakers, typically the mother or grandmother of the focus child. Utterance boundaries were determined by conversational turns or intonational breaks. Child utterances were transcribed phonologically and, where it differed, the caregiver's interpretation was transcribed on a separate tier.

Instances of clause chains, subordinate circumstantial constructions, and any other utterances with multiple verbs within a single intonation unit were noted and counted. Repetitions of a recent utterance by the child or an interlocutor were not included in the token counts. Clause chains were coded for the number of distinct lexical verbs, finite verb position, and function. The mean length of utterance (MLU) was calculated if the speaker produced 50 utterances or more within the recording session. It was calculated as a morpheme count per utterance, excluding false starts and repetitions (but counting functional reduplication), and counting irregular or portmanteau forms as single morphemes. All statistical analyses were performed using R (R Core Team, 2018).

RESULTS AND DISCUSSION

Adult Usage

Before considering the trajectory of acquisition, it is helpful to examine how adults use clause chains in their speech to and around children. The corpus contains 1637 utterances from 21 adults, all female. These adults are predominately mothers, grandmothers, and aunts of the focus children. Transcription efforts have focused on child-directed speech, so these utterances are largely child-directed.

An initial examination of utterances according to the age of addressee was performed. The mean length of utterance (MLU) was reduced with younger addressees, as is common with child-directed speech (e.g., Cross, 1977). This reduction was particularly noticeable in speech to infants. The average MLU of all adult utterances directed to the youngest child (0;10) was 1.5 morphemes per utterance. In contrast, the MLU of adult speech directed to 3- and 4-year-olds, 3.3, approached that of speech directed to adults, 3.7. Reduction of the average utterance length was most commonly achieved by ellipsis of arguments (e.g., *punkaṉu* 'fell' for 'you fell') or frequent utterances consisting of a single nominal (e.g., *tjutju* 'doggiewoggie'). No differences in the use of clause chains were observed according to age of addressee: The frequency of use, length of the chain, and morphosyntactic and semantic types of clause chains were all similar, regardless of the age of the addressee. This does not necessarily mean that adult Pitjantjatjara speakers do not modulate their clause chain use according to age of addressee, but a more thorough

Juxtaposed finite		Clause chain			Subordinate	
Sequential	Simultaneous	Sequential	Simultaneous	Medial only	Switch subject	Same subject
12	1	31	21	4	7	0

investigation of both adult- and child-directed speech would be needed to evaluate this.

Clause chains were present in 56 of the 1607 utterances, i.e., 3%, as seen in **Table 2**. This frequency is much lower than suggested by earlier descriptions of the language (Goddard, 1985; Bowe, 1990), a point I will return to below.

Thirty-one of the clause chains described sequential actions, as in examples (24 and 25). Twenty were used for adverbial or aspectual modification, as in examples (26 and 27).

24. A is calling her daughter (9) to come look at something with her:

    A: *NAME   nyangatja   pitja-la   nya-wa*
        NAME   this   come-MV   see-IMP
        'NAME come look at this.'

                          PITJACQ_Frank_20161006:00:21:00

25. A instructs her daughter (9) to use a lighter to start the fire (Follows immediately from preceding example):

    A: *waṟu-ngka   pala   tili-ra   ngalya-kati*
        fire-INST   that   light-MV   this.way-bring.IMP
        'Bring it this way and light it with that fire (cigarette lighter).'

                          PITJACQ_Frank_20161006:00:21:02

26. P instructs the two children (3;2 and 4;2), who have been arguing, to play nicely with each other:

    P: *ka   nyupali   wiṟu-ṟa*
        and.DS   2.DU.NOM   do.properly-MV
        inka-nma
        play-IMP.IPFV
        'And so, you two be playing nicely.'

                          PITJACQ_Andrew_20180323:00:24:53

27. The children have been playing hide-and-seek. P suggests a hiding spot to her son (4;8):

    P: *wiya   kumpi-ra   nyina-nyi   alatji*
        no   hide-MV   sit-PRS   like.this
        'No, be hiding like this.'

                          PITJACQ_Daniel_20180926:00:23:43

The majority of the clause chain constructions are finite-final. However, 12 or 21% are finite-initial, as in examples (28 and 29).

28. B tells U (her adult daughter) to tell B's other adult daughter to come and look at what they are doing. U does so, saying:

    U: *nyawa   kunyu   pitja-la*
        see-IMP   QUOT   come-MV
        'Come look, someone says.'

                          PITJACQ_Winfred_20160929:00:13:32

29. L tells her son (1;9) to get up and move away from where he is playing:

    L: *ara   paka-ra*
        go.IMP   get.up-MV
        'Get up and go!'

                          PITJACQ_Andrew_20161010:00:14:19

Most chains consisted of two verbs, and the longest chains contained three verbs, as in example (30). The average number of verbs in a chain was 2.1. There were also sentences with medial verbs but no finite verb, as in example (31). These medial-verb-only clauses were not reported in previous descriptions of the language. They are used for polite imperatives or continuing aspect, functions which are also noted for similar non-canonical medial verb clauses in the Papuan language Nungon (Sarvasy, 2015).

30. A is giving her daughter (9) advice on how to deal with schoolyard bullies

    A: *nyuntu   kuli-ra   wanti-ra*
        2.SG.ERG   listen-MV   leave.alone-MV
        a-nama
        go-IMP.IPFV
        'You don't take notice (of those kids) and keep going.'

                          PITJACQ_Frank_20161006:00:31:32

31. L (mother) is redirecting a request from the two children (3;2) and (4;2)

    L: *pula   NAME-la   wangka-ra*
        DU   NAME-LOC   ask-MV
        'Two, be asking NAME.'

                          PITJACQ_Andrew_20180323:00:01:26

There were no examples in this conversational corpus of adult clause chains with different subjects, although these occur in narratives, see examples (6) and (9). In this corpus, the dedicated switch-subject subordinate constructions formed with *-nyangka* was used in all the switch-subject contexts, for instance (32). No examples of the same-subject consecutive action marker *-nytjatjanu* were observed in this sample.

32. P is talking to her son (4;8) about the bubbles he is trying to blow:

    P: *uwa,   ngara-nyangka   paluṟu*
        yes   stand-INF.DS   3.SG.NOM
        katu-ri-nganyi
        high-INCHO-PRS
        'Yes, it (the bubble blower) stays (there) and it (the bubble) goes up.'

                          PITJACQ_Daniel_20180926:00:23:43

This pattern of usage for clause chain constructions and switch-subject subordinate constructions largely conforms to previous descriptions of the language (e.g., Goddard, 1985; Bowe, 1990). The main difference is that clause chains are less frequent and shorter than suggested by previous descriptions. This is likely, at least in part, due to the wide range of genres and speech contexts contained in the present recordings. Sequences of chained actions are likely to be more common in particular contexts, such as narratives, where speakers are more want to describe sequences of actions (Slobin, 1995).

One construction observed among the adult utterances in this sample is not reported in previous descriptions of Pitjantjatjara. In addition to the clause chains discussed above, there were 13 utterances containing strings of finite verbs in the imperative, (e.g., 33 and 34). These imperative verb strings have no explicit marking of coordination. In contrast to other juxtaposed clauses discussed above, they are impressionistically produced as a single intonational unit and serve the same range of functions (often with the same verbs and in the same contexts) as clause chains. They most typically describe sequences of actions performed by a single actor (e.g., 33 and 34). There is also one example which refers to simultaneous actions, shown here in (35). This strategy has not been discussed in earlier descriptions of the language (e.g., Goddard, 1985; Bowe, 1990; Rose, 2001; Langlois, 2004). All the adult examples are instructions to children and in imperative mood. This construction may be a feature of child-directed speech and potentially restricted to imperatives. Future investigation in a more varied corpus of adult speech would be needed to evaluate this.

33.   F is calling her granddaughter (0;10) to come closer and watch her prepare kangaroo tails for cooking:
      F: *NAME*   *pitja*   *nya-wa*
            NAME   come.IMP   see-IMP
            'NAME come look'
      Granddaughter continues to crawl away.
                                PITJACQ_Anne_20170919:00:06:20

34.   S is moving the recording session to a different place. She tells one of the children (3;10) to pick up his toy and carry it to the new place:
      S: *mantji-la*   *mantji-la*   *toy*
            get-IMP   get-IMP   toy.ACC
            ngalya-kati
            this.way-bring.IMP
            'Pick up the toy and carry it this way.'

      Child picks up toy and follows her.
                                PITJACQ_Simon_20190417:00:11:51

35.   K (16) to younger sister (3;6).
      K: *nya-wa*   *pata-la*
            see-IMP   wait-IMP
            'Watch and wait.'
                                PITJACQ_Rachel_20170507:00:05:35

Stages of Acquisition: Cross-Sectional Analysis

In order to capture the overall progress of acquisition, all utterances from all children with similar MLU (or age, once MLU reached adult levels) were examined to identify patterns of usage. This analysis suggested five clusters, as seen in **Table 3**.

A Pearson chi-squared analysis was carried out to test for significant differences in patterns of usage across these initial clusters. This compared proportions of use for each construction type across age groups. Significant differences between groups were noted, $\chi^2(1, N = 25) = 101.31, p < 0.001$. *Post hoc* comparisons with Bonferroni correction showed three significantly different groups or stages of acquisition, as discussed below.

Stage I: Finite Juxtapositions

In this earliest observed stage of the acquisition of Pitjantjatjara converb constructions, children are typically achieving clause chain functions by juxtaposing finite verbs, rather than using medial verb morphology. This mirrors the earliest stage of Turkish converb acquisition, where children primarily use juxtaposition in place of converb morphology until around the age of 2;6 (Aksu-Koç and Slobin, 1985). In Pitjantjatjara, this pattern was observed among children with MLUs between 1.1 and 2.5 and between the ages of 1;9 and 2;11. See **Table 4** for details of individual children within this range.

There is a tendency for the younger children, with MLUs between 1.1 and 1.5, to use juxtaposed finite verbs to refer to simultaneous aspects of the same event, as in examples (36) and (37). In contrast, older children, with MLUs between 2.1 and 2.4[7], tended to use verb sequences to refer to sequential actions, as in examples (38) and (39). This resembles the tendency for English-acquiring children to use multiclausal constructions for describing single before multiple situations (Diessel, 2004). It also bears a resemblance to early word plus gesture combinations, where children initially combine gestures and words in relation to the same element, before combining words and gestures relating to distinct elements, and then finally

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[7]There were no children in this sample with MLUs between 1.5 and 2.0.

TABLE 3 | Children's clause chain use: number of tokens (percentage of total for that age group).

	Juxtaposed finite		Clause chain			Subordinate	
	Sequential	**Simultaneous**	**Sequential**	**Simultaneous**	**Medial only**	**Switch subject**	**Same subject**
Adults	12 (16%)	1 (1%)	31 (40%)	21 (28%)	4 (5%)	7 (9%)	0
MLU 1.1–1.5	1 (14%)	4 (57%)	0	0	2 (29%)	0	0
MLU 2.1–2.4	3 (60%)	1 (20%)	1 (20%)	0	0	0	0
MLU 2.5–4.1	5 (20%)	1 (4%)	3 (12%)	14 (56%)	2 (8%)	0	0
4 to 6 years	4 (9%)	0	20 (47%)	12 (28%)	6 (14%)	1 (2%)	0
6 to 10 years	3 (21%)	0	5 (36%)	1 (7%)	3 (21%)	2 (14%)	0

TABLE 4 | Clause chain and finite verb juxtapositions produced by children with an MLU between 1.1 and 2.4.

Child	Age	MLU	No. of Utterances	Juxtaposed finite		Clause chain		
				Sequential	Simultaneous	Sequential	Simultaneous	Medial only
A	1;9	1.2	121		1			
S	2;4	1.5	295	1	1			1
S	2;5	1.5	275		2			
F	2;6	2.1	101	1				
D	2;8	N/A	12			1		
E	2;11	2.1	152	1				
W	2;11	2.4	68	1	1			
	Totals		1431[1]	4	5	1	0	1

For clarity, zeros are not marked. [1]Note the total includes all utterances produced by children within this MLU range. Some of these children did not produce relevant utterances during a recording. However, given the low frequency of these constructions and their number of utterances, the absence of tokens could not be taken as evidence that they were not at the same stage of acquisition. Their utterances are, therefore, maintained in the total number of utterances count and used for calculating overall frequency values. Including their utterances yields a frequency of 0.8% for verb juxtapositions plus clause chains, which is the same frequency found when only considering sessions with more than 100 utterances.

producing word combinations referring to distinct elements (Kelly, 2014).

36. Andrew (1;9) is sitting and playing, when his older brothers come up and start to hassle him. He yells (repeatedly):
   A: *a-ya   tju-ya*
      a-ra   tju-ra[8]
      go-IMP   put.down-IMP
      'Go away and leave me alone (mother's interpretation).'
   His older brothers move away.
   PITJACQ_Andrew_20161010:00:09:39

37. Simon (2;5) is trying to draw his friend over to play somewhere else.
   S: *letsko   pitja*
      let's go   come.IMP
      'Come, let's go!'
   PITJACQ_Simon_20181031:00:53:26

38. Frank (2;6) has an empty cup.
   F: *mami!*
      Mother
      'Mum!'
      paka-la   tjuti-li   paka-la
      'Get up and fill.'
      get.up-IMP   fill-FUT/IMP[9] get.up-IMP
      tjuti-li   paka-la
      fill-FUT/IMP   get.up-IMP
      (repeated another three times)
      'Get up and fill.'
   M: *Nyaa-na   paka-ra   tjuti-lku?*
      what-1.SG.ERG   get.up-MV   fill-FUT
      'What (should) I get up and fill?'
   PITJACQ_Frank_20161006:00:37:29

39. The wind has caught up a stack of papers and blown them away. While Emily (2;11) and her family are running around trying to collect them, Emily says:
   E: *witi-la   nguri-la   mantji-la   mantji-la*
      grab-IMP   search.for-IMP   get-IMP   get-IMP
      'Grab (it), find (them), get (them), get (them)!'
   PITJACQ_Emily_20170928:00:56:47

Most of the juxtaposed verbs are in the imperative, as in examples (36, 37 and 39). This is a pattern also observed in the older child and adult finite verb juxtapositions, as in examples (33–35). There is then a question as to whether these juxtapositions are an early form of clause chaining or a specific form of imperative coordination. A definitive answer would require a larger sample, however, the present data suggests these verb juxtapositions are precursors to clause chaining. Firstly, there is a general bias toward the imperative in this dataset. The imperative is the most frequent form of the verb in this dataset: 67% of the verb forms produced by children in this MLU bracket are in the imperative. Imperatives are also the most frequent form of the finite verb within clause chains, making up 50% of all clause chains. Secondly, there are exceptions where other verb forms are juxtaposed. Indeed, only six of the nine verb juxtapositions are imperative, a proportion which perfectly matches that of imperative verb form use more generally within this group. One instance is in the negative and two are in the past. The example in (40) is the clearest with both verbs marked for past tense. The juxtaposition shown in example (41) shows one of the difficulties in judging these cases. Simon is reporting a series of events which occurred in the recent past, so the utterance has a past

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[8]Where two lines of transcription are given, the first line refers to the child's pronunciation and the second provides the adult forms or adult interpretation.

[9]This form is difficult to interpret. It is likely a reduced or harmonized form of the future tense marker *-lku* or the imperative mood marker *-la*. There are no clear examples in Frank's speech of this form to compare with, but Frank and other children of similar ages typically reduce consonant clusters and harmonize vowels. Thus, both *-lku* and *-la* could easily be produced as *-li* in this context. There is also a form *-li*, which indicates 1st person dual subject. This seems unlikely in this context as the subject is interpreted as 2nd person singular and Frank does not use any of these subject marker clitics in his other speech yet and they are typically acquired much later around 4 years of age.

interpretation. The first verb is clearly marked for past tense. The second verb is pronounced as the bare verb root, which in this conjugation class is the form of the imperative. This second verb could then be interpreted as an (inappropriate) usage of the imperative, a past tense form with the final syllable elided[10], or a bare verb stem. Finally, these verb juxtapositions are utilized to achieve functions typically performed by clause chains and adult caregivers interpret them as clause chains, as can be seen in (39).

40. Wally (2;11) is playing with some friends, opening the windows of the car and trying to throw balls through to the other side. He reports:

    W: *ala-nu*   *puṯa-nu*
          open-PST   miss-PST
          '(She) opened and missed.'
                  PITJACQ_Wally_20180928:00:18:16

41. Simon (2;4) is playing with a ball which rolls away around the corner. He follows it and comes back with the ball. His mother praises him saying 'clever boy'. Simon says:

    S: *a-nu*   *nyina*
          go-PST   sit
          'Went and sat.' (referring to the ball and how it rolled away and stopped just around the corner out of his mother's sight)
                  PITJACQ_Simon_20180925:00:09:12

It is interesting to note that while juxtaposed verbs occur in only 1% of the utterances by children within this sample, they appear to be among the early word combinations produced by Pitjantjatjara speaking children. The children with MLUs between 1.1 and 1.5 are all in the two-word stage – where they are producing some two-word utterances among a majority of single word utterances. A count of two-word combination types shows that Action-Action combinations are as frequent as Agent-Negation, Object-Attribute, Possessor-Possessum, and Action-LOCation combinations, as seen in **Table 5**. Many of these other combination types are typically noted in studies of early word combinations in other languages (Slobin, 1970; Bowerman, 1973), however, I have not seen Action-Action combinations noted. This early combination of actions may be a feature of clause chaining languages.

Although juxtaposition is the dominant strategy in this age bracket, medial verb forms are not entirely absent. Daniel (2;8) produces the very adult-like clause chain shown in (42). Unfortunately, there are not enough utterances from Daniel at this age to accurately determine his MLU and he has been placed in this bracket based on his age alone. It could be that he is in fact at a more advanced stage of clause chain acquisition. It is also possible that this particular construction is one which Daniel hears more frequently and has thus learnt to repeat.

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[10] Reduction of the final syllable, TAM marker, is common in adult Pitjantjatjara and often only leaves a part of the nasal onset. Syllable deletion is also a common feature of child speech.

TABLE 5 | Two-morpheme utterance types among children with MLUs between 1.1 and 1.5.

Type	Number of tokens	Number of speakers (4 max)	Age range	Example
Action and Agentive	50	3	1;9–2;11	*Mami* (Mummy) *ala* (open)
Action and Objective	24	3	1;9–2;4	*Pala* (that) *nya* (see)
Agentive and Objective	14	2	1;5–2;11	*Mama* (mother) *ama* (breastmilk) [Mother give me breastmilk]
Action and Negation	9	2	1;9–2;5	*Antuntji* (hit) *wiya* (no)
Agentive and Location	9	1	1;11–2;5	NAME *malak* (back) [NAME spray me in the back]
Action and Action	5	2	1;9–2;5	*anu* (went) *nyina* (sit)
Agentive and Negation	5	2	2;1–2;5	NAME *wiya* (NAME, no)
Objective and Attribute	4	1	2;4–2;11	*Pina* (ear) *maru* (dark colored)
Possessor and Possessum	4	2	0;10–2;4	NAME *kuka* (meat) [N's meat]
Action and Locative	3	1	2;4–2;5	*Paya* (go away) *putu* (far)

42. Daniel (2;8) has been sliding down a sandhill with his brothers. He then reports to his mother:

    D: *rita-ya*   *punka-nu*   *munu*
          rita-ṟa   *punka-nu*   *munu*
          race-MV   fall.down-PAST and.SS
          '(I) was racing and fell down, and…'
               PITJACQ_Andrew_20161010:00:09:02

Another use of medial verbs which is more clearly within this bracket is by Simon at 2;4 and 2;5. In each of these sessions, Simon produces nearly 300 utterances with an MLU of 1.5. Across both sessions, he produces four juxtaposed finite verb pairs, mostly in reference to simultaneous aspects. He is, thus, a clear example of Stage I. He also produces a few repetitions of the medial verb form of the verb *pitja* 'to come,' *pitja-la*, which he pronounces *pitjaya* due to regular replacement of *l* and *r* by *y*. This sound replacement is well-attested among children acquiring diverse languages (Solé, 2002; McGowan et al., 2004; Klein et al., 2012). There is, however, no discernible difference between his usage of this form and the imperative form *pitja*. This may be an initial step toward the acquisition of the medial verb form.

The tendency toward simultaneous juxtapositions and absence of medial verb usage initially motivated the suggestion of a distinction between children with MLUs between 1.1 and 1.5 from those with more advanced syntax and MLUs between 2.1 and 2.4, as seen in **Table 3**. However, a *post hoc* chi-squared test showed no significant difference in the use of verb juxtapositions or medial

verbs between these two groups, $\chi^2(1, N = 4) = 7.50$, $p = 0.112$. This distinction was, therefore collapsed to yield a single early stage in Pitjantjatjara clause chain acquisition characterized by the juxtaposition of finite verbs. A larger sample would be helpful to determine whether there is indeed a difference between these two groupings within the juxtaposing stage.

Stage II: Medial Verbs Are for Modifying

In this stage we see children with MLUs between 2.5 and 4.1 and aged between 2;11 and 3;11 (**Table 6**). These children are producing adult-like clause chain constructions; however, they are predominately using them for modifying (14 tokens) rather than sequential purposes (3 tokens). This mirrors the tendency for English-acquiring children to use subordinate complex sentences to describe single situations before using them to combine situations (Diessel, 2004). Sequential actions are more commonly described using finite verb juxtapositions (5 tokens) than with clause chains (3 tokens). This pattern of use is significantly different from that of the younger children in Stage I, $\chi^2(1, N = 4) = 15.07$, $p = 0.005$.

It is worth noting the wide MLU range of this stage. For most sessions, the child has an MLU between 3.2 and 3.8. Where the child has a lower MLU, they are mostly conversing with a younger child and are likely modulating their speech accordingly. Both children with lower MLUs are older than most of the children at this stage, aged 3;10 and 3;11, and their use of clause chains is typical of this stage. On the other end of the range, one child, Tabitha (3;9), presents with an MLU of 4.1, which is within the observed adult MLU range. In this session, she is interacting with older children and an adult. She is a noted talker in the community and reported to be advanced for her age by her adult family members, however, her use of clause chains in this recording resembles that of the other 3-year-olds in this stage.

The main characteristic of this stage of acquisition is the use of clause chains for modification rather than sequential actions.

Children at this stage appear to use clause chains for the full adult range of modification purposes and there are examples of aspectual (43 and 44), postural (45), and other adverbial uses (46 and 47).

43. Andrew (3;2) is playing with some toy cars with his brother (4;2). They are talking to the cars, telling them what to do as they move them around:
    A: *nyangatja   kunyu   kulu*
        here   QUOT   small
        '(Be) here small one, they say.'
        rawa-ri-ninyi   ngara-la
        long.time-INCHO-PRS   stand-MV
        'Remain (here).'
                PITJACQ_Andrew-Daniel_20180323:00:22:05

44. Denzel (3;10) is talking with his friend (2;11):
    D: *aru   NAME   aru-ra   aru-ra*
        follow   NAME   follow-MV   follow-MV
        aru-ra   papa
        follow-MV   dog
        'NAME, follow and keep following the dog'
                PITJACQ_Simon_20190417:00:33:47

45. Rachel (2;11) is asking her grandmother to sit and draw with her:
    R: *nyina-ra   wakatju-nama*
        sit-MV   draw-IMP.IPFV
        'Draw (while) sitting.'
                PITJACQ_Rachel_20161007:00:40:24

46. Rachel (2;11) returns to a drawing she started earlier in the session and adds some more to it. As she does so, she says '(I) ruined(it)' twice:
    R: *kula-ya   pu-ngu*
        kura-ra   pu-ngu
        spoil-MV   hit-PST
        '(I) ruined(it).'
                PITJACQ_Rachel_20161007:00:24:22

TABLE 6 | Summary of all children in the corpus with an MLU within the range 2.5 and 4.1.

Child	Age	MLU	No. of utterances	Juxtaposed finite		Clause chain		
				Sequential	Simultaneous	Sequential	Simultaneous	Medial only
R	2;11	3.3	110	1		1	4	2
A	3;2	3.2	112	2			1	
A	3;3	3.8	70	2		1	1	
D	3;3	3.2	84				3	
R	3;6	3.2	101			1	1	
T	3;9	4.1	154				2	
D	3;10	2.7	62				1	
E	3;11	2.5	224		1		1	
Totals			**964**	**5**	**1**	**3**	**14**	**2**

For clarity, zeros are not marked.

47. Tabitha (3;9) is playing with some older children mapping out imaginary houses for themselves and their friends in the sand:

T: *nyanga*   *alatji-ya*   *NAME-nya*
    nyanga   *alatji-ngara*   *NAME-nya*
    here   do.like.this-MV   NAME-ACC

    tjana   *ngari-ngi*
    tjana   *ngari-ngi*
    3.PL.NOM   lie-PST.IPFV
'Here, NAME and their (place) should be here like this.'
                          PITJACQ_Tabitha_20180407:00:07:24

Children at this stage sometimes refer to sequential actions using clause chains, as in examples (48 and 49). However, they more commonly use the juxtaposed finite verb strategy of the previous stage, for instance example (50). There does not appear to be a difference between the children who use each strategy or the particular verb combinations they use them with. It is possible that as children acquire clause chains they are initially specialized for modification as a contrast to the finite verb chain strategy which remains a potential strategy for sequential actions among adult speakers. This would be something to investigate with more fine-grained longitudinal data.

48. Andrew (3;3) is playing a game of chasing with his brother (4;3):

A: *NAME*   *riitja-ra=na*   *kapatja-ri-ng*
    NAME   race-MV=1.SG.ERG   captured-INCHO-PST
'NAME, I ran and caught (you).'
                          PITJACQ_Andrew_20180423:00:51:04

49. Rachel (3;6) calls her cousin over to look at something:

R: *NAME,*   *pitja-la*   *nya-wa*
    NAME   come-MV   see-IMP
'NAME, come see!'
                          PITJACQ_Rachel_20170507:00:23:42

50. Andrew (3;2) is pointing something out to his brother (4;2):

A: *kutjara*   *nyangatja*   *wali-ngka=na*
    two   here   house-LOC=1.SG.ERG[11]

    pitja   *nya-wa*
    come.IMP   see-IMP
'These two in the house, come see!'
                          PITJACQ_Andrew_20180323:00:25:45

This is also the stage at which children learning Pitjantjatjara start to produce two other complex clause types – purposive and complement clauses. The complement clauses typically function as objects of verb *wangka* 'say,' as in (51). The purposive clauses are not yet combined with a finite verb. These uses of purposive clauses independently of a matrix verb, as in (52 and 53), are an acceptable option in adult Pitjantjatjara much like English 'because it's raining.'

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[11]This form is unexpected here. It is likely an error, but it is unclear whether Andrew was extending this clitic pronoun for a possessive or if it is a mispronunciation of another form.

51. Andrew (3;2) is reporting his brother (4;2)'s wrongdoing to his mother:

A: *NAME*   *pika-ku=na=nta*   *wangka-nyi*
    NAME   hurt-FUT=1.SG.ERG=2.SG.ACC   talk-PRS
'NAME is saying "I'll hurt you".'
                          PITJACQ_Andrew-Daniel_20180323:00:25:31

52. Rachel (2;11) asks her grandmother to get her some water to drink:

R: *kapi*   *tjiki-tja-ku*
    water   drink-NOML-PURP
'water for drinking'
                          PITJACQ_Rachel_20161007:00:24:00

53. Denzel (3;10) is attempting to get his friend (2;11) to give him a turn with a toy whistle, he tries a new tactic saying he wants to learn how to play it, accompanied by reaching gesture:

D: *NAME,*   *ka*   *ninti-ntja-ku*
    NAME   and-DS   learn-NOML-PURP
'NAME, in order (for you) to teach (me).'
                          PITJACQ_Simon_20190417:00:34:40

In summary, in this second stage of Pitjantjatjara clause chain acquisition, children regularly use clause chains for simultaneous modifying type functions. They also use clause chains to refer to sequential actions, but still prefer juxtaposed finite verbs for this purpose. The children in this stage are of a similar age to when Turkish speaking children begin to use converb constructions (2;6–3;6, Aksu-Koç and Slobin, 1985). However, Turkish speaking children typically acquire sequential converbs early and only begin to use converbs for other semantic functions such as manner modification around 5 years of age (Çapan, 2013). This may relate to differences between Turkish converbs and Pitjantjatjara clause chains, particularly that Turkish has multiple converb forms with distinct semantic functions, while Pitjantjatjara has a single medial form used for many semantic functions. Pitjantjatjara adults also continue to use juxtaposed finite verb for sequential actions. This means that the strategy initially used by children in both languages is a valid adult strategy in Pitjantjatjara and so may remain a preferred strategy for longer among Pitjantjatjara speaking children. In both languages, converb/clause chain constructions appear to be acquired earlier than other non-finite constructions with noun-like participles, and they may form a link between simple sentences and more opaque non-finite constructions (Aksu-Koç and Slobin, 1985).

Stage III: Clause Chains Are for Sequential Actions

This is the final stage of Pitjantjatjara clause chain acquisition observed in this study and includes children aged 4 to 10 years, as seen in **Table 7** for individual details. It was initially conservatively divided into two groups: 4- to 6-year-olds and 6- to 10-year-olds, based on the wide age range and the lower number of utterances from 6- to 10-year-olds (414, as opposed to 1160 utterances from 4- to 6-year-olds). *Post hoc* tests, however, showed no difference between the two age groups, $\chi^2(1, N = 3) = 4.47$, $p = 0.215$, and the distinction was collapsed.

TABLE 7 | Summary of all children in the corpus aged 4 to 10 years.

Child	Age	No. of utterances	Juxtaposed finite		Clause chain			Subordinate
			Seq	Sim	Seq	Sim	Medial only	Switch-subject
W	4;1	123			2	1	2	
D	4;2	160	4		2			
A	4;3	107				2	1	
D	4;3	107			6	2		
D	4;8	268			3	4	2	
D	5;3	143			5	3		1
J	5;9	94			2	1		
A	6;10	45			1	1		
L	7;4	93	1					
S	7;7	85	1		1			
C	9;6	43					1	2
M	9;7	85			2		2	
O	9;9	58	1		1			
Totals		1574	7	0	25	13	9	3

For clarity, zeros are not marked.

This stage is primarily distinguished from Stage II by the use of clause chains as the preferred strategy for describing sequential actions, as in example (54). This is also where children begin to use subordinate switch-subject constructions, as in example (55). These differences between Stage II and Stage III were significant, $\chi^2(1, N = 5) = 13.83, p = 0.017$.

54. Murphy (9) is calling his younger cousin (3;6) over to look at the video camera

M: *pitja-la*   *putu*   *nya-wa*   *NAME*
come-MV photo see-IMP NAME
'NAME come and look at the photo (image on the video camera).'

<div align="right">PITJACQ_Rachel_20170507:00:02:10</div>

55. Daniel (5;3) has been arguing with his brother (4;3) about whose turn it is to play with a particular toy

D: *puli-ngka*   *aru-ni*   *rawa*
hill-LOC   follow-PRS   long time
inka-inka-nyangka
play-REDUP-INF.DS
'(I've been) following (you) around on the hill for a long time, while you've been playing (with it).'

<div align="right">PITJACQ_Daniel_20190418:00:29:44</div>

Post hoc comparisons with adult usage showed no significant difference, $\chi^2(1, N = 5) = 5.42, p = 0.367$. This suggests that Pitjantjatjara children have largely mastered adult-like clause chains and related constructions by around 4 years of age. There is, however, one notable difference which was not included in the statistical comparison and that is the position of the finite verb within the chain. Adult speakers produce the finite verb initially in 21% of clause. In contrast, all of the clause chains produced by 4- to 10-year-olds in this sample were finite-final. In fact, there was only one finite-initial clause chain produced by a child in this corpus and that was the aspect marking 'remain' example (43) from Stage II above. This example is also

unusual in that the verb *rawaringanyi* 'do for a long time' is primarily used as an aspect marker rather than a main lexical verb. There were 38 clause chains produced by children within this stage. Given adult proportions, we would expect 8 of these to be finite-initial. Since none of them were, it is possible that the finite-initial version is acquired later. This connects with the likelihood that the finite-initial chains are syntactically distinct from the finite-final chains discussed above.

It is at this stage that children are first observed using switch-subject constructions in clause chains (56 and 57) and subordinate constructions (55 and 58). Subject changes in clause chains without the use of a different subject marker such as *ka* are not predicted based on previous descriptions of the language (Glass and Hackett, 1970; Goddard, 1985, 1988; Bowe, 1990), but I have observed them occasionally, particularly in child speech.

56. Some older boys have been picking on Winfred(4;1), he comes back to report to his mother:

W: *kuwari=na*   *pu-ngkula*   *ula-nyi*
now=1.SG.ERG hit-MV cry-PRS
'Just now, (they) hit I cry.'

<div align="right">PITJACQ_Winfred_20160929:00:20:49</div>

57. Daniel (5;3) and his cousins are eating biscuits (the kind with cream sandwiched between two halves) and a disagreement breaks out:

D: *wiya*   *NAME-tu*   *ngayunya*
no   NAME-ERG   1.SG.ACC
ngalku-ra   *ngalku-ra*   *unngu*   *palatja*
eat-MV   eat-MV   inside   that
ngayulu   *mukuri-ntji-wiya*
1.SG.ERG   want-NOML-NEG
'No! NAME is eating that inside bit from mine, I don't want (him to)'

<div align="right">PITJACQ_Daniel_20190418:00:09:24</div>

58. Catelyn (9) is talking about bullies at school and what to
     do about them with her mother.
     C: *mum*   *ngayulu*   *ngula*   *kula-kutu*
          mum   1.SG.ERG   later   school-towards
          a-nkula   *NAME-nya*
          go-MV   NAME-ACC
          wangka-nyi   *ngayunya*   *titji-mi-nyangka*
          talk-PRS   1.SG.ACC   tease-LOAN-INF.DS
          'Mum, if I go to school and talk with NAME, (they)
          tease me.'
     …
     C: *nyanga*   *alitji-ri-nyangka*
          this   like.this-INCHO-INF.DS
          karangki-ri-pai   *panya*
          cranky-INCHO-HAB   ANAPH
          'If (I) do that, (they'll) get mad.'
                                   PITJACQ_Frank_20161010:00:30:47

It is also in this stage that we see the first coordinated
clauses within a single utterance, by Daniel aged 4;3 (59). This
is relatively late compared to English, where children produce
clause coordinations from around 2 to 3 years of age (Bloom
et al., 1980; Diessel, 2004). This difference is in line with the use
of the clause chaining constructions as the standard strategy for
expressing sequential actions in Pitjantjatjara.

59. Daniel (4;3) is instructing his mother in the preparation
     of his sandwich
     D: *tomato*   *kata-la*   *munu*   *tju-ra*
          tomato   cut-IMP   and.SS   put-IMP
          'Cut the tomato and put it on.'
                                   PITJACQ_Daniel_20180423:00:02:33

Longitudinal Progression

Given the structure of the corpus, it is also possible for us to
compare these three stages with the longitudinal development of
individual children.

Five children were recorded at multiple timepoints within this
corpus:

- Simon was recorded on six occasions between the ages
  of 1;4 and 2;11, however it is only within the recordings
  at 2;4 and 2;5 that we see clause chainlike constructions.
  He produces finite verb juxtapositions, largely in reference
  to simultaneous elements, and isolated medial verb forms,
  with no discernible difference in meaning from imperative
  verb forms. This is consistent with Stage I.
- Emily was recorded at 2;11, where she produced one
  finite verb juxtaposition in reference to sequential actions.
  This could be consistent with either Stage I or II. She
  was recorded again at 3;11, where she produced one
  finite verb juxtaposition and one clause chain, both in
  reference to postural modifications. This most closely
  resembles Stage II.
- Rachel was recorded at 2;11, where she produced one finite
  verb juxtaposition in reference to sequential actions and
  seven clause chains, only one of which is in reference to
  sequential actions. This is consistent with Stage II. She
  was recorded again at 3;6, where she produced two clause

chains, one sequential and the other modifying. This is
consistent with Stage III but given the small number of
tokens could also be consistent with Stage II.

- Andrew first appears in this corpus aged 1;9. During this
  recording he has an MLU of 1.2 and produces one set
  of juxtaposed imperative verbs. This is consistent with
  Stage I. In his recording sessions at ages 2;4 and 2;8, no
  clause chains or juxtaposed verbs are observed. At age 3;2,
  he produces juxtaposed finite verbs for sequential action
  descriptions and a clause chain for aspectual modification.
  This matches Stage II. At age 3;3, he produces four finite
  verb juxtapositions and three clause chains to refer to
  sequential actions as well as one clause chain to refer to
  manner modification. This could fit with either Stage II
  or III and may represent a transition between the two. At
  age 4;3, he produces three clause chains, all for modifying
  functions. This could match either Stage II or III.
- Daniel first appears in this corpus aged 2;8. During this
  recording, he produces one clause chain construction to
  refer to sequential actions. This is atypical of the early
  stages; however, as we only have 12 utterances from Daniel
  at this age, it is not possible to draw any clear conclusions.
  At age 3;3, Daniel is recorded producing three clause
  chains, all with modifying functions. This is typical of
  Stage II. At age 4;2, Daniel produces four finite verb
  juxtapositions, all describing sequential actions, and two
  clause chains, both for modification. This is again typical
  of Stage II. At age 4;3, he produces eight clause chains, six
  for sequential actions and two for modification, as well as
  one clausal coordination. This is typical of Stage III. At
  age 4;8, he produces nine clause chains for both sequential
  and modifying purposes. This is again typical of Stage III.
  Finally, at age 5;3 he again produces nine clause chains
  for both sequential and modifying purposes, as well as
  one switch-subject subordinate construction. This is also
  typical of Stage III.

The above observations show a progression through each of
these three stages of Pitjantjatjara clause chain acquisition, not
only when looking across the corpus cross-sectionally, but also
when following individual children longitudinally.

A Summary of Pitjantjatjara Clause Chain Acquisition

The trajectory of clause chain acquisition was divided into three
stages. The first stage is characterized by juxtaposition of finite
verbs and matches the first stage of Turkish converb acquisition
(Aksu-Koç and Slobin, 1985). The second stage is seen with
children around 3 to 4 years of age and is characterized by the use
of clause chains with medial verb morphology for simultaneous
modifying type functions. This differs from the pattern we see
with Turkish converbs where children acquire temporal converb
functions before other modifying functions (Çapan, 2013). The
final stage is observed with children 4 years and older. By
this stage, Pitjantjatjara speaking children are also using clause
chains for sequential actions and appear adult-like, except for the

absence of finite-initial clause chains which are not produced by even the oldest children in this sample.

The majority of chains in this corpus consist of only two verbs. This is true for adults as well as children. There is, however, a significant tendency for chain length to increase with age. This was tested using linear mixed models with the lme4 package (Bates et al., 2018). The dependent variable was chain length with medial-verb only sentences counted as chains of one. Fixed effects were age and type, clause chain or finite juxtaposition. Age was the only significant factor, $\beta = 0.11$, $SE = 0.03$, $z = 3.27$, $p = 0.001$.

Overall, clause chains were less frequent in this corpus than predicted based on earlier descriptions of Pitjantjatjara. Clause chains were present in only 3% of adult utterances. Including finite juxtapositions in this brings the overall frequency to 4%. This contrasts with the general ubiquity reported in earlier descriptions of Pitjantjatjara (e.g., Goddard, 1988; Bowe, 1990). I have only observed this ubiquity in written narratives. For instance, a random page of a children's book is quoted in example (63). Five of the thirteen sentences contain a clause chain, indicated in bold.

63. *Munuyal ngurangkalta tjarpangu.* **Kal tjitji panya tjuta ngunytju tjananguru wararakatira ankula wiyaringu. Munul tjitji tjutangka tjunguringkula inkangi.** *Kal minyma panya ngunytju minaku anu.* **Munul tjutira tjikira katira tjunu.** *Munul tjitji panya tjuta ungu tjikintjaku.* **Kal tjitji tjutangku tjikira anu. Munuyal inkara waningi.** *Ka putu wangkangi "Tjitji walaya pitja. Anuyal." Kal ngura pararilta ankula inkara waningi. Munuyal ma-kumpinu.*

(Minyintirilu, 1980, p. 5)

As noted for Turkish (Slobin, 1995), it is likely that clause chains are more frequent in narrative contexts, since they are typically used for event linkage. While there are short spontaneous narratives contained within the present corpus, there are also many other contexts which are less conducive to event linkage. It is possible that previous reports of clause chain ubiquity have been based on speech contexts more consistently conducive to event linkage. Indeed, although clause chaining was less frequent than expected, it was the dominant strategy employed for combining sequential actions. It is also possible that linguists have focused on the possibility of long clause chains, much as there is a focus on long verb complexes in polysynthetic languages although only some slots are in fact generally used in practice (e.g., Ponsonnet, 2015). A more detailed investigation of Pitjantjatjara narratives would be required to resolve this.

CONCLUSION

This paper set out to sketch the progress of child acquisition of Pitjantjatjara clause chains. This investigation also uncovered some previously undescribed properties of adult clause chain use. Clause chains are not as frequent in spontaneous speech as previous descriptions have suggested. It is also possible for medial verbs to occur without a finite verb. In these cases they appear to be used for polite imperatives or to mark repeated or continuing actions; note that these functions are also described

for medial clauses occurring without a finite clause in Nungon (Sarvasy, 2015). Finally, the dataset showed several cases of finite verb juxtapositions. This is potentially limited to child and child-directed speech.

The investigation identified three stages in the acquisition of Pitjantjatjara clause chains. 1) Pitjantjatjara speaking children begin by juxtaposing verbs without medial verb morphology, to refer to simultaneous aspects of an action or sequential actions. 2) They then use clause chains with adult-like medial verb morphology for modification functions. 3) Finally, they use adult-like (finite-final) clause chains for sequential and modifying functions. The children in the present dataset did not produce adult-like finite-initial clause chains. These may be acquired significantly later.

There are some striking similarities in the acquisition of Turkish and Pitjantjatjara converbs, especially given the differences between the two languages and their social settings. In both languages, children start out producing sequences of finite verbs to achieve clause chain-like functions. This is also a precursor to English coordinated clauses (Diessel, 2004) and the juxtaposed finite verbs of Pitjantjatjara speaking children are potentially a precursor of coordinated clauses and clause chains combining sequential actions.

In Pitjantjatjara, we can see that these early action combinations are among the initial set of word combinations children make before progressing on to longer utterances. Descriptions of two-word combinations in other languages (e.g., Slobin, 1970; Bowerman, 1973) do not list combinations of actions. This may indicate that Pitjantjatjara speaking children combine action elements earlier than children acquiring other languages, possibly due to the influence of clause chains. Alternatively, it may be that researchers have overlooked action combinations as they are not among the standard strategies of the adult language.

In both Pitjantjatjara and Turkish (Aksu-Koç and Slobin, 1985), children are observed to use adult-like clause chain morphology from around the age of 2;6. However, there is a difference in the functions to which they typically apply them. Turkish children typically first use converbs for temporal relations, particularly linking sequential actions. In contrast, Pitjantjatjara speaking children's early clause chains are typically for modification rather than temporal sequence. This is potentially linked to the greater lexicalization of modificational rather than sequential clause chains in Pitjantjatjara. It is also potentially linked to the fact that the initial finite juxtaposition strategy remains a viable adult strategy for temporal sequences in Pitjantjatjara. It is notable, however, that Pitjantjatjara speaking children appear to employ both finite verb chains and clause chains first for referencing two aspects of a single event and only later in order to join separate elements together. This is potentially linked to Slobin's (1995) finding that Turkish children do not acquire the converb -erek until notably later around the age of 7 years. This converb form is claimed to be used to join two events together into a cohesive unit and it may be that the Pitjantjatjara sequential clause chains have more in common with this Turkish form than the other, earlier acquired, converb forms.

This initial investigation of the acquisition of Pitjantjatjara clause chains provides a foundation for further investigations addressing the manner and timing of Pitjantjatjara clause chain acquisition. It also raises questions regarding the similarities and differences in the acquisition of clause chaining constructions cross-linguistically.

DATA AVAILABILITY STATEMENT

The datasets generated for this study will not be made publicly available. They contain participants' personal information and they have chosen not to make it generally available. Requests for more information or to access portions of the data should be directed to the author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Human Research Ethics Committee of The University of Melbourne (Approval number 1647234). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin. Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this manuscript.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

FUNDING

ACKNOWLEDGMENTS

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The Acquisition of Clause Chaining in Nungon

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The clause chain is an under-investigated complex sentence type, found in hundreds of languages. In a clause chain, as many as 20 or more 'medial' clauses with under-specified verbal predicates combine with a single 'final' clause with fully-specified verbal predicate. Clause chains are of interest for three main reasons: (a) the special syntactic relationship between clauses, which is neither textbook subordination nor coordination; (b) the potential extreme length of a single chain; and (c) switch-reference marking in clause chains of some languages could require speakers to plan at least one clause ahead as they speak. Research on child production of complex sentences has largely overlooked clause chains. Longitudinal data for three children aged 1;1 to 3;3 acquiring the Papuan language Nungon show that Nungon-speaking children begin producing clause chains around the age of 2;4, with a marked increase in rate of use around age 2;11. Chain length is limited to two clauses until age 3;1. Different-subject marking in medial clauses is used by all three children early, but is first attested in one-clause, 'root medial' contexts, rather than in chains. Bayesian statistical models confirm the strong tendency for children to use root medials in expressions of desires and commands. Children's production of three types of complex sentences—clause chains, subordinated final clauses, and coordinated final clauses—is shown to be subject to the same type of developmental constraint; but once development reaches an adequate level for increased complex sentence production, children acquiring Nungon produce many more clause chains than complex sentences involving subordinated or coordinated final clauses.

Keywords: Nungon, Papuan, acquisition, clause chain, complex syntax, under-described language

INTRODUCTION

This paper investigates child acquisition of the special type of complex sentence known as 'clause chains' in the Papuan language Nungon. Acquisition of clause chains is compared with that of subordinate clauses and coordinate clauses, and usage patterns are compared with those in child-directed speech. This section introduces clause chains in Nungon and the motivation for targeting their acquisition by children.

The clause chain is an under-investigated sentence type found in hundreds of languages around the world: from Ethiopia to Turkey to the Caucasus, the Amazon, and Papua New Guinea (Longacre, 1985, 2007; Dooley, 2010, *inter alia*). A clause chain is a sequence of one to twenty or more 'medial' clauses (with 'medial' verbs that are unmarked for tense, mood, and, often, subject), followed or preceded by a single 'final' clause (with a 'final' verb that gives all tense, mood, and subject information). Clause chains' most basic function is the description of sequentially related events, actions and states. An eight-clause chain from the Papuan language Nungon is shown in (1), from an adult recollection of preparations for a hunting trip. Throughout this paper, medial clauses are in single curly brackets, and final clauses are in double curly brackets, following the convention in Sarvasy (2017a).

(1) {Iyep i-in-a}, {dowoksi
    sun be-DS.3SG-MV evening

aa-na-ya}, {haa imbange
3SG.O.see-DS.1PL-MV weather beautiful

t-un-a}, {imu
do-DS.3SG-MV food.for.journey

dokdok yoo-nga},
ready NSG.O.take-MV.SS

{yoo-ng hi-nga},
NSG.O.take-DEP put-MV.SS

{dowoksi gun tawa noni dokdok
evening arrow bow 1PL.POSS ready

yoo-ng hi-nga},
NSG.O.take-DEP put-MV.SS

{hot yanyan to-nga},
bowstring fasten:RED do-MV.SS

{{duo-go-mong}}.
sleep-RP-1PL

The sun being (there), we seeing (the sun) in the evening, the weather being fine, readying our food for the journey, packing it, readying and packing our bows and arrows, fastening our bowstrings, we slept.

Example (1) shows that Nungon constituent order is verb-final, the language is mildly agglutinating, and involves 'pro-drop': subjects are not obligatorily expressed as either pronouns or noun phrases. Clause chain boundaries are marked though morpho-syntax, with the full indication of tense, mood and subject on the final verb indicating the end of the chain, but also through prosody, with level or rising pitch on each medial verb in the chain, but falling pitch on the final clause (Farr, 1999; Sarvasy, 2015a).

Co-referentiality of subjects across clauses in the chain is obligatorily indicated on each medial verb through switch-reference marking (Haiman and Munro, 1983; van Gijn and Hammond, 2016). When producing the medial verb of a medial clause A, a Nungon speaker signals in advance whether the subject of the next, as-yet-unspoken, clause B will be exactly co-referential with the subject of clause A or not. If the subject will be co-referential, this is a 'same-subject' (SS) context, and the medial verb of clause A does not inflect to index the subject of clause A. But if the subject of clause B will not be exactly co-referential with that of clause A, then this is a 'different-subject' (DS) context, and the medial verb in clause A must inflect to index the person/number of the subject in clause A (No information is given in advance about the person/number of the subject in clause B; it is simply understood that clause B's subject argument will differ from the subject of clause A).

The first three medial clauses of (1) are marked for DS; their subjects are, in order: 'the sun,' 'we,' and 'the weather.' (Note that subject characteristics like animacy do not affect switch-reference marking, which strictly follows grammatical subjecthood.) The remaining four medial clauses are marked for SS, but their shared subject is not made explicit until the final clause at the end of the chain, which reveals that its subject, and that of the four preceding medial clauses, is 'we.' As a 'final' clause, this clause has a 'final' verb: these are always inflected for tense or mood and subject person/number. In Nungon, SS medial verbs receive only an unchanging suffix *-a* (*-nga* after vowel-final verb roots), but DS medial verbs inflect to indicate their own subject's person/number.

Speakers of clause chaining languages like Nungon have a third structural option for complex sentence formation, beyond the two available to speakers of English and other Western European languages. That is, Nungon speakers can not only produce: (a) complex sentences with up to 25 or more medial clauses and a single final clause 'chained' together (as in example 1), but they can also produce complex sentences more like those of English, in which: (b) a main final clause subsumes one or more subordinate final clauses, or (c) two or more final clauses are coordinated, using prosody or conjunctions. It is generally accepted that clause chaining represents a special type of 'asymmetrical' coordination in which the medial clauses are morpho-syntactically dependent (unlike English coordinated clauses), but not syntactically embedded (unlike English subordinate clauses; Foley and Van Valin, 1984; Nonato, 2014; Weisser, 2014).

Further, examination of a corpus of monologual Nungon adult texts belonging to narrative and other genres shows that clause chain distribution in Nungon monologual storytelling is frequent and highly predictable, with number of chains per text increasing linearly as text length increases. In other genres, such as essays written in Nungon (Sarvasy and Ögate, 2019), clause chains are shorter and sparingly used; this relates to clause chains' primary function to describe sequential events and actions. Nungon clause chains thus differ from complex sentence structures in English, which have unpredictable distributions (Barker and Pederson, 2009).

Clause chains' morpho-syntactic differences from subordinate or simple coordinate complex sentences, their potential extreme length (chains of over 100 clauses have been attested in some languages: Wise, 2018), and switch-reference marking, which apparently requires speakers to plan chains at least two clauses at a time, are all of relevance to the study of child acquisition of complex sentences more broadly. Sarvasy (2019b) showed that the earliest verbs produced by one child acquiring Nungon are tensed, 'final' verbs (although the child does go through a phase of optionally using a morphologically simplified, 'root nominal' form alongside the well-formed 'final' verbs). Medial verbs were not among the earliest forms produced. The timing and general trajectory of clause chain production in Nungon have not yet been investigated. The research questions tackled in this paper on child acquisition of Nungon clause chains are:

(a) How does the development of clause chaining in Nungon pattern relative to the development of subordinated and coordinated final clauses?

(b) Do Nungon-speaking children produce chains of three or more clauses from the beginning of complex sentence production, or are their early chains limited to two clauses?

(c) If switch-reference marking requires advanced sentence planning skills, could this mean that children's clause chain production necessarily lags behind their production of subordinated or coordinated final clauses (which are not marked for subject co-reference across clauses)?

(d) Do children produce SS marking before DS marking, which entails conception of sentences involving more than one subject?

The following section gives basic background on the Nungon language and compares Nungon clause chains to other complex sentence types.

NUNGON CLAUSE CHAINS: BACKGROUND

Nungon (Sarvasy, 2013, 2014a,b, 2015a,b, 2016, 2017a,b,c, 2018b, 2019a,b; Sarvasy and Ögate, 2019; Sarvasy et al., 2020) is a Papuan language of the Finisterre-Huon language family, spoken by about 1,000 people in the highest inhabited reaches of the Uruwa River valley, Morobe Province, Papua New Guinea. Nungon epitomizes the unmatched linguistic diversity of Papua New Guinea (PNG)—and the difficulties inherent in drawing linguistic lines—in that 'Nungon' is actually an umbrella term for four different dialects, belonging to the villages Kotet, Towet, Yawan, and Worin, which differ in roughly 10–20% of lexicon and in portions of their phonetic and phonological systems. Astoundingly, these different dialects are spoken in villages located maximally 30–45 min walking from each other. The four Nungon dialects further belong to a larger, oval-shaped dialect continuum within the Uruwa River valley, in which every village community historically had its own distinct dialect (Sarvasy, 2013).

Full descriptions of the Nungon verb and inflection categories are in Sarvasy (2014a, 2017a). As noted in the Introduction, the term 'final' here refers to a category of verbal inflection corresponding to the inflections possible on the verb of the final clause of a clause chain. Nungon final verbs occur in the last clause of clause chains and are also the verb forms used in non-chained sentences. Final verbs are obligatorily marked for mood (Immediate or Delayed Imperative), tense (Remote Past, Near Past, Present, Near Future, or Remote Future), or reality status (Counterfactual), and always index subject person/number (with three numbers distinguished: singular, dual, and plural).

Subordination in Nungon involves a main final clause subsuming one or more subordinated final clauses marked with the clitic = ma. The subordinated clause can either function as an argument of the main clause, as in (2), or be connected to the main clause with looser semantics, as in (3).

(2) {{o   {{Yawan   ongo-go-rok=ma}}=ha
    CONJ   Yawan   go-RP-2SG=SUB=BEN

    hat   yo-i}}.
    story   say-IMM.IMP.2SG
    Then tell the story about (when) you went to Yawan.
                                          (Father to TO, 3;1)

(3) {{horo-n=don   hai-ha-rok=ma}}-i
    root-LOC=RESTR   cut-PRES.SG-2SG=SUB-TOP

    horogon=don   ma=hai-rok}}?
    top=RESTR   NEG = cut-IRR.2SG
    But you're cutting at the base; you're not going to cut at
    the top?   (Mother to TO, 3;0)

Coordination of final clauses in Nungon involves either simple juxtaposition of final clauses, with only prosodic linking (as in example 4), or coordination of final clauses through the use of conjunctions such as 'that is,' 'but,' 'however,' or the adverb *huttai* 'actually,' which is used in conditional statements, as in (5).

(4) {{Tik   mir=it-du-ng}},
    barkcloth   wear.on.head=be-RP-2/3PL

    {{yok hai-ng   mir=it-du-ng}}.
    bag cut-DEP   wear.on.head=be-RP-2/3PL
    They used to wear barkcloth, they used to fashion and
    wear string bags.

(5) {{Nok   ongo-t   huttai}}   {{ep-pem}}.
    1SG.PRO go-NP.1SG   actually   come-CONTR.1SG
    Had I actually gone, I would have come (back).

Both final clause subordination and coordination are markedly rarer than clause chaining in a sample of 49 adult Nungon narratives from 18 speakers (Impressionistically, final clause coordination is also rarer in that genre than final clause subordination).

Nungon clause chains were exemplified in (1). The primary and most lexically flexible function of Nungon clause chains

is to describe a sequence of related events, actions, or states, as in (1). Within this function, events in a chain are generally understood to be consecutive, and presented in the temporal order in which they occurred/will occur (Farr, 1999), though there is the possibility that the actions or states described in some pairs of clauses within a chain can be understood as overlapping in time. Chains such as that in (1) have no upper length limit, and there are no restrictions on the types of verbs that can occur in them, nor on their positions in the chain.

Among clause chains that describe sequential events and actions, certain lexical pairings within the chain can be considered semi-conventionalized. For instance, Nungon has several individual verbs to express the bearing of non-human animal(s) or object(s) from one place to another: *ke-/he-* 'bring it/them,' *ku-/hu-* 'take it/them away,' *köö-/höö-* 'raise it/them,' *koo-/hoo-* 'lower it/them.' Use of these verbs glosses over the component actions involved in such carrying or moving. An alternative is to express a similar meaning using an SS two-clause chain with the verb *to-/yoo-* 'take up it/them' in the first clause, followed by a verb of motion, such as *ongo-* 'go,' *e-* 'come,' *öö-* 'ascend,' or *oo-* 'descend,' in the second clause. The sequencing of verbs in such a chain, with 'taking it up' always preceding 'going' or the other motion verbs, makes logical sense: the object cannot be carried to another place in the course of the 'going' unless it has already been taken up by the goer. While the pairing of 'take up it/them' with a motion verb can be considered somewhat conventional, it still allows for ample speaker flexibility: not only does the speaker have a choice of motion verbs, but the speaker can also insert other linguistic material between 'take up it/them' and the verb of motion, as in (6), from an adult personal narrative.

(6) {Ongo-nga}, {giyöng yok-no to-nga},
    go-MV.SS betelnut bag-3SG.POSS SG.O.take-MV.SS

    {{ogo-n=ton öö-go-k}}.
    same.level-LOC=GEN ascend-RP-3SG

    Going on, taking up his betelnut bag, he ascended on the other side (of the river).

There are also two Nungon constructions in which SS two-clause chains have grammaticalized, and could be said to function largely as monoclausal constructions. The Nungon Continuous aspect construction comprises any lexical verb in SS medial form immediately followed by *it-* 'be,' without any intervening material, and usually, without a pause. This is the usual way in the language to describe an in-progress event, action or state, illustrated in (7). Here, the single clausal 'was beating out song' is the more felicitous interpretation, rather than the two-clause 'beating out song, was/stayed.' Despite this, there are indications from both adult and child speakers that the two verbs of the Continuous aspect construction can be optionally expanded into a clearly biclausal chain, either by inserting additional linguistic material between the first medial verb and *it-* 'be,' as in (8), or by adding a pause between them.

(7) {nan Suba uwing
    father Suba hourglass.drum

    honggir-a}, {{aap wer-a
    hold-MV.SS song 3SG.O.beat-MV.SS

    it-do-k}}.
    be-RP-3SG

    Father Suba, holding an hourglass drum, was beating out song. (Mother to Niumen, 3;1)

(8) {aap wer-a}, {{wo-go-rok it-du-ng}}.
    song 3SG.O.beat-MV DIST-ADV-SEMBL be-RP-2/3PL

    Beating out a song, they were like that. (Niumen, 3;2)

The other grammaticalized two-clause chain type is called the Inferred Imperfective aspect construction. Here, a special form of the verb *to-* 'do' indicates a degree of non-firsthand information source, or evidentiality (Sarvasy, 2018a). This can be immediately preceded by a medial verb in what is formally a SS two-clause chain, as in (9), where the child Niumen's insect bites are visible to his mother, but the insects who bit him are unknown.

(9) wo, {nungon=to ge-i-nga}
    DIST what=FOC 2SG.O-bite-MV.SS

    {{ta-ga-ng}}, opmupmu, wo?
    do-INFR-2/3PL small:RED DIST

    There, what seem to be biting you, the little ones, there?
    (Mother to Niumen, 3;2)

In the child–parent interactions used here, the Inferred Imperfective sometimes occurs with its extended function: to express incredulous annoyance, as in Niumen's complaint to his mother in (10).

(10) ai, {nok na-no-ng
     INTJ PRO.1SG 1SG.O-tell-DEP

     mur-a} {{ta-ga-rog-a}},
     point-MV.SS do-INFR-1SG-ATT[1]

     gog-u.
     PRO.2SG-TOP

     Ai, you seem to be ordering me around, you!
     (Niumen, 3;0)

The Inferred Imperfective construction differs from the Continuous aspect construction in that the special form of 'do' obligatorily occurs in a final verb form, while the verb 'be' in the Continuous aspect construction can itself take a medial form within a clause chain.

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[1] While the 'attention' suffix *-a* is homophonous with the medial suffix *-a*, they are easily distinguished by morphology and context. Morphologically, the attention suffix only occurs after the subject person/number suffix on verbs bearing tense suffixes, while the medial suffix *-a* attaches to Dependent verb forms (which lack tense). Contextually, the attention suffix serves to call extra attention to the

Both aspectual constructions are included in the present study. They are counted as two-clause chains, though given special codes; for some analyses, they are omitted or kept separate from other clause chains. There are indications in Niumen's transcripts at 2;11 and older that the child already understands that these constructions are formally composed of two separate words, if not clauses: Niumen is able to omit the verb *it-* 'be' elliptically in response to a question framed in the same aspect and to insert a demonstrative between the medial verb and *it-* 'be' in (8).

Though Nungon medial clauses are morphologically dependent and canonically occur within clause chains, they can occur independently, outside clause chains, in both child and adult speech, under certain pragmatic conditions (Sarvasy, 2015a). Such medial clauses are called 'root medials' here, in a nod to 'root infinitives' of child German and other languages (Rizzi, 1994; Sarvasy, 2019b). In Nungon, some of the basic pragmatic functions of root medials are: (a) to command, with slightly different force or politeness than dedicated imperative forms, (b) to elaborate on a preceding clause chain, and (c) to express something elliptically, or with a 'trailing-off' effect. An example of a root medial used to command is in (11).

(11) {musuwat-no=dek   honggir-a.}
     end-3SG.POSS=LOC   hold-MV.SS
     Hold it from the end.   (Father to TO, 3;3)

MATERIALS AND METHODS

The present dataset comes from a larger longitudinal study of five children acquiring the Towet village dialect of Nungon in a village setting; more information on the larger study is on its CHILDES page, https://childes.talkbank.org/access/Other/Nungon/Sarvasy.html (MacWhinney, 2000). The five children were aged 1;1, 2;1, 2;10, 3;5, and 3;8 at the study's outset. All were recorded interacting with one or more parents and other family members for 1 h monthly over a 25-month period, except the youngest, Abraham, who entered the study later than the others, and was recorded throughout a 19-month period, through age 2;7. Of these children, transcripts from the youngest three are included in the present study. These were the ones that were fully coded and available for analysis. The age range from approximately 2;0 to 3;3 is also especially useful for examination of the early development of clause chaining, since the two older children already seem to have adept command of clause chains of varying lengths from their earliest recording sessions (at 3;5 and 3;8): this was part of the reason that the three youngest children's transcripts were coded first. Transcription and coding of an additional 60 h from a denser corpus with three other children, aged 2;1 to 2;7 initially and tracked intensively for 5 months, is now underway.

Recording sessions took place in or around the children's homes with participants seated on the floor or ground. At the beginning of each session, the interviewer (a local Nungon

speaker and classificatory kin of all children) positioned a small tripod-mounted Zoom H5 audio-recorder on the floor or ground, with the two built-in microphones pointing toward the child. This was set to record at a 44.1 kHz sampling rate and into WAV format. A second interviewer held a Canon digital camera recording in VGA video for the duration of most sessions. After the interviewer turned on the audio recorder and pressed 'record,' s/he sometimes left the scene, leaving parent and child alone to converse (or accompanied by the video-recording interviewer). After approximately 1 h, the interviewer returned and ended the session. The parents understood that the goal of the sessions was to track the children's linguistic development, and that they were meant to solicit speech from them. In some sessions, the parents relied on props as conversational prompts, especially printed images, including two picture-books left by the researcher: a compilation of photos of Towet community members, and *Koko's Kitten* (Patterson and Cohn, 1985). The parents also often prompted the children to talk about recent excursions to mountain farm plots, the high forest, or the coast, recount recent village events, and comment on or call out to people passing by the scene of the recording. In two sessions (at 3;0 and 3;3), Towet Oe (TO) and her father chat as the child prepares a meal and her father serves as her assistant. TO and Abraham's fathers were present in some of the sessions, and in one to two transcripts, served as main interlocutor in the absence of the child's mother, but Niumen's mother is his primary interlocutor in all the transcripts used here.

The recording sessions were digitally transcribed by the four interviewers on Lenovo 10.1" laptops in the villages in Wordpad using mid-CHAT format (MacWhinney and Snow, 1985, 1990), or, for sessions after September 2016, directly into CLAN. Of these transcriptions, ten (the five first made available on CHILDES, plus the first four for TO) have been thoroughly checked by the researcher against the audio recordings. Although two of the transcribers used more orthographic idiosyncrasies (such as separating the final syllable of polysyllabic words from the rest of the word with a space) than the others, these transcriptions were found to be highly faithful to the recordings.

For the present study, only the first 11 transcripts for Abraham (1;1 through 2;1) and the transcript from 2;4 were available. The first 15 transcripts for TO were available (2;1 through 3;3), and the first six transcripts for Niumen were used (2;10 through 3;3). These were coded in different ways.

In the first transcript for Niumen, and all 15 transcripts for TO, all child verb forms were coded by hand into a text file version of the transcript. Verbs were coded as to inflection and subject person/number. Medial verbs were coded as such, and received additional codes if they were marked for DS, occurred within a Continuous aspect or Inferred Imperfective construction, or were root medials. In the TO transcripts, all parent verb forms were similarly coded as well, but in the Niumen transcript at 2;10, only parental medial verbs were coded. The remaining five transcripts for Niumen had been fully glossed in CLAN for inclusion in the CHILDES database, so no further coding was done to them for the present study. Time constraints mean that parent verbs could not be coded in the transcripts for Abraham, but the child's verbs were coded in

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situation described in the verb it marks: 'be aware that X vs. Y,' while the medial suffix is the obligatory ending on the last verb of a predicate in a medial clause of a clause chain, and entails no additional emphasis or attention.

a spreadsheet of all his utterances in the collected transcripts, obtained through CLAN.

The transcripts that had been coded by hand into a text file were then searched individually using the search function in Microsoft Word to yield individual medial verb tokens for the children, and total counts of target phenomena for children and adults. The other five transcripts for Niumen were searched for the relevant morphological glosses in CLAN. From the spreadsheet with all utterances for Abraham, coded utterances including medial verbs were culled by hand.

All 785 child utterances including medial verbs for the three children were then compiled into a spreadsheet that served as the basis for further qualitative and statistical analysis of child medial verb and clause chain production. This spreadsheet also included counts for each utterance for number of medial verbs in the chain, length (in clauses), if the chain indicated Continuous aspect or Inferred Imperfective aspect, whether the utterance included a 'root medial' clause or was otherwise elliptical (lacked a final clause), and four pertinent contextual codes: desire, free narrative, picture-book, and repetition. The 'desire' code indicated whether the utterance expressed a command or desire; this was determined by conversational context for root medials, and, for clause chains, by whether the final verb in the chain was in an imperative inflection. The 'free narrative' code indicated whether the utterance occurred as a child's original narration of some past or future events, and the 'picture-book' code indicated whether the utterance was produced while the child and parent were engaged in describing printed images. The 'repetition' code indicated whether the child's production was an immediate repetition of a parental prompt. Prompted medial verbs were not excluded from initial counts, but self-repetitions within the same utterance or immediately after were excluded. In the example utterances in the Results section, child productions that immediately follow parental prompts are distinguished from those that do not follow parental prompts; total number of prompted medial verbs per transcript per child are given in **Table 1**, below.

Subordinated and coordinated final clauses in the children's speech were then culled by hand from all transcripts for the three children, yielding an additional spreadsheet with 243 utterances including these constructions. Each construction was coded according to several sub-types of coordinated and subordinated clauses, and also coded as to whether a clause was formally marked as subordinate with the marker = *ma* but occurred independently of a main clause—the subordinated equivalent to 'root medial' clauses. Time constraints meant that the same constructions were not also culled for parental speech.

Analysis and visualization were performed in R, using the brms, ggplot2, and tidyverse packages.

RESULTS

Discussion of the verb/utterance ratio as a measure for children's verbal development begins this section, followed by summaries of overall frequencies of medial verb tokens, and of medial verbs marked for DS, across speakers in the dataset. Children's clause chain productions are then examined in depth, followed by a brief discussion of clause chaining in child-directed speech, then statistical model results.

General Verbal Development

In the statistical models later in the paper, both age and a proxy for verbal sophistication, verbs/utterance, are used as independent variables. This section introduces the verbs/utterance ratio.

The ratio of verb tokens to total utterances within a single transcript is taken as somewhat indicative of verbal sophistication, where utterance is equated with one time-marked entry in the CHILDES/CHAT format (MacWhinney and Snow, 1985, 1990). Nungon does allow non-elliptical verb-less clauses (Sarvasy, 2017a), especially to express identity and equation ('X = Y'), where English speakers would use the copula *be*. In the present study, verb-less clauses are most often present in question-answer sequences about the identities of people in printed material [*ngo numa?* 'this (is) who?' *wo nan* 'that (is) Father'], or the owners of items at hand [*ngo numa = hon?* 'this (is) whose?' *wo nagain* 'that (is) mine']. The ratio of verb-less clauses to clauses with verbal predicates are expected to vary from transcript to transcript, depending on discourse content and context. In fact, however, when instances of maternal *ngo numa?* 'this (is) who?' and *ngo nungon?* 'this (is) what?' were tallied for Niumen's and TO's mothers, these were found to occur in between 12.43% and 16.57% (mean: 13.33%) of all Niumen's mother's utterances, and 0.00% and 7.71% (mean: 2.29%) of TO's mother's utterances. This shows that the amount of variation across transcripts in use of these by a single speaker is relatively small.

Another possible confounding factor for use of the verb/utterance ratio as an indication of verbal sophistication is the possibility that it could mask discourse-related asymmetries between child and caregiver speech in these dialogic recording sessions, for instance, if children tend to give elliptical, verb-less answers to questions originally posed with verbs (anticipated for the measure of MLU by Johnston, 2001). Impressionistically, this is not overwhelmingly the case for Nungon-speaking children, and Nungon's status as a pro-drop language with a strong preference for argument omission might play a role in dispreferencing verb-less answers to questions that include verbs.

Indeed, the ratio of verb tokens to total utterances does increase with age for the children, and all three appear to follow similar developmental trajectories when this measure is applied. **Figure 1** shows stable, low rates of verb production from about 16–24 months (Abraham), then gradual increases from about 24–33 months (Abraham and TO), and finally, accelerating rates of increase from about age 34 months on (TO and Niumen). The ratios for different children at the same ages are almost all within 0.1 of each other. This is reassuring: despite this study's limitations in using only three children studied for different lengths of time and age ranges, the children appear to follow similar developmental trajectories.

The youngest child, Abraham, produces no verb tokens for the first three recording sessions (ages 13–16 months). From 17 to nearly 24 months, his ratios are all between 0.0 and 0.04.

TABLE 1 | Counts of clause chain-related verb forms produced by target children.

Child	Age (mos.)	Total utts.	Total verbs	Total medial verbs	Medial verb types	DS marking	Cont. aspect	Inf. Impfv aspect	Total chains, l = 2	Total chains, l ≥ 3	Total 'root medials'	Prompted medial verbs
Abraham	13	294	0	0	0	0	0	0	0	0	0	N/A
Abraham	15	374	0	0	0	0	0	0	0	0	0	N/A
Abraham	16	267	0	0	0	0	0	0	0	0	0	N/A
Abraham	16.8	359	1	0	0	0	0	0	0	0	0	N/A
Abraham	17	316	11	0	0	0	0	0	0	0	0	N/A
Abraham	19	319	14	0	0	0	0	0	0	0	0	N/A
Abraham	19.3	86	1	0	0	0	0	0	0	0	0	N/A
Abraham	20	827	23	0	0	0	0	0	0	0	0	N/A
Abraham	21	434	16	0	0	0	0	0	0	0	0	N/A
Abraham	23.8	658	18	0	0	0	0	0	0	0	0	N/A
Abraham	25	161	11	0	0	0	0	0	0	0	0	N/A
Abraham	28	349	64	6	3	1	0	0	2	0	4	5
TO	25	469	26	0	0	0	0	0	0	0	0	N/A
TO	26	389	37	0	0	0	0	0	0	0	0	N/A
TO	27	615	78	0	0	0	0	0	0	0	0	N/A
TO	28	414	54	2	2	0	0	0	0	0	2	0
TO	29	566	94	7	3	1	1	0	3	0	4	0
TO	30	514	77	2	2	0	0	0	1	0	1	1
TO	31	568	57	0	O	0	0	0	0	0	0	N/A
TO	32	642	79	2	1	0	0	0	1	0	1	1
TO	33	546	92	1	1	0	0	0	0	0	1	0
TO	34	503	86	3	3	2	0	0	0	0	3	0
TO	35	220	67	8	5	6	1	0	2	0	5	1
TO	36	490	207	16	13	4	0	0	7	0	9	0
TO	37	697	256	48	27	29	0	0	15	3	26	0
TO	38	506	188	31	18	19	0	0	14	2	13	0
TO	39	544	324	73	39	36	3	1	37	5	27	3
Niumen	34	158	44	9	8	0	3	1	7	1	2	2
Niumen	35	800	312	86	22	3	76	1	81	0	5	12
Niumen	36	702	293	80	25	11	55	3	66	0	12	2
Niumen	37	879	597	188	68	47	77	2	123	10	32	18
Niumen	38	690	442	167	55	33	94	4	114	15	18	4
Niumen	39	554	389	115	32	25	51	15	96	1	13	5

But his ratio at age 25 months is 0.068, representing a minor jump to a ratio which is similar to, though slightly higher than, TO's verb/utterance ratio at the same age: 0.055. At 28 months, Abraham's verb/utterance ratio is higher still, at 0.18; this is slightly more than, but in a similar range to, TO's ratio at the same age: 0.13. Thus, Abraham's net increase in verb/utterance ratio between ages 25 and 28 months is 0.037/month, or almost the same increase each month in his 26th, 27th, and 28th months as his total net gain between 16 and 24 months. TO starts at a more advanced stage than Abraham, but her development over the study period can also be divided visually into two stages: a slower increase between 25 and 34 months, then more rapid increases between 35 and 39 months. Niumen's verb/utterance ratio increases between the ages of 34 and 39 months are at a similar scale to those of TO.

All parental verb/utterance ratios are generally higher than those of the children, with the exception of one data point from TO's father, where he produced 104 utterances, including 67 verbs; that ratio (0.64) is the same as the child Niumen's ratio at age 38 months (442 verbs in 690 utterances). Niumen's verb/utterance ratios at four of the six ages are higher than TO's at the same ages, but the difference between the two children at any one point is always less than the difference between the higher child's ratio and the lowest of the parents' ratios at that point. TO's mother's verb/utterance ratios are within the range of 0.8–1.9, while Niumen's mother's ratios for the smaller age range in which data is available are 1.2–1.8. Indeed, mother's verb/utterance ratio is predictive of child's verb/utterance ratio, as will be seen in the statistical model results.

Medial Verb Development

A first clue to clause chain use by all speakers is their use of medial verbs, which only occur in medial clauses: either medial clauses within clause chains, or 'root medial' clauses (pragmatically-driven independent uses of medial clauses, outside of clause chains).

FIGURE 1 | Verbs per utterance by child's age.
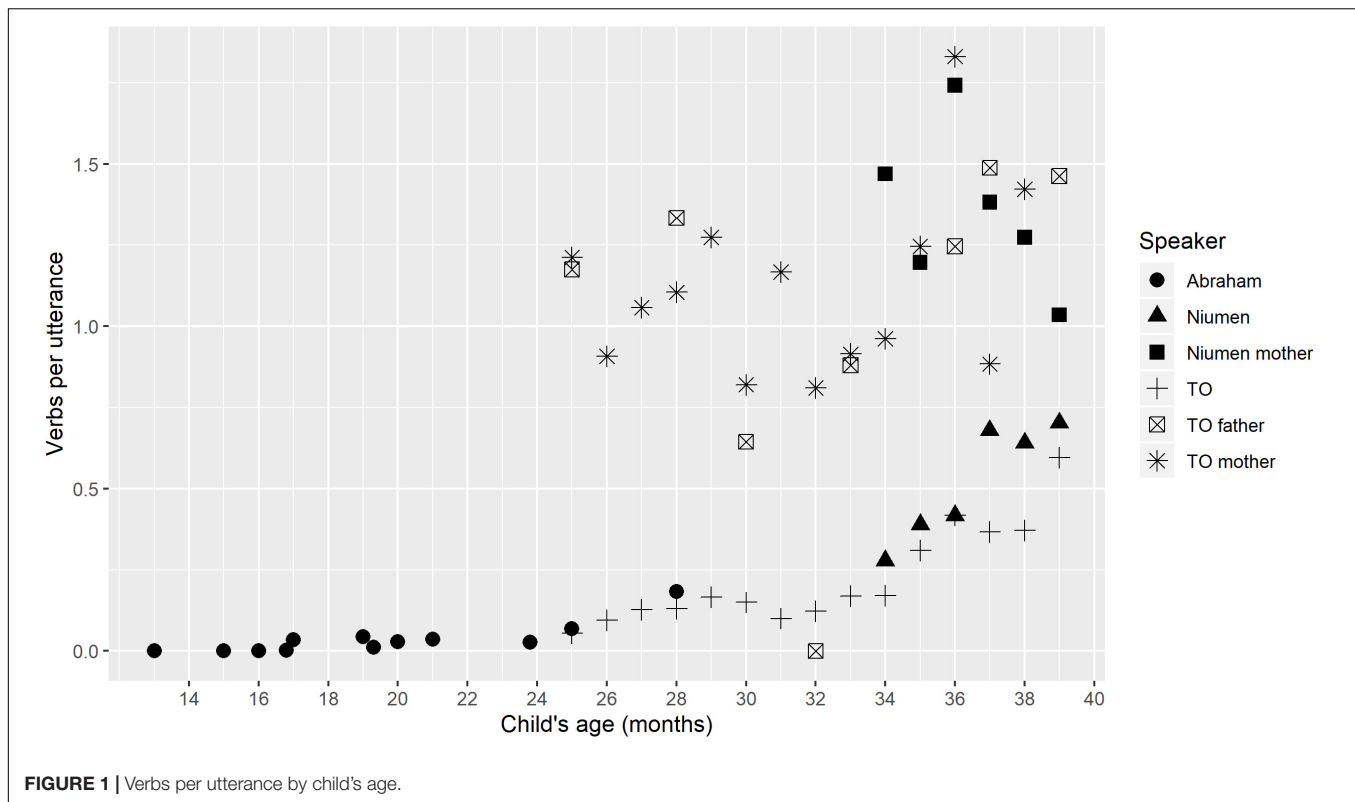
Medial verb use can be quantified through the percentage that medial verb tokens comprise of the total verb tokens produced by a speaker in a single transcript, in **Figure 2**. If the percentage of medial verbs is higher for a speaker in transcript A than in transcript B, this indicates that: (a) the speaker produced more clause chains or root medials in A than in B, *or*: (b) the speaker produced the same or fewer clause chains in A than in B, but chains in A tended to be longer (comprising more clauses) than chains in B, *or*: (c) the speaker produced more, and longer, clause chains in A than in B.

A few general trends are evident in **Figure 2**. Throughout the study period, TO's parents have higher percentages of medial verbs than TO in a given transcript, but TO's percentages from 37 to 39 months fall in the same range as her parents' did in the period up to 33 months. This means that the parents could be adjusting the complexity of their clause chaining based on TO's own verbal sophistication (Bohannon and Marquis, 1977; Soderstrom, 2007, *inter alia*). In only one instance, from the last transcript for Niumen at age 39 months, does a child's percentage of medial verbs surpass that of a parent in the same transcript.

Although TO and Niumen's verb/utterance ratios are similar at the same ages (**Figure 1**), Niumen produces higher percentages of medial verbs (of all verb tokens) than TO from 34 to 39 months. This difference is largely due to Niumen's more frequent use of the Continuous aspect construction. **Figure 3** shows that if aspectual two-clause chains are omitted from counts, Niumen and TO's proportional medial verb usages are similar in the period from 34 through 39 months. Of the 359

instances of the Continuous aspect construction produced by TO and Niumen during the study period, 337 (or 93.9%) occurred in the context of picture-book or other printed image description. Picture-book description was a frequent activity for Niumen and his mother in the recording sessions, but not as much for TO and her parents.

Overall, **Figures 2**, **3** show that children's medial verb production increases with age. It also appears that parental fine-tuning may be occurring, with TO's mother producing on average 5.7% more medial verbs in the period of 34–39 months than in the first nine transcripts, and TO's father producing on average 6.0% more medial verbs from 34 to 39 months than from 25 to 33 months.

The obligatory switch-reference marking on Nungon medial verbs means that a further division can be made among medial verbs, even once those occurring in aspectual constructions are optionally filtered out. Our research questions hinted at the possibility that children might produce SS and DS medial verbs with different frequencies and at different developmental stages. In the last global proportion counts in this section, we examine proportions of DS-marked medial verbs across speakers. **Figure 4** shows the percentage of medial verb tokens that are marked for DS in a given transcript, by speaker, and **Figure 5** gives the same percentage for only non-aspectual medial verbs.

Figures 4, **5** imply a limited relationship between age and use of DS marking: there seems to be reduced incidence of DS marking in the early stages of medial verb production (approximately 2;4 through 2;9), but once medial verb use increases, around 2;10–2;11, DS marking is robustly present

FIGURE 2 | Medial verb tokens per total verb tokens.

FIGURE 3 | Medial verb tokens not in aspectual constructions, per all verb tokens.
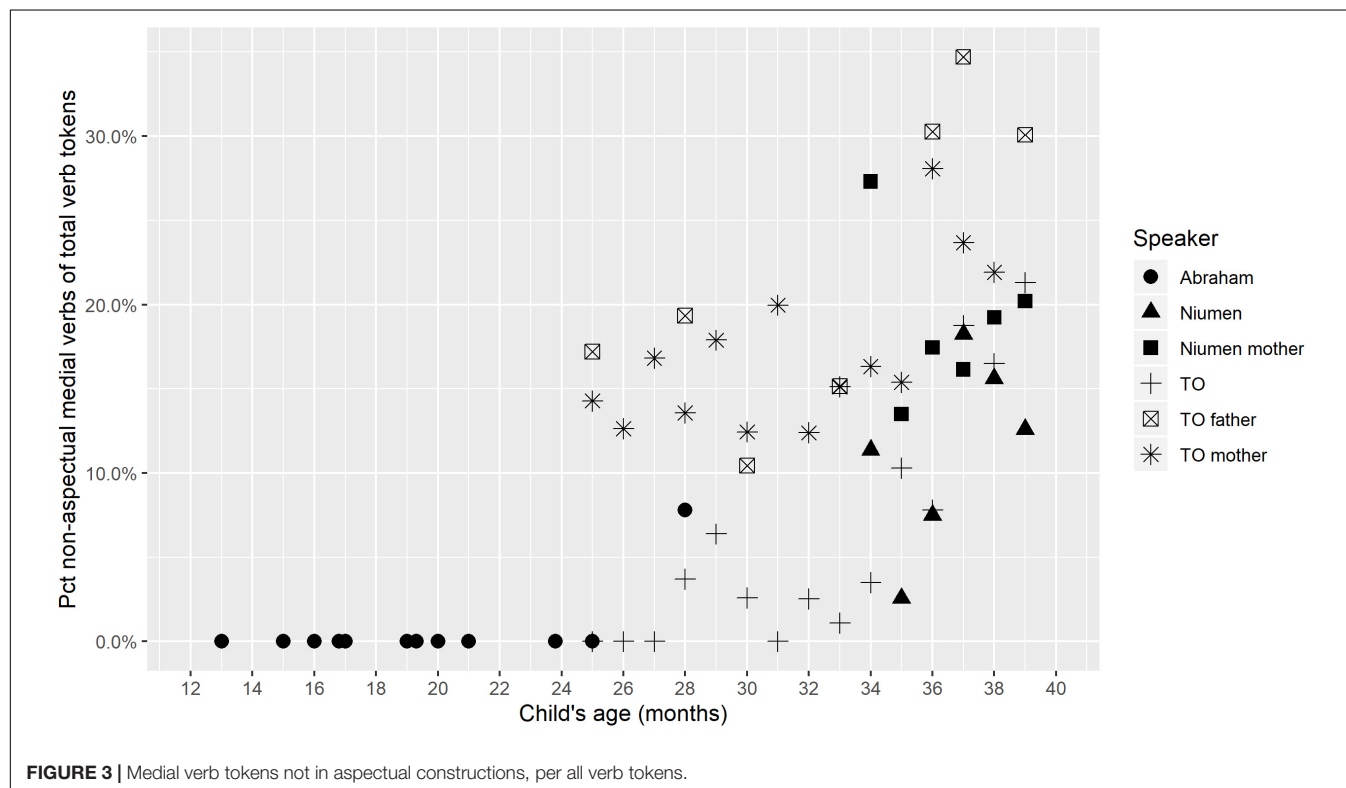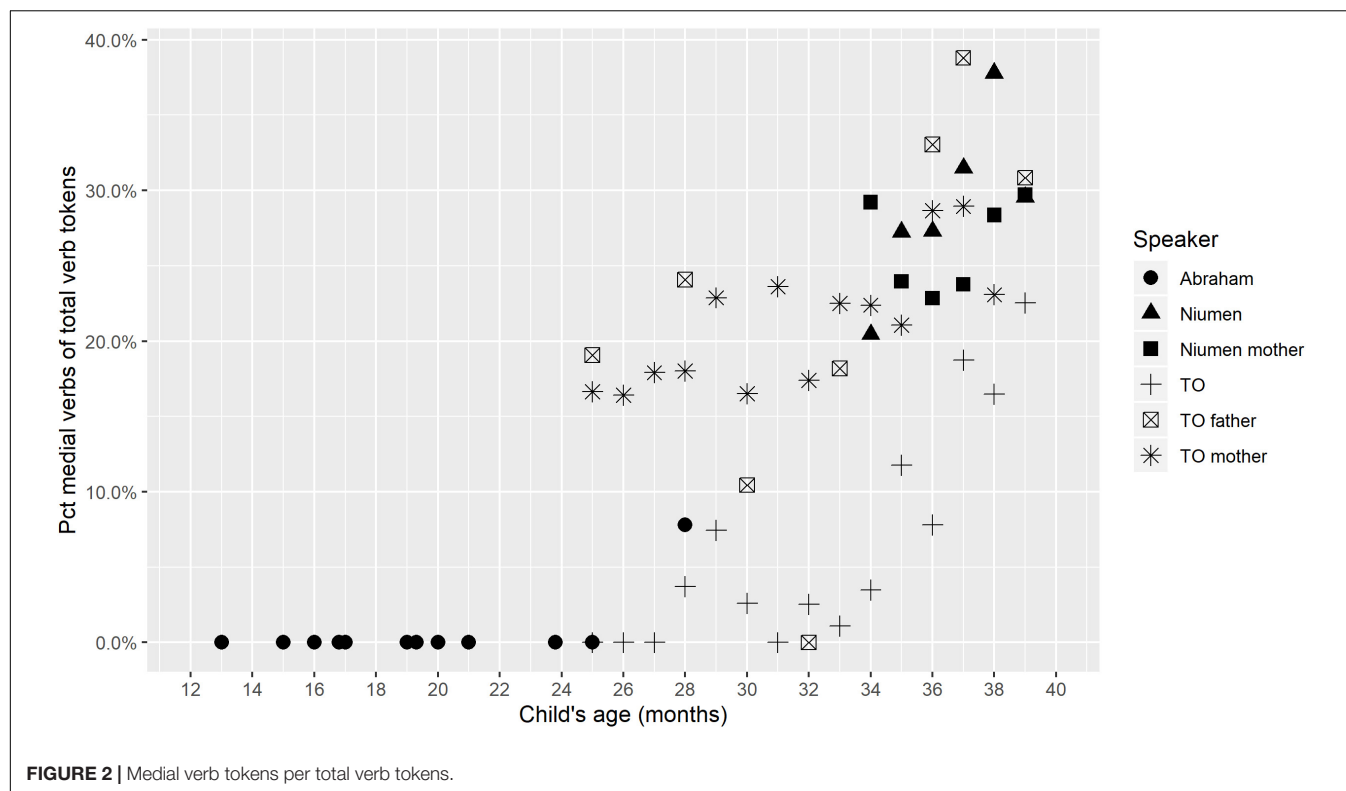
on 33.3–51.0% of Niumen's non-aspectual medial verbs, and 25.0–85.7% of TO's non-aspectual medial verbs. Niumen's use of DS marking between 2;11 and 3;3 could show a slight upward trend, but TO's use in the same age range does not show any indication of this. In the very first transcripts with medial verb productions for TO and Niumen, all their medial verbs happen

FIGURE 4 | Percentage of medial verb tokens with Different-Subject marking.

FIGURE 5 | Percentage of non-aspectual medial verb tokens with Different-Subject marking.
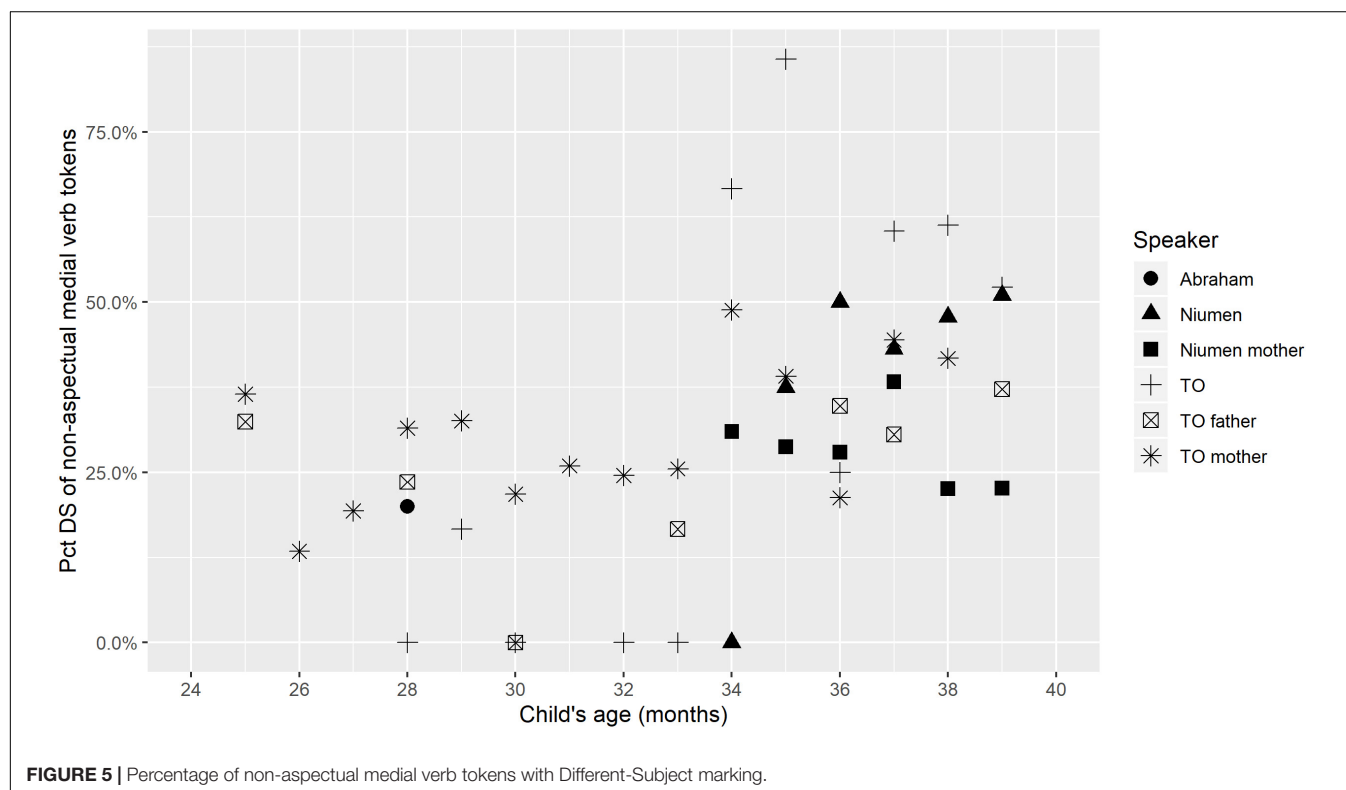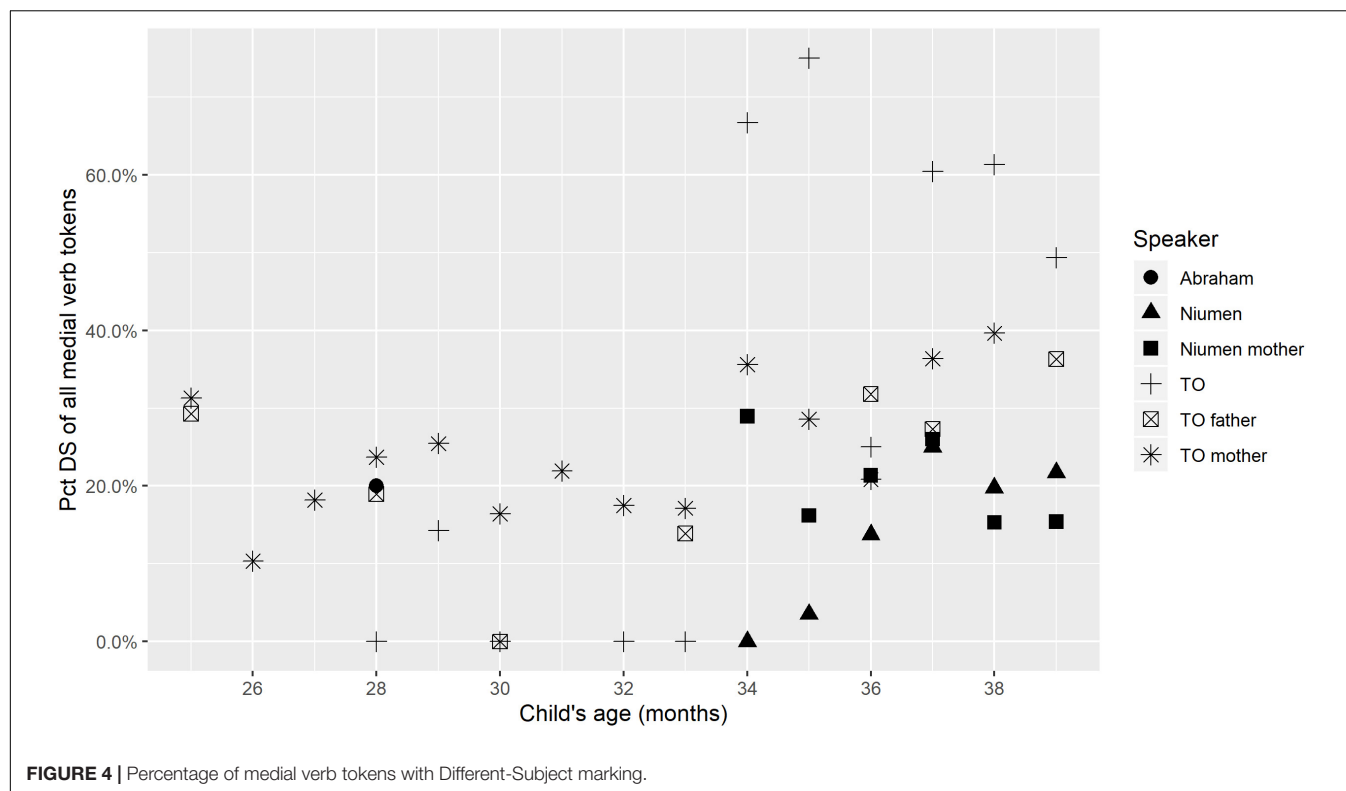
to be SS, but these transcripts stem from recording sessions at very different ages: 2;4 for TO and 2;10 for Niumen. Both children then produce a mix of SS and DS forms in the very next recording

session. Abraham's first six medial verbs, at 2;4, include one DS-marked medial verb in a root medial clause, but this is one of his utterances that follows a parental prompt.

TO's proportional use of DS is in contrast to her parents, whose percentages of DS-marked medial verbs show a potential, slight increase from 34 months, but whose percentages still remain between 10 and 40% for the entire study period. Attributing the parents' increase in DS marking to fine-tuning may be untenable, since switch-reference marking depends on subject maintenance or changes within clause chains, which relates to the meaning of each chain. However, it could be the case that the parents begin to describe more semantically complex situations in their child-directed clause chains as the child's perceived verbal sophistication increases.

We now turn to detailed analysis of children's clause chain production in Nungon.

Clause Chain Production by Children

Overall results for the target children are in **Table 1**. **Table 1** gives, for each child at each age: total utterances, number of verb tokens, number of medial verb tokens, number of medial verb types, number of DS-marked medial verbs, number of Continuous aspect constructions, number of Inferred Imperfective aspect constructions, number of clause chains containing two clauses, number of clause chains containing three or more clauses, number of root medials (independent medial clauses), and number of prompted medial verbs.

In **Table 1**, medial verb types can be taken as an estimate of the lexical range of medial verbs. It should be noted that this measure does not take the lexical verb of the following clause into consideration. This means that all tokens of the SS medial verb *to-nga* 'taking it up' illustrated in example (6) would be classed as the same 'medial verb type' regardless of the particular verb of motion used in the following clause of a two-clause chain. Two medial verbs of the same type do not necessarily occur in identical clause chains—in fact, in many cases, they do not. SS-marked and DS-marked medial verbs were classed as different types, such that the SS verb *ongo-nga* 'going' would be a different 'medial verb type' than the DS, 2sg medial verb *ong-i-ya* 'you having gone,' despite the fact that they are formed from the same verb root.

As noted before, Abraham produces no recognizable medial verb tokens between ages 1;6 and 2;1. There is a gap in data availability for him for 2;2 and 2;3; in the last available transcript, at 2;4, he produces six medial verbs, of which five occur in prompted utterances (either root medials or two-clause chains). The detailed examination here will thus focus on TO's and Niumen's productions.

Figure 2 indicated that medial verbs begin to form greater percentages of total verb tokens from about age 2;10 (34 months). This period also marks the beginning of a marked increase in medial verbs produced in bona fide clause chains, as opposed to root medial clauses. **Table 1** shows that TO produces independent root medial clauses more consistently than two-clause chains through age 2;10 (34 months). She continues producing equal or greater numbers of root medials than standard medial + final two-clause chains through 3;1 (37 months), but in the last 2 months of the study period (3;2 and 3;3, or 38 and 39 months), medial verbs in clause chains outnumber medial verbs in root medial clauses. The shift in balance is not due to any decrease in

TO's root medial token production, but rather stems from TO's increased production of bona fide clause chains.

As noted in the discussion of **Figures 4**, **5**, TO's first three two-clause chains, produced without prompting at 2;5 (29 months), are all SS. But even though her first production of a DS-marked medial verb occurs in that month's transcript, that token occurs in a root medial clause, not a true two-clause chain. TO's next two productions of DS medial verbs occur at 2;10: these are, again, in root medial clauses. It is not until 2;11 that TO produces her first two-clause chains with DS marking. So although the DS form is used early in root medial clauses, there is no positive evidence from TO that the child can produce DS-marked medial verbs in actual clause chains before 2;11 (It is hoped that the new, denser corpus targeting verbal development in three additional Nungon-speaking children between 2;0 and 3;0 will help establish whether this is also the case for children recorded for 4 h monthly instead of one).

We now examine some of the actual child productions in the dataset. Since Abraham's only clause chains are almost all repetitions of parental prompts, the detailed discussion here focuses on development by TO and Niumen. At 2;4, TO produces her first two medial verbs in the transcripts. Both of these are un-prompted by her parents. The first occurs in the root medial utterance in (12).

(12) FAT: wo,   balus   ami-no.
            DIST   airplane   bed-3SG.POSS
            That is the airstrip.

     CHI: {nok   öö-ng   ongo-nga}.
            PRO.1SG   ascend-DEP   go-MV.SS
            I going up.

     FAT: öö   wo-go-rok.
            yes   DIST-ADV-SEMBL
            Yes, that's right.

     MOT: nn,   {{gok   buu
            yes   PRO.2SG   plane.BT

            ongo-go-rok=ma}},   wo-rok.
            go-RP-2SG=SUB   DIST-SEMBL
            Yes, where you went on the airplane, that's it.
            (TO, 2;4)

TO's other medial verb token at 2;4 occurs in a two-clause utterance with the medial and final clauses' ordering reversed, seen in (13). This non-canonical ordering is also attested in the speech of adults (Sarvasy, 2015a), when an elaboration or explanation is supplied after the speaker has already concluded a preceding clause chain by uttering a final clause.

(13) {{yoo-wa-k}},   {wo-ndo   hi-nga},   wo.
     NSG.O.take-NP.SG-3SG   DIST-NEAR   put-MV.SS   DIST
     He took it, coming from there, that one. (TO, 2;4)

This follows her mother's pointing out an image in a picture-book (*Koko's Kitten*); it is unclear what TO means by it. The medial clause here was coded as a root medial clause, since it lacks a following final clause.

At 2;5, TO produces seven utterances including medial verbs, of which four are root medial clauses, one is a Continuous aspect two-clause chain, and two are SS two-clause chains that refer to distinct actions. None of these follow parental prompts. One of the root medial clauses has a medial verb that is inflected for DS, but all other medial verbs are SS. The Continuous aspect chain is shown in (14), and the two SS two-clause chains are in (15) and (16).

(14) {duwo-nga} {{it-du-ng}} ngo haha xxx.
sleep-MV.SS be-RP-2/3PL PROX haha UNINT

They were sleeping, here, haha. (TO 2;5)

(15) {bauk ho-nga} ngo=ma
sweet.potato cook-MV.SS PROX=SPEC

{{buu ongo-wa}}.
airplane.BT go-IMP.1SG

Having cooked sweet potatoes, then I will go on the airplane. (TO, 2;5)

(16) {to-nga} {{ongo-c=ma}}, böc.
SG.O.take-MV.SS go-NP.3SG=SUB house

Taking it up, he went, (to the) house. (TO, 2;5)

The chains in (15) and (16) differ slightly in the degree of close association between the actions of the first and second clauses. In (15), the cooking of sweet potatoes and getting on an airplane are separated in time and space; nor is there any conventionalization about this combination. In contrast, the SS clause chain in (16) fits one conventional way of carrying something from one place to another, as illustrated in (6), above, and the 'taking up' is immediately followed by the 'going.'

The second verb in (16) is ambiguous between a 'root nominal,' the nominalized form of the verb used as a main clause predicate in child-directed and child speech (discussed extensively in Sarvasy, 2019b), and the Near Past form of this particular verb with a 3sg subject. Unlike root medials, root nominals are not found in adult-directed adult Nungon speech. It should be noted here that there is no evidence in the dataset for any morphological reduction of medial verb forms or other un-adult-like features of child clause chain productions—save for one three-clause chain produced by TO at age 3;3 in which one of the DS-marked medial verbs should be SS-marked, given as example (25) below.

At 2;5, two of TO's four root medial clauses express TO's immediate desires or requests, as seen in (17), in which the medial verb bears DS marking, and (18). Another root medial clause apparently describes a picture of the kitten in the picture-book *Koko's Kitten* and resembles a Continuous aspect construction without the verb 'be' (in 19), and the fourth root medial clause describes a friend's mother's having gone away (in 20).

(17) mama {bauc ngo-ndo i-in-a}.
mother.BT sweet.potato PROX-NEAR be-DS.3SG-MV

Mama, the sweet potato being here. [i.e., 'let it be here'] (TO, 2;5)

(18) {obe-ng na-mo-nga}.
break-DEP 1SG.O-give-MV.SS

Breaking it for me. [i.e., 'break it for me'] (TO, 2;5)

(19) {duwo-nga} ee.
sleep-MV.SS INTJ

Sleeping eh. (TO, 2;5)

(20) CHI: {dada mama ongo-nga}.
sibling.BT mother.BT go-MV.SS

Dada('s) mama going.

MOT: {{dada mama-no Lae it-ta-k}}.
sibling.BT mother-3SG.POSS Lae be-PRES.SG-3SG

Dada's mama is in Lae. (TO, 2;5)

Despite the fact that TO produces three two-clause chains at 2;5, and a potential precursor (with medial and final clauses switched) at 2;4, her clause chain use does not increase in the subsequent recording sessions over the next 5 months. TO's transcripts from 2;6 to 2;10 include her productions of six root medial clauses (of which four are SS and two are DS) and only two two-clause chains, both SS and lexically identical to each other ('coming, see it!' although produced in different transcripts, at 2;6 and 2;9), and both produced at the prompting of her mother to call out to a sibling, as seen in (21).

(21) MOT: {{karup agep mabö-hi}}
quick firm call.out-IMP.2SG

Agu {e-nga} {{aa-hi}}.
Agu come-MV.SS 3SG.O.see-IMP.2SG

Quick, call out loudly: 'Agu, coming, see it!'

CHI: Agu {e-nga} {{a-i}}!
Agu come-MV.SS 3SG.O.see-IMP.2SG

Agu, coming, see it! (TO, 2;6)

In the transcript from age 2;11, TO shows a slight increase in two-clause chains over previous months, while continuing to produce root medial clauses as well. Both two-clause chains she produces at 2;11 have DS-marked medial verbs: these are her first DS two-clause chains, since all her DS-marked medial verbs in earlier sessions occur in root medial clauses, not two-clause chains. From 2;11 through 3;1, TO's production of two-clause chains continues to expand in both lexical and semantic versatility and quantity. For instance, the combination of verbs in the DS two-clause chain in (22) is not conventionalized and shows some linguistic creativity on the part of the child. Similarly, the postposed expansions on the two-clause chain

in (23) indicate an enhanced expressive ability over TO's earliest clause chains.

(22) {irom i-i-ya}, {{tutu na-wa}}.
free be-DS.2SG-MV breast.BT eat-IMP.1SG

You being idle, let me nurse! [Directed at her mother.] (TO, 2;11)

(23) {opmu di-un-a} {{na-nangka-mong}},
small burn-DS.3SG-MV eat-NF.PL-1PL

dedi-na gomong,
father.TP-1SG.POSS ASSOC

papa-na gomong.
paternal.uncle.BT-1SG.POSS ASSOC

It having cooked a bit, we will eat it, my Daddy and others, my Uncle and others. (TO, 3;0)

In the session at 3;1 and the two following sessions, TO shows mastery of complex, creative three-clause chains, including DS-marked as well as SS-marked medial verbs. One of these is in (24).

(24) {ami-no ngo=dek i-in-a}
bed-3SG.POSS PROX=LOC be-DS.3SG-MV

{wo horo-ng wor-a}
DIST breathe-DEP beat-MV.SS

{{ongo-rangka-mok}}.
go-NF.DU-1DU

(The airplane still) being on the airstrip, running fast, the two of us will go. (TO, 3;1)

At 3;3, TO produces the only incorrect switch-reference marking on a medial verb attested for any of the children in the entire dataset. This is thus the single incorrectly switch-reference-marked token out of a total of 193 medial verb tokens produced by TO, with no incorrect switch-reference marking in any of the 6 medial verb tokens produced by Abraham, nor the 645 tokens produced by Niumen. TO's sole medial verb token with incorrect switch-reference marking occurs within the three-clause chain in (25).

(25) {o dumdum w-i-ya}
CONJ running 3SG.O.beat-DS.2SG-MV

{ong-i-ya} {{g-aa-wa}}, oro.
go-DS.2SG-MV 2SG.O.see-IMP.1SG well

And you running, you having gone, let me see you, okay. [First DS marking should be SS, according to transcribers: subject 'you' is maintained across the two clauses] (TO, 3;3)

Niumen's earliest speech sample, at 2;10, includes eight utterances with medial verbs (all SS marked, and including

one root medial clause; of 158 total utterances). Two of these follow parental prompts. The six unprompted medial verbs exhibit all three major functions of clause chains: description of consecutive actions (in 26); Continuous aspect (in 27), and Inferred Imperfective aspect (in 28).

(26) {guo-nga} {{ep-bo-mong}}.
bathe-MV.SS come-RP-1PL

Having bathed, we came. (Niumen, 2;10)

(27) {eep oro-nga} {{it-do-k}}.
tree wind.around-MV.SS be-RP-3SG

It was winding around a tree. (Niumen, 2;10)

(28) {{nain it-ta-k}} {ga-no-nga} {{ta-ga-ng}}.
where be-PRES.SG-3SG 2SG.O-tell-MV.SS do-INFR-2/3PL

They seem to be telling you, 'Where is it?' (Niumen, 2;10)

By 3;1, Niumen (like TO) produces complex, non-conventionalized chains of three or more clauses, containing multiple events and, often, DS marking (19.8–25.0% of Niumen's medial verbs are DS marked at 3;1–3;3). But while TO never produces a clause chain of more than three clauses in the study period, Niumen's attested unprompted chain lengths jump from only two clauses (2;10–3;0) to the range of three-to-five clauses (3;1–3;3). One of Niumen's four-clause chains is in (29), and a three-clause chain with two DS-marked medial verbs is in (30).

(29) {nog-u öö-ng ongo-nga}
1SG.PRO-TOP ascend-DEP go-MV.SS

{gowik hai-k gowik
knife cut-NMZ knife

to-nga} {öö-ng ongo-nga}
SG.O.take-MV.SS ascend-DEP go-MV.SS

{{eep hai-wi-t-ma}}.
tree cut-IRR.SG-1SG-RF

As for me, going up, taking a machete, going up, I will fell a tree. (Niumen, 3;1)

(30) {nogo hai-wa-ya} {mö-un-a}
1SG.PRO.FOC cut-DS.1SG-MV fall-DS.3SG-MV

{{ho-ng na-rangka-mok}}.
cook-DEP eat-NF.DU-1DU

I cutting (it), it falling, we two will cook and eat it. (Niumen, 3;1)

The Introduction explained that languages like Nungon have three options for complex sentence formation, compared with the two major options in English. This section concludes by comparing TO and Niumen's non-aspectual clause chain

productions with their productions of subordinated and coordinated final clauses.

Figures 6, **7** show the numbers of non-aspectual clause chains of two or more clauses, complex sentences including coordinated final clauses, and complex sentences with subordinated final clauses, produced by TO and Niumen. Speech reports ('s/he said, "I will go"'), which also superficially involve two or more final clauses, are not shown in **Figures 6**, **7**, but speech report tokens
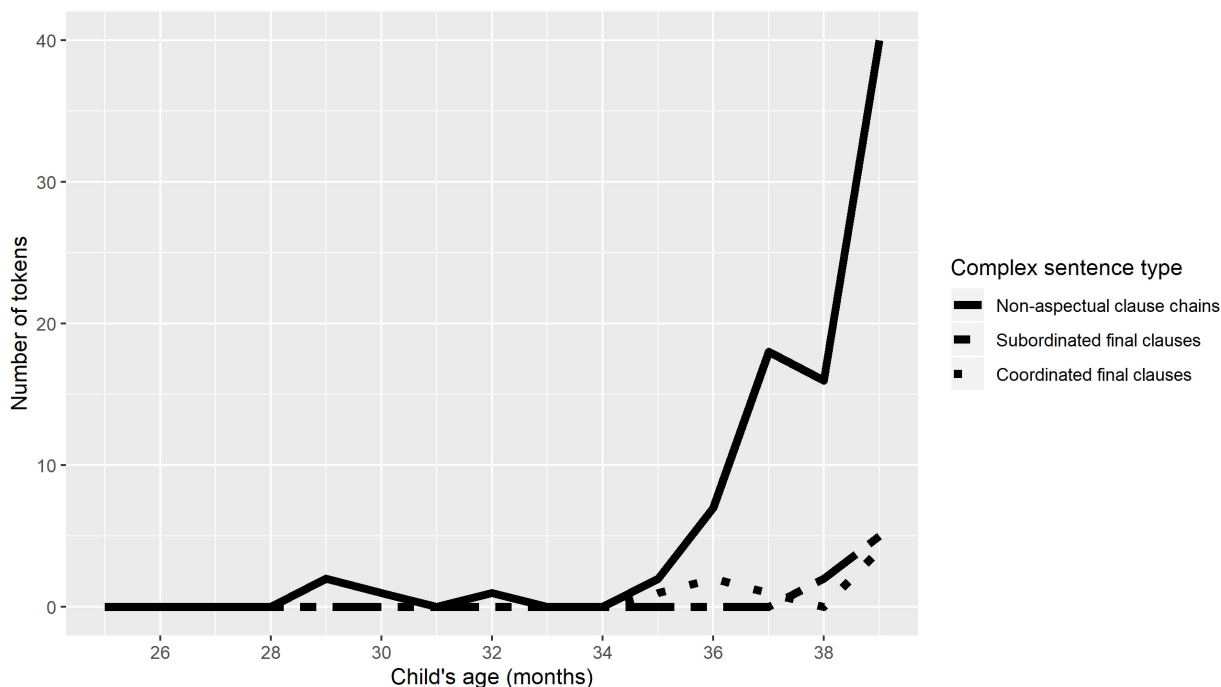
FIGURE 6 | Comparison of complex sentence types, TO.
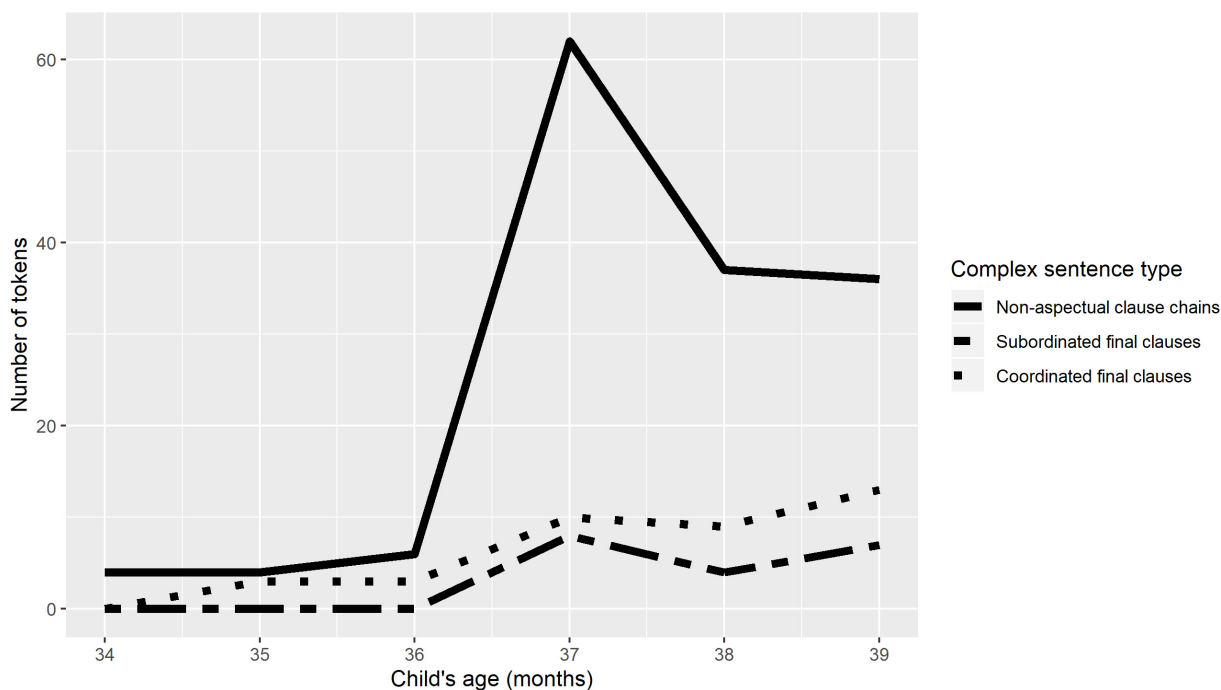
FIGURE 7 | Comparison of complex sentence types, Niumen.

were relatively sparse in the dataset, ranging from 0 to maximally 3 for either child in any transcript.

For both children, counts of all three types of complex sentence in **Figures 6**, **7** begin to increase at 2;11 or 3;0, after a sustained period of minimal complex sentence production. But for both children, the increase in complex sentence production coincides with a sharp divergence in clause chain production from the other two types of complex sentence.

Figures 6, **7** imply that children's productions of complex sentences including two or more clauses are shaped by both cognitive development and native language characteristics. For both children, all types of complex sentence production increase around the same time, but the increase is most dramatic for clause chains, and clause chains continue to be produced in much greater numbers than subordinated or coordinated final clauses for the rest of the study period.

Clause Chains in Child-Directed Speech

Clause chains are an integral feature of Nungon discourse, and the preferred way to describe related events or actions. It therefore makes sense that clause chains are present in child-directed speech from the earliest transcripts here, before the children themselves begin to produce clause chains. Overall results for TO's parents and Niumen's mother are in **Table 2**.

Conversational turns when interacting with toddlers are necessarily limited in length, but the parents here manage some respectably long and complex clause chains within their turns. Example (31), which TO's mother directed at TO at age 3;2, is a six-clause chain within a speech report, which also includes a parenthetical two-clause Inferred Imperfective aspect chain interpolated into the main clause chain:

(31) numa=ho   muuno,
     who=FOC   not

     {{wase-ya=ho   yo-go-k=ma}}-i,
     namesake-2SG.POSS=FOC   say-RP-3SG=SUB-TOP

     {e-nga},   {ir-a},   {naga=rot
     come-MV.SS   be-MV.SS   PRO.EMPH.1SG=COMIT

     ma=ir-a}   {{ta-ga-rok}},
     NEG = be-MV.SS   do-INFR-2SG

     {e-i-ya},   {raisi ho-nga}
     come-DS.2SG-MV   rice   cook-MV.SS

     {ga-m-a-ya}
     2SG.O-give-DS.1SG-MV

     {{na-i-rok-ma}}   {{yo-go-k}}.
     eat-IRR-2SG-RF   say-RP-3SG

     (Don't say) 'who was it?', what your namesake said was, 'Coming, staying, (since) you don't seem to spend time with me, you coming, I cooking rice and giving it to you, you will eat,' she said. (TO's mother, 3;2)

In (31), two of the five medial verbs within the main clause chain are marked for DS. Example (32) is a six-clause chain (there are eight clauses here, but the first two clauses are self-repetitions), directed from TO's father to TO at age 3;1:

(32) awe,   {Diyas=ho   to-nga}   {ongo-nga} {Diyas
     yet   Diyas=FOC   SG.O.take-MV.SS   go-MV.SS   Diyas

     to-nga}   {ongo-nga}
     SG.O.take-MV.SS   go-MV.SS

     {a-un-a},   {orogo
     3SG.O.see-DS.3SG-MV   good

     imbange   i-in-a},
     wonderful   be-DS.3SG-MV

     {wo   k-e-nga}   {{ga-m-angka-k}}.
     DIST   SG.O-come-MV.SS   2SG.O-give-NF.SG-3SG

     Not yet, it's Diyas who taking it, going, Diyas taking it, going, seeing it, it being good, wonderful, then bringing it, she will give it to you. (TO's father, 3;1)

In (32), as in (31), two of the five medial verbs are marked for DS.

Statistical Model Results

Bayesian modeling was used to test impressions from visual inspection of the data.

First, a Bayesian logistic regression model served to test the relationship between child's age (in years) and the verbs per utterance ratio. This showed a very strong quadratic relationship between age and the verb/utterance ratio. The conditional effects are visualized in **Figure 8** and population-level effects are given as Model 1 in **Table 3**. The model greatly outperforms a null model using leave-one-out cross-validation.

Second, Bayesian logistic regression models were used to evaluate the relationship between children's medial verb use and: age, verb/utterance ratio, or both age and verb/utterance ratio. The model using age and verb/utterance together was top-ranked in leave-one-out cross-validation, but with only a very small ELPD difference of -0.4 between that model and the one also including age, and a standard error of 0.5. The conditional effects of the verb/utterance ratio in this model are visualized in **Figure 9**, and population-level effects are given as Model 2 in **Table 3**.

Visual inspection of the children's medial verb data yielded uncertainty around whether DS marking can be considered to increase with age. When Bayesian logistic regression models were fit to the entire dataset, including aspectual clause chains, a model predicting DS marking using a combination of age and verb/utterance ratio outperformed a null model and models using verb/utterance or age alone. Population-level effects for the best-fitting model are under Model 3 in **Table 3**, and the conditional effects of the child's age on DS marking are in **Figure 10**.

Speaker	Child's age (mos.)	Total utterances	Total verbs	Total medial verbs	DS medial verbs	Cont. aspect	Inf. Impfv. aspect
TO mother	25	491	595	99	31	12	2
TO mother	26	584	530	87	9	19	1
TO mother	27	697	737	132	24	7	1
TO mother	28	487	538	97	23	24	0
TO mother	29	566	721	165	42	36	0
TO mother	30	539	442	73	12	18	0
TO mother	31	562	656	155	34	23	1
TO mother	32	568	460	80	14	23	0
TO mother	33	340	311	70	12	23	0
TO mother	34	548	527	118	42	28	4
TO mother	35	240	299	63	18	15	2
TO mother	36	183	335	96	20	1	1
TO mother	37	43	38	11	4	1	1
TO mother	38	661	940	217	86	10	1
TO mother	39	–	–	–	–	–	–
TO father	25	183	215	41	12	4	0
TO father	26	–	–	–	–	–	–
TO father	27	–	–	–	–	–	–
TO father	28	411	548	132	25	25	1
TO father	29	–	–	–	–	–	–
TO father	30	104	67	7	0	0	0
TO father	31	–	–	–	–	–	–
TO father	32	1	0	0	0	0	
TO father	33	225	198	36	5	5	1
TO father	34	–	–	–	–	–	–
TO father	35	–	–	–	–	–	–
TO father	36	374	466	154	49	12	1
TO father	37	558	830	322	88	31	3
TO father	38	–	–	–	–	–	–
TO father	39	623	911	281	102	5	2
Niumen mother	34	177	260	76	22	5	0
Niumen mother	35	990	1185	284	46	120	4
Niumen mother	36	776	1352	309	66	68	5
Niumen mother	37	901	1245	296	77	89	6
Niumen mother	38	722	920	261	40	79	5
Niumen mother	39	569	589	175	27	53	3

Bayesian logistic regression modeling further confirmed that the children used 'root medial' clauses primarily to express commands and wishes. Sarvasy (2015a) described this as one of the functions of root medial clauses in adult speech, but did not quantify it. A model in which a 'command/desire' context was a factor in whether a given medial verb occurred in a root medial clause far outperformed the comparison null model, in which no factors predicted root medial clause occurrence, when evaluated with leave-one-out cross-validation. Population effects for the better-fitting model are under Model 4 in **Table 3**, and its conditional effects are visualized in **Figure 11**, where the value 0 on the *x*-axis represents a non-command/desire context, and the value 1 represents a command/desire context.

The last area investigated statistically involves potential correlations between child and adult productions in a given transcript. To Model 1, I added 'mother's verb/utterance ratio' as an additional factor in predicting child's verb/utterance

ratio. Indeed, as mother's verb/utterance ratio increases, child verb/utterance ratio also increases; population-level effects are as Model 5 in **Table 3**, and the conditional effects are visualized in **Figure 12**.

To Model 2, I added 'mother's medial verbs/total verbs ratio' as an additional factor in predicting child's medial verb/total verbs ratio. The mother's medial verbs/total verbs ratio yielded an estimated effect of lowering the child's ratio by −0.10, but with a large amount of uncertainty (the 95% confidence intervals extend from −0.24 to 0.05). Thus, mother's medial verb/total verb ratio is not predictive of child's medial verb/verb ratio under this model.

DISCUSSION

This has been the first study of the development of clause chaining in child speech in the Nungon language of
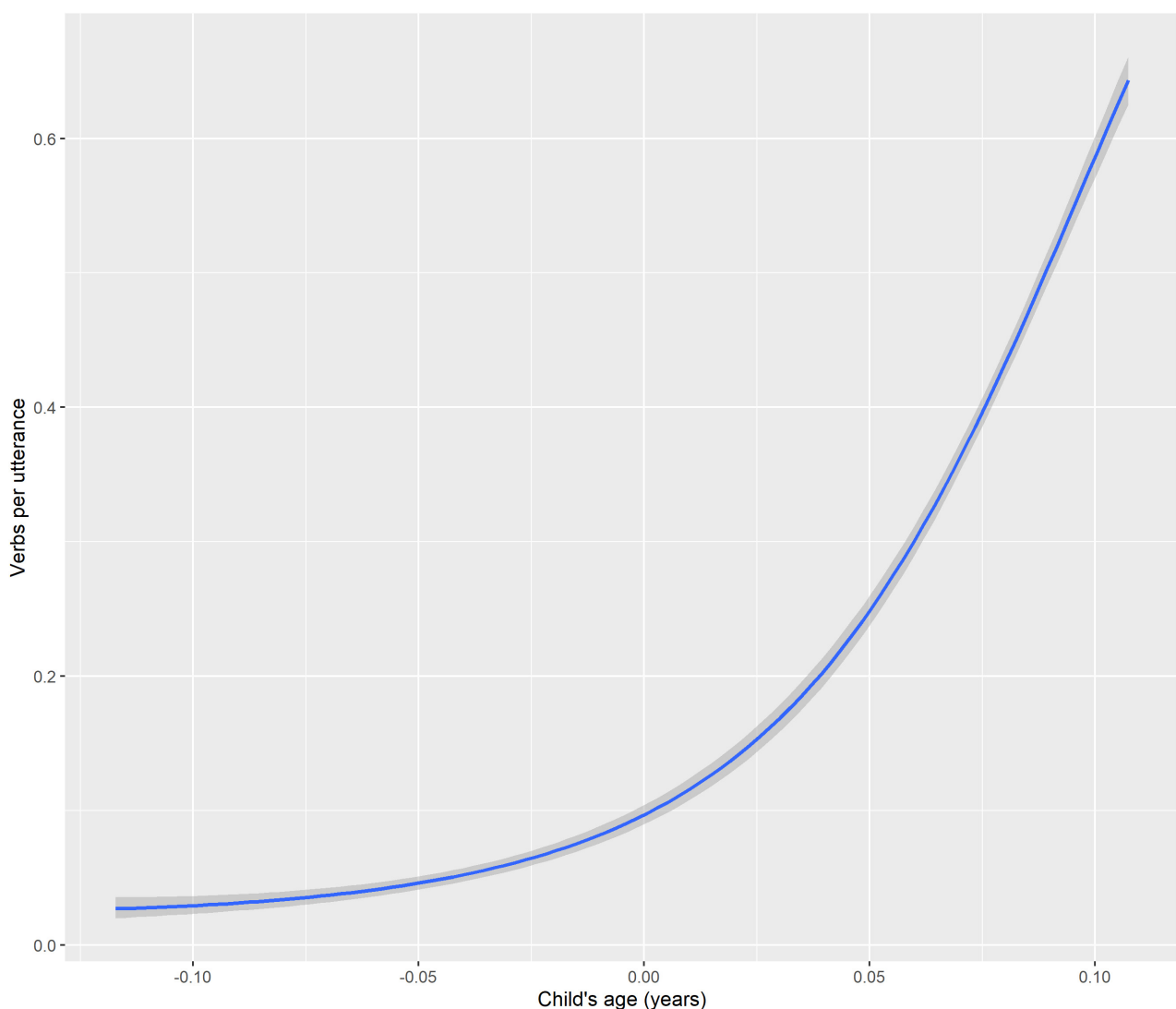
FIGURE 8 | Conditional effects of child's age and age^2 on verb/utterance ratio.

Papua New Guinea. Clause chain formation requires children to produce one or more 'medial' clauses ending in medial verb forms, followed by a single 'final' clause with a final verb that is marked for tense, mood, and subject person/number. Children's first medial verb productions are attested at 2;4 (Abraham and TO). For both children for whom there is data at this age, most or all of the earliest medial verb tokens occur in 'root medial' clauses (Sarvasy, 2019b): independent uses of individual medial clauses, without any following final clause. 'Root medial' clauses occur more consistently than two-clause chains in the speech of TO through 2;11, when two-clause chain use begins to increase and the child seems to demonstrate more power over two-clause chain structure and semantics than in the preceding several months.

That said, one of the earliest two-clause chains produced by TO (at 2;5) is a non-conventionalized combination of verbs, with other material interpolated within the chain (example 14).

This implies that TO may already have productive command of clause chain structure at this early stage, and it could reflect the limitations of the relatively sparse (1 h monthly) sampling method that TO does not demonstrate this in the five subsequent months' recording sessions. (On the other hand, the thin sampling method could also make this chain seem more creative than it really is; a denser corpus could reveal more rote-learned patterns in child productions.)

Nungon medial verbs are obligatorily marked for switch-reference: whether the subject of the following clause will be co-referential with the present clause's subject. Although DS-marked medial verbs are attested from early on (2;5 for TO), these only occur in root medial clauses then and for the next 5 months (through 2;10). That is, the medial verbs in TO's first five two-clause chain productions (the total attested for her in the recording sessions between 2;4 and 2;10) are all SS. Her first DS medial verbs in two-clause chains are attested at 2;11.

TABLE 3 | Population-level effects for Bayesian linear models.

Model			Estimate	Est. error	1–95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
1	Age to predict verb/utterance ratio	Intercept	−1.85	0.08	−2.03	−1.71	1.00	2233	2502
		Child's age	2.87	2.78	−0.63	9.86	1.00	1812	1977
		(Child's age)^2	198.38	23.16	141.12	230.78	1.00	1783	1998
2	Age and verb/utterance ratio to predict medial verbs/verbs ratio	Intercept	−2.68	0.15	−2.98	−2.37	1.00	2753	3198
		Child's age	−1.13	1.77	−5.73	1.38	1.00	3050	1954
		(Child's age)^2	−0.48	3.23	−4.16	2.40	1.00	3184	1471
		Verbs per utterance	2.19	0.25	1.74	2.72	1.00	1622	2733
		(Verbs per utterance)^2	−0.59	0.09	−0.77		1.00	1744	2783
3	Age and verb/utterance ratio to predict DS marking/total medial verbs	Intercept	−4.08	0.61	−5.33	−2.91	1.00	2965	3360
		Child's age	49.17	8.53	32.55	66.03	1.00	2931	3325
		Verbs per utterance	−0.90	0.19	−1.26	−0.54	1.00	3483	3495
4	Command/desire context to predict root medial clauses	Intercept	−2.29	0.15	−2.59	−2.01	1.00	3461	3559
		Command context	2.48	0.25	2.00	2.97	1.00	4174	4192
5	Addition of mother's verb/utterance ratio to Model 1	Intercept	−1.81	0.06	−1.92	−1.70	1.00	7588	6279
		Child's age	0.21	1.28	−2.27	2.86	1.00	3923	2929
		(Child's age)^2	220.95	13.01	194.69	245.92	1.00	3937	3378
		Mother's verb/utt ratio	0.15	0.02	0.10	0.20	1.00	7087	5022

This implies that there could be a development-related delay in production of two-clause chains with different subjects for the two clauses: the child shows mastery of the DS-marked medial verb form in root medial contexts 6 months before she ever produces it within a two-clause chain. We await data from the new, denser longitudinal study to confirm whether the additional three children show a similar pattern.

Nungon discourse differs from that in Ku Waru of Papua New Guinea (Rumsey et al., 2020) in that DS marking is well-represented in adult speech, whether child-directed or adult-directed. In Ku Waru as in Nungon, medial verbs must indicate whether the subject of the following clause will differ from that of the present clause. But Rumsey et al. (2020) state that Ku Waru adult discourse shows a strong dispreference for DS clause chains, and this is also reflected in the makeup of child-directed speech. Accordingly, only one of the children in Rumsey et al.'s (2020) study of early Ku Waru clause chain productions ever produces a DS clause chain, and this production occurs at 4;7, over 2 years after the child began producing SS clause chains.

In Nungon, the most conventionalized two-clause chains are arguably those that verge on monoclausal constructions: the two aspectual uses of SS two-clause chains. With these constructions, other linguistic material cannot intervene between the first medial verb and the second verb, which must be a particular lexical verb. For TO, who is the only child for whom data was available in the period of 2;5–2;10, there is no indication that clause chain production begins with just aspectual clause chains, then expands to include chains describing sequential actions. TO's three earliest spontaneous two-clause chain productions include one wholly non-conventionalized clause chain, one Continuous aspect construction, and one clause chain using

the common pairing of 'taking it up' and 'go.' Further, TO's medial verb types counts (**Table 1**) show no indication that she relies on a very small number of lexical verbs for her chains. Findings here therefore diverge slightly from those for Ku Waru by Rumsey et al. (2020) in that Nungon-speaking children's earliest clause chains are a mix of more and less conventionalized lexical combinations, and there is no indication for Nungon that early chains should be analyzed as involving a single action, rather than two (If this were the case, findings for Nungon clause chain development could be compared to those for early clausal subordination in languages like English and German: Diessel, 2004; Brandt et al., 2008).

Two elements of the Nungon data point to developmental constraints on the production of complex sentences by these children: first, the relatively infrequent productions of clause chains until around the age of 3;0 (for TO, at least), after which there is marked expansion in frequency and variety of clause chains, and second, the restriction in clause chain length to just two clauses per chain until age 3;1 (for both TO and Niumen). The marked increase in frequency and variety of clause chains about 7 months after the first clause chain productions suggests that complex sentence production is at least partially constrained by development: that a 'simple sentence' stage does indeed precede a 'complex sentence' stage (as posited early by Bowerman, 1979, and as maintained by constructivist accounts such as Diessel and Tomasello, 2000, but *contra* Lust et al., 2009). Research into child acquisition of complex sentences has rarely examined the development of sentences comprising more than two clauses. The Nungon data here accords with the Ku Waru data in Rumsey et al. (2020), in that children acquiring these two Papuan languages clearly produce only two-clause chains for

**FIGURE 9 |** Conditional effects of verb/utterance ratio on medial verb/verb ratio.
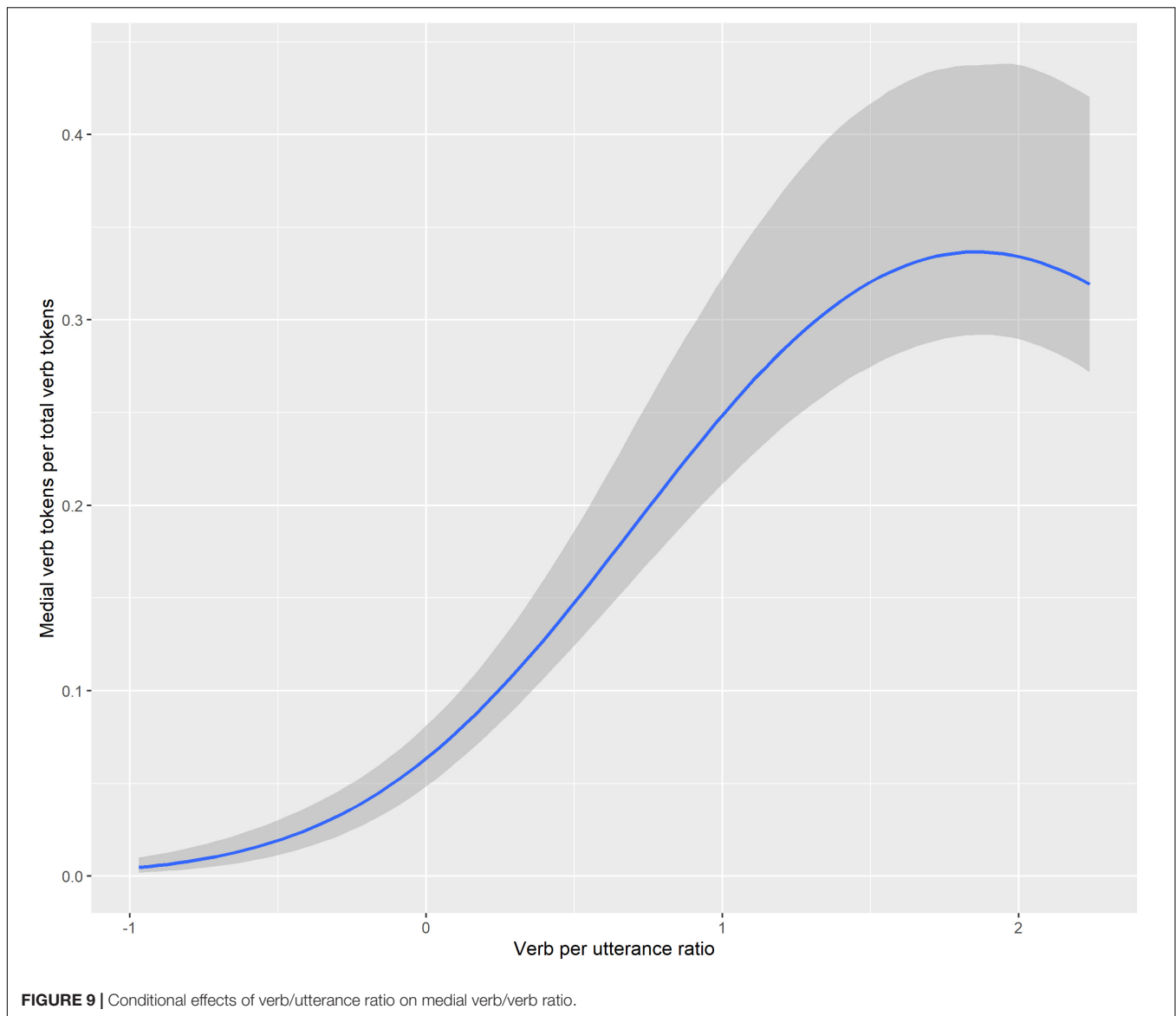
a period before beginning to produce chains of more than two clauses. Thus, at least for clause chains in these two languages, children can be said to go through a 'two-clause stage,' after which their clause chains expand in length to three clauses (for the Ku Waru children and TO), or more (for Niumen, whose two-clause stage is followed by a stage in which he produces chains of 3–5 clauses).

Another facet of Nungon clause chain production that was hypothesized to be problematic from a cognitive perspective, however, proved not necessarily so. Obligatory switch-reference marking in Nungon clause chains would seem to entail that proficient speakers must plan their clause chains at least two clauses at a time—which should be highly cognitively demanding. There are at least three potential ways to ameliorate this for child speakers. One option is that children opt not to produce clause chains at all until they are developmentally able to perform this advance planning, since subordinated or coordinated final clauses

do not need to be marked for switch-reference. A second option is that children avoid producing clause chains in which the subject changes from clause to clause. They could then begin each chain with the assumption that the subject of the first clause will be maintained throughout the following clauses in the chain, and apply SS marking to each medial verb by default even if they have not planned as far as the following clause (This could be the case for children acquiring Ku Waru, though the pattern there could alternatively be attributed solely to frequencies in adult speech: Rumsey et al., 2020). A third option for dealing with the cognitive demands of switch-reference marking is that children produce clause chains that can involve changes in subjects across clauses, but use morphologically simplified medial verbs that do not force the children to indicate in advance whether the upcoming subject will differ.

The first and third option here clearly do not apply to children learning Nungon: the earliest two-clause combinations
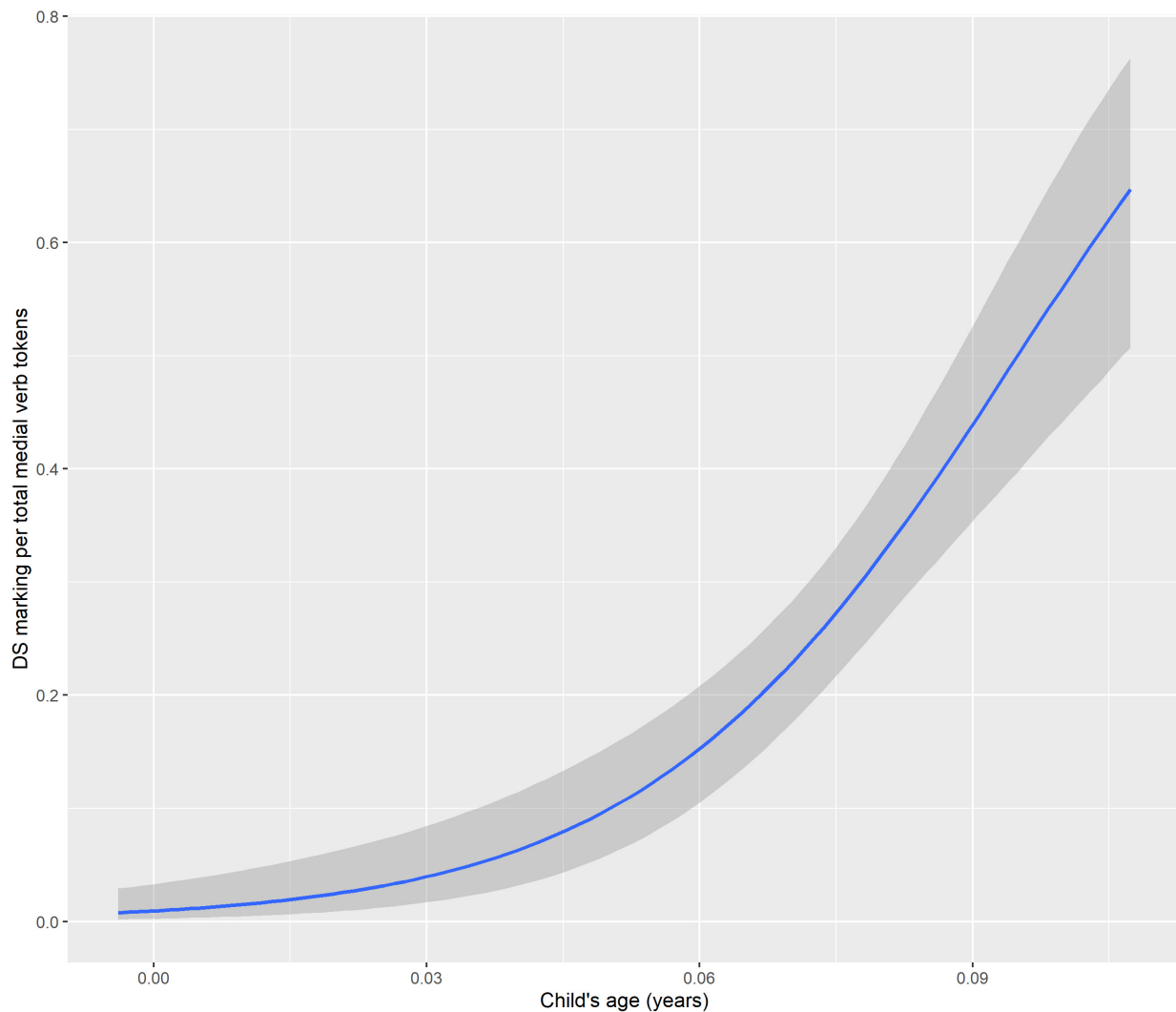
FIGURE 10 | Conditional effects of age on DS marking.

produced by Abraham and TO are clause chains, not other complex sentence types, and there is absolutely no indication that children alter medial verb forms to avoid switch-reference marking. It may be the case that children acquiring Nungon pursue the second option, preferring SS two-clause chains over DS two-clause chains from the earliest two-clause chains at 2;4–2;5 through about 2;10. But the few clause chain tokens from a single child in this critical time period mean that it is as yet unclear whether the semblance of this strategy is due to sampling. Ongoing work on the new, denser longitudinal study targeting verb productions in this age range should help to finalize this component of the analysis.

Finally, comparison of children's early clause chain productions with their early subordinate and symmetrical coordinate sentences suggests that these three complex sentence types are all governed by the same developmental constraints on complex sentence production, but that once development has reached an adequate stage, language-specific characteristics

determine distributions of the three types in a child's speech. The very first two-clause sentences produced by the children are clause chains, not the other two types of complex sentence, but these are produced (by TO) in very low frequencies for the first 6 months (2;5–2;10). At the same age at which clause chain use by TO and Niumen begins to increase sharply, their use of the other two complex sentence types also increases, but at much lower levels.

Figures 6, **7** can be seen as support from child language data for a typological distinction between 'clause chaining languages' and 'non-clause chaining languages' (a direction of influence across linguistic sub-disciplines that is rarely achieved: Slobin and Bowerman, 2007). It is intuitively clear to language learners and descriptive linguists that some languages employ clause chaining widely and others do not, but this is difficult to quantify. For instance, the asymmetrical coordinated relationship between clauses in a clause chain can be likened to the relationship between adverbial and main clauses in languages like English
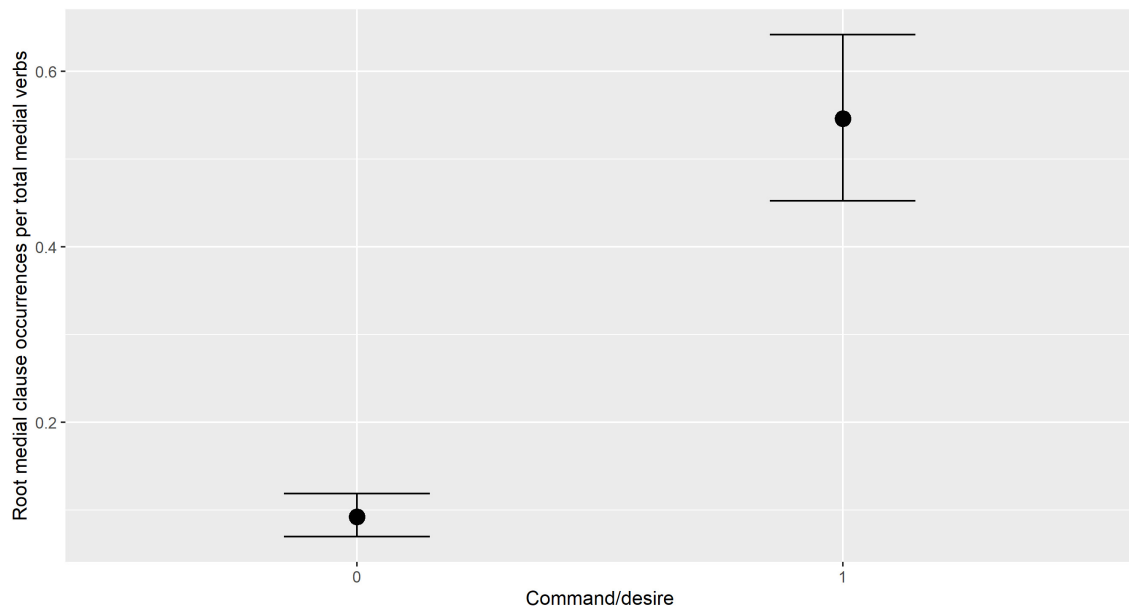
FIGURE 11 | Conditional effects of command/desire context on root medial clause occurrence.
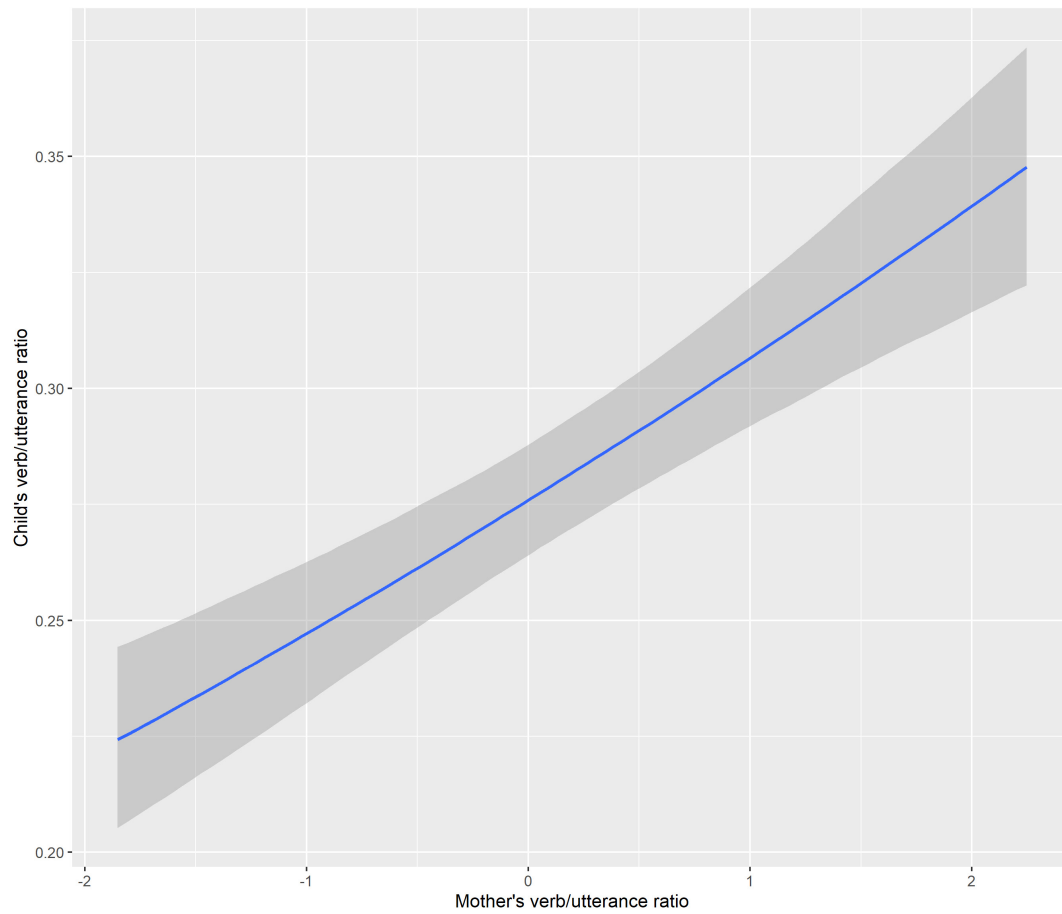
FIGURE 12 | Conditional effects of mother's verb/utterance ratio on child's verb/utterance ratio.

(Bickel, 2010). But if an English speaker attempted to produce a clause chain-type sentence in English, using a series of clauses with gerunds instead of finite verbs, the result would be highly unnatural (as seen in the English translations of the Nungon examples in this paper), in contrast to Nungon, where the most natural translation of an English narrative is likely a series of clause chains. One way of establishing a criterial demarcation between 'clause chaining languages' and 'non-clause chaining languages' would be to require that a 'clause chaining language' permit chains of over three or four gerundial clauses—but this is still possible to approximate in English, albeit unnatural and decidedly rare in actual discourse. Without relying on naturalness judgments or arbitrary length limits, the child production data here shows that the Nungon language privileges clause chains over sentences with coordinated and subordinated final clauses, at least in the early stages of complex sentence production. That is, clause chains are more than two times more frequent in Nungon child speech than the other two complex sentence types. It remains to be seen whether this pattern will be replicated for children learning other 'clause chaining languages.'

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Australian National University Human Ethics Committee. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin. Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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Beyond the Two-Clause Sentence: Acquisition of Clause Chaining in Six Languages

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Clause chains are a special type of complex sentence, found in hundreds of languages outside Western Europe, in which clauses are dependent but not embedded, and dozens of clauses can be combined into a single sentential unit. Unlike English complex sentences, clause chains' distribution is partially predictable in that they can, most fundamentally, be linked to a particular semantic context: description of temporally sequential events or actions. This and the morphological simplicity of verb forms in clause chains may combine to accelerate their acquisition by children, relative to complex sentences in other languages. No previous cross-linguistic studies of the acquisition of complex sentences have investigated clause chaining. In this paper, we report insights from a survey of the acquisition of clause chaining in six languages of diverse stocks with child speech databases spanning 1;1 to 10 years. Overall, children acquiring clause chaining languages begin to produce 2-clause chains between around 1;11 and 2;6. An initial stage in which chains are limited to just two clauses in length is followed by a stage in which longer chains of 3–5 clauses are also produced. Children acquiring languages in which adults produce both same-subject and different-subject clause chains produce a similar mix from early on; for some languages, this involves morphological "switch-reference" marking that anticipates the identity of the subject of an upcoming clause. This survey broadens our understanding of the acquisition of complex sentences by adding new data on the acquisition timing, semantics, and reference continuity of early clause chains.

Keywords: clause chain, acquisition of complex sentence, Japanese, Korean, Ku Waru, Turkish, Nungon, Pitjantjatjara

INTRODUCTION

In hundreds of languages around the world, speakers have a third option for complex sentence formation, in addition to the well-known "subordination" and "coordination." This third option is called a "clause chain," and involves one or more "medial" clauses with under-inflected verbs as predicates, followed or preceded by a "final" clause with a fully inflected verb as predicate[1] (Longacre, 1985; Dooley, 2010; Sarvasy, 2015). An example of a clause chain in Korean is in (1); throughout this paper, medial clauses are in single curly brackets and final clauses are in double curly brackets, following the convention in Sarvasy (2017):

(1) a. {nolan   kong-i   chayk-ul
         yellow   ball-SBJ   book-OBJ
         chi-ese},
         hit-and.so.MV

     b. {chayk-i   aph-ulo   ka-taka},
         book-SBJ   front-toward   go-while.doing.MV

     c. {pyek-ey   pwutitchi-ese},
         wall-LOC   get.hit-and.so.MV

     d. {tasi tola-o-myense},
         again turn-come-while.MV

     e. {{nolan   kong   aph-ey
         yellow   ball   front-LOC
         memchwu-ess-eyo}}.
         stop-PST-POL.SE

"A yellow ball hit the book and so, while the book was going forward, (the book) got hit on the wall and so, as (it) was coming back, (it) stopped in front of the yellow ball." (Author's Korean adult corpus)

Note in (1) that the verbal predicates of the first four "medial" clauses (1a–d) have no tense marking; only the verb in the "final" clause (1e) at the end of the chain bears tense inflection.

Clause chains are defined by three main criteria:

(a) Structure: one or more "medial" clauses (with a "medial verb" predicate that is unspecified for tense and, often, other categories) co-occur with a single "final" clause (with a "final verb" predicate that is fully specified for tense and other categories). Often, medial clauses feature rising or level pitch, whereas the final clause features a prosodic fall.

(b) Syntax: medial clauses are dependent in that they lack tense and other category specification, but they are not embedded in other clauses.

(c) Lexicon and length: there are no restrictions on which lexical verbs can occur within chains, nor the positions in which these can occur in the chain; nor are there restrictions on the length of the chain, measured in clauses, with chains of 100 clauses or more attested for some languages (Wise, 2018).

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[1]It is conventional in much literature on clause chaining to use "final" to describe the verb forms that are fully specified for tense and other categories, as well as the clauses that include such verbs. This term originated in literature on languages in which the clause with the fully-specified verbal predicate comes last in the chain. Because all six languages discussed here belong to this category, the term is used here.

Criterion (a) rules out serial verb constructions and other multi-verb complex predicates as potential clause chains because those constructions constitute single clauses (Aikhenvald, 2018). Criterion (b) differentiates clause chaining from relative and complement clause constructions (which are embedded in other clauses) and from coordination of clauses with equal status (although the medial clauses have equal statuses to each other within the chain, they are marked as dependent, with only the final clause of the chain able to serve independently as a lone main clause). Criterion (c) distinguishes between clause chaining and adverbial clause constructions in other languages; even though adverbial clauses in languages like English can have superficially similar syntactic relations to medial clauses in clause chains, it is unnatural to combine more than about two adverbial clauses in a single English sentence.

Languages in which criteria (a–c) are satisfied can be considered "clause chaining languages." Many of these languages exhibit two additional characteristics:

(d) The most basic function of clause chains across languages is to describe sequences of related events and actions. Although at least one study has shown that distribution of English relative and complement clauses is unpredictable based on discourse semantic content (Barker and Pederson, 2009), for clause chaining languages, there is growing evidence that clause chain use correlates with description of temporally sequential events/actions (Farr, 1999; Defina, 2020; Sarvasy, under review).

(e) In many clause chaining languages, "switch-reference" marking of medial clauses (Haiman and Munro, 1983; van Gijn and Hammond, 2016) signals in advance whether the subject of the following, as-yet unspoken, clause will be co-referential with the subject of the present clause. An example of switch-reference marking is in (2), from the Papuan language Nungon:

(2) a. {Usam   it   usam   it   to-nga},
         side   be   side   be   do-MV.SS

     b. {tem-u-ya},
         SG.OBJ.shoot-DS.2/3PL-MV

     c. worok, {mö-nga},
         thus   dangle-MV.SS

     d. {dee-nga},
         fall-MV.SS

     e. {yoni = dek   e-nga},
         PRO.3PL.EMPH = LOC   come-MV.SS

     f. {{handat-do-k}}.
         3NSG.OBJ.follow-RP-3SG

"(The group of boys) surrounding (the monster), shooting her-SWITCH, thus, dangling, falling, coming toward them, she (= the monster) pursued them." (Author's Nungon adult corpus)

In Nungon clause chains, medial verbs obligatorily indicate whether the subject of the following clause will differ from their own subject. If there is no anticipated difference in subject, a medial verb bears an unchanging final suffix -nga (-a after consonant-final verb roots), as in (2a, 2c, 2d, and 2e). But when

(and only when) the subject of the next clause will differ from the subject of the current clause, the medial verb of the current clause bears a special subject person/number inflection before the medial verb suffix -(y)a (as in 2b). This inflection only indexes the subject of the current clause; no information is given in the current clause about the upcoming clause's subject, except that it will differ. Thus, in example (2), "shoot him/her" (2b) indexes its own subject, marking that the subject of the upcoming clause (2c) will differ from the current clause's subject. In this case, the grammatical subject switches from "a group of boys" (2a–b) to "a female monster" who was dangling from a branch (2c–f). While the subject person/number markers on the medial verb in (2b) and the final verb in (2f) indicate person and number, the identity of the two subjects is understood from narrative context.

Clause chains occur in a swath of languages across Asia, from Japanese and Korean through Mongolic, Tibeto-Burman, Turkic, and Caucasian languages. They feature in numerous languages of East Africa (especially those of Ethiopia), in some indigenous languages of North and South America, and in Melanesia. Switch-reference marking is not found in most clause chaining languages of mainland Asia, but is well-attested in the Americas and Melanesia.

In this paper, we present a first comparative sketch of child acquisition of clause chains in six languages of diverse stocks, based on the analyses of the companion papers in this Research Topic. Our motivation for this comparative study is threefold.

First, most comparative work on the acquisition/development of complex sentences has focused on clause combining structures involving coordination and subordination (e.g., relative clauses, complement clauses, and clausal coordination: Bowerman, 1979; Berman and Slobin, 1994; Diessel, 2004; Bencini and Valian, 2008; Kidd, 2011). In contrast, clause chaining – with dependent, but not embedded, clauses – does not fit easily into either category, leading Foley and Van Valin (1984) to coin a new term to describe its structure: co-subordination (and see Genetti, 2005 on the inconclusiveness of standard "tests" for syntactic relations in clause chains). Because clause chain syntax is special in not being clearly textbook subordination or coordination, our first area of investigation here is the general development of clause chaining in child speech.

Second, as pointed out in criterion (c), in clause chaining languages, it is commonplace for speakers to produce long chains including 10 or more medial clauses. Our second area of investigation concerns the developmental pattern in production of 2-clause, 3-clause, or longer chains.

Finally, switch-reference marking within clause chains means that sentence planning spans discrete clauses. If children can produce switch-reference marking accurately, this could represent advanced sentence planning abilities (Sarvasy, 2020). On the other hand, if this long-distance planning is difficult for young children, we wonder what strategies they adopt to produce clause chains without necessarily having to indicate switch-reference: do they avoid clause chaining altogether, produce reduced forms of medial verbs, or produce only same-subject clause chains? Our third area of investigation is the development of switch-reference marking and topic continuity within clause chains.

We investigated these three topics through a synthesizing analysis of this Research Topic's acquisition studies on three Eurasian clause-chaining languages, with many millions of speakers – Japanese (Clancy, 1985, 2020[2]), Korean (Choi, 2020), and Turkish (Aksu-Koç and Slobin, 1985; Ögel-Balaban and Aksu-Koç, 2020) – as well as three under-described clause chaining languages of Papua New Guinea and Australia, each with fewer than 5000 speakers – Ku Waru (Rumsey et al., 2020), Nungon (Sarvasy, 2020), and Pitjantjatjara (Defina, 2020). Although these studies target children between 1;1 and 10 years, our emphasis in this comparative analysis is on early development, drawing primarily on the early, qualitative, longitudinal components of these studies.

The six languages share the following features: (a) verb-final constituent ordering, although Pitjantjatjara is flexible in this regard; (b) finite verbs are marked for, at least, tense or mood; (c) they are all "pro-drop" languages, with explicit personal pronouns used sparingly in discourse. The Eurasian languages (Japanese, Korean, and Turkish) differ from the Pacific languages (Ku Waru, Nungon, and Pitjantjatjara) in (a) the number of distinct semantic relations indicated by medial clauses (maximally two, sequential and simultaneous, for the Pacific group, but between four and 15 frequently used semantic relations, and up to 100 less-frequent ones, for the Eurasian languages) and (b) overt indication of switch-reference (marked through dedicated morphemes in the Pacific languages, but a covert feature of particular semantic relation types in the Eurasian languages).

With data from these six languages, we examine the following developmental aspects of clause chains: (i) general developmental patterns, (ii) chain length, and (iii) switch-reference (or topic continuity).

CROSS-LINGUISTIC ACQUISITION OF CLAUSE CHAINING

Children's ages, number of participants, and size of the databases that served as the sources for the literature we consulted are in **Table 1**. The most relevant results for early acquisition come from the longitudinal, rather than experimental, studies; overall results from these studies are in **Table 2**.

General Developmental Patterns

Child production of clause chains begins around the same time in five of the six languages. Children acquiring Japanese, Korean, Ku Waru, Nungon, and Turkish show productive clause chaining of at least 2-clause chains by about age 2;6, with chaining beginning as early as 2;0 (and younger for some children in Japanese, Korean, and Ku Waru). The earliest 2-clause sentences in Nungon, observed at 2;4–2;5, are clause

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[2]All data from the six target languages comes from these sources, except where otherwise noted. Note that Clancy (1985) covers the age range between approximately 2;0 and 3;8, where Clancy (2020) begins; similarly, Aksu-Koç and Slobin (1985) covers the age range between approximately 2;4 and 4;0, where Ögel-Balaban and Aksu-Koç (2020) begins.

TABLE 1 | Data summary for the six clause chaining languages.

Language type	Language	Longitudinal/cross-sectional	Data collection method	Child ages	Number of children	Approximate size of corpus[a]
Eurasian	Japanese i (Clancy, 1985)	(a) Longitudinal (b) Cross-sectional	(a) Spontaneous speech recording; diary observation (b) Interviews/experimental	1;0–6;3	5 (Clancy's) 1 (Okubo's) + 39 children + ∼600 in cross-sectional studies[b]	[a]
	Japanese ii (Clancy, 2020)	Cross-sectional	Narrative elicitation based on still-picture cartoon and film clips	3;8–7;4	60	N/A
	Korean i (Choi, 2020)	Longitudinal	Spontaneous speech recording	1;1–5;1	5	∼37 h
	Korean ii (Choi, 2020)	Cross-sectional	Elicitation from short motion event video clips	3–10 years	60	N/A
	Turkish i (Aksu-Koç and Slobin, 1985)	(a) Longitudinal (b) Cross-sectional	(a) Spontaneous speech recording; diary observation (b) Interviews/experimental	1;0–6;4	12 adult–child interactional (Slobin and Aksu's) + 48 cross-sectional and micro-longitudinal (Slobin and Aksu's) + 3 longitudinal and 60 cross-sectional (Aksu's) + 3 other longitudinal[c]	[b]
	Turkish ii (Ögel-Balaban and Aksu-Koç, 2020)	Cross-sectional	Elicitation from a picture-book	4–11 years	40	N/A
Pacific	Ku Waru (Rumsey et al., 2020)	Longitudinal	Spontaneous speech recording	1;8–4;9	4	∼40 h (32,760 child and adult utterances)
	Nungon (Sarvasy, 2020)	Longitudinal	Spontaneous speech recording	1;1–3;3	3	∼33 h (15,725 child utterances, 13,384 adult utterances)
	Pitjantjatjara (Defina, 2020)	Longitudinal	Spontaneous speech recording	0;10–10 years	28 (including 5 focus children)	4200 child utterances, 1637 adult utterances

[a]*It is hard to assess the number of hours recorded for longitudinal studies in Clancy's (1985) and Aksu-Koç's (Aksu-Koç and Slobin, 1985) studies, and number of hours/utterances is not applicable to the cross-sectional/experimental studies (Choi, 2020; Clancy, 2020; Ögel-Balaban and Aksu-Koç, 2020).* [b]*Clancy collected 30 h of spontaneous speech data from five children, ages ranging from 1;6 to 3;6. She also consulted Okubo's (1967) monthly recordings of her daughter's (1 child) development from 1;0 to 6;0. For particular grammatical aspects (e.g., verbal inflections, case marking, sentence-final particles, multi-morpheme stage, negation), Clancy's database includes longitudinal study/observation records (e.g., diary studies) of 39 children collected by different researchers. Then, for later development (3;3–6;3), there are cross-sectional/experimental studies of 300 children, which were part of a National Language Research Institute project in Japan. In addition to these, Clancy used cross-sectional data of over 300 children gathered by other researchers.* [c]*12 children from 1;10 to 5;11 (adult–child interactional speech corpora, Aksu-Koç and Slobin, 1985); 48 children from 2;0 to 4;8 (cross-sectional and micro-longitudinal samples, Berkeley Crosslinguistic Acquisition Project, Slobin, 1972–1973, Aksu, 1978b; Aksu-Koç and Slobin, 1985); 3 children from 1;9 to 2;6 (longitudinal), and 60 children from 3;0 to 6;4 (experimental, investigating aspect, and modality, Aksu, 1978a; Aksu-Koç, 1988); 2 children from 1;0 to 2;0 and 1 child from 1;3 to 2;4 (monthly recordings) collected by other researchers.*

chains, not finite subordinate or coordinate structures. Children acquiring Pitjantjatjara, in contrast, produce 2-clause sentences that comprise juxtaposed finite verbs before producing 2-clause chains with medial verb forms. They only begin to produce 2-clause chains around age 2;8 and older. Clancy's (2020) mixed-effects statistical model did not find that age had a significant effect on certain properties of clause chains in Japanese, such as chain length, implying that by 4 years, Japanese children's clause chain productions are relatively adult-like. For Korean and Turkish, at least, there is further development around 10 years of age that brings clause chain productions closer to the adult grammar (in terms of medial verb forms and chain lengths). Because the other four studies did not include children of over 8 years, it remains to be seen whether this is also the case in the other languages.

For all the languages, children show early production of clause chains involving sequential actions/events (**Table 2**). Three languages (Korean, Ku Waru, Turkish) enable speakers to specify, through the particular medial verb suffix, whether actions denoted by adjacent clauses occur simultaneously or sequentially. In these languages, production of chains denoting simultaneous actions tends to develop later. The Eurasian languages have from four (Turkish) to at least five (Japanese; Iwasaki, 2002, p. 60) to 100 (Korean; see Sohn, 2009) distinct medial verb suffixes to indicate specific inter-clausal semantic relations (see example 1). For Korean, the forms indicating sequentiality, cause, and manner are among the earliest to be used by children, from 2;0. In contrast, the Pacific languages have the means to express maximally just two inter-clausal semantic relations: temporal sequentiality and simultaneity (in Ku Waru). In Nungon and Pitjantjatjara, there is a single medial verb form with general sequential temporal semantics. Nungon and Pitjantjatjara medial clauses can have extended semantic interpretations, including aspectual, conditional, and causal, but these must be deduced from context because they are not indicated formally (see example 2).

In sum, these data taken together suggest that at 2;0–2;6, children are ready to join two ideas in a clause chain, regardless of language-specific morphology, and that by 4 years, they have acquired the basic structure of clause chains in the target language (see similar findings by Berman and Slobin, 1994, for other types of complex sentences). The developmental order of semantic functions can be explained, at least in part, by the degree of concreteness of the events/states being chained.

Clause Chain Length: From 2-Clause to Longer Chains

Both language and individual differences impact the ages at which children produce chains of three or more clauses. For all languages, children begin by producing 2-clause chains before producing longer ones. After this initial stage, children vary – within and across languages – in the age at which they produce longer chains (of ≥3 clauses). Children also vary as to whether their first longer chains are limited to just three clauses for an extended period, or immediately range from three to five clauses, but the overall picture from the data is that there is no consistent ordering pattern in acquisition of 3-clause, 4-clause, and 5-clause chains. For example, the first clause chains of one Korean child were 2-clause chains (2;0 through 2;3). However, in the single session at 2;4, he produced one 4-clause chain and one 5-clause chain (and no 3-clause chains), among a number of 2-clause chains.

Onset ages for production of longer chains (≥3 clauses) vary widely, between 2;0 and 5;3. The children acquiring Korean began producing chains of 3–5 clauses the earliest: one child at 2;0, one month after beginning to produce 2-clause chains, and another at 2;4, in the fourth month after beginning to produce 2-clause chains. In Ku Waru, 3-clause chains are attested only from 2;8, and in Nungon from 3;1 (when one child begins to produce 3–5-clause chains, and the other begins a 3-month stage of maximally 3-clause chain production). In Japanese, one child already produced a 20-clause chain at 3;10, while narrating a story based on a nine-panel cartoon; as noted above, clause chain use in some languages has been shown to correlate with discourse genre, with high frequency and possibly greatest length in narratives (Farr, 1999; Defina, 2020; Sarvasy, under review).

Children acquiring Pitjantjatjara and Turkish show the slowest developmental trajectories of the six languages in terms of chain length. In Pitjantjatjara, young children mostly produce 2-clause chains, with the first 3-clause chain attested in the speech of a child of 5;3. Although the small sample size for this study could have impacted this result, clause chains in adult child-directed Pitjantjatjara speech are very infrequent, featuring in only 3% of utterances (Defina, 2020), and short: rarely more than three clauses in length. In Turkish, children still produced only 2-clause chains at age 4, with 3- and 4-clause chains attested from 5 years of age. Even adult narratives in the Turkish study contained maximally 4-clause-long chains, in contrast to adult chains in Japanese, Korean, Ku Waru, and Nungon.

Differences between these groups cannot be attributed to relative morphological or semantic complexity of the verb forms involved in clause chaining: in each language, there is at least one "same-subject" (see next section) medial verb form with maximally general, temporally sequential meaning, formed with a monosyllabic suffix after the verb root (Japanese -te, Korean -ko, Nungon -nga/-a, Pitjantjatjara -la/-ra, Turkish -Ip, and Ku Waru various forms with subject inflection). In only Ku Waru does this general form also incorporate subject person/number, and then the distinctions made are still fewer than in final verbs.

Diverse study designs for the different languages could have affected clause chain length, by both delimiting discourse genre and shaping how narratives were subdivided into sentential units. In the longitudinal Korean, Ku Waru, and Nungon studies, parents engaged the target children in play and conversation in an indoor setting. The Japanese and Turkish studies targeting children of 3;8–4;0 and older both elicited narratives from participants, but in different ways. The Japanese study involved: (a) story-telling while viewing a series of events depicted in nine panels laid out horizontally in front of the narrator, or (b) free re-telling of stories after viewing videos. In contrast, Turkish study participants narrated a picture-book while viewing the book, page by page: this pacing could have limited clause chain length in the results for Turkish (evinced in the limited and relatively uniform length of even adult Turkish clause chains, in contrast to the greatly varying lengths produced by Japanese adults). The Pitjantjatjara study was the most naturalistic: target children wore audio recorders as they moved freely in an outdoor location among a few family members. This design could have limited child and adult clause chain length by limiting occasions to tell stories.

Alternatively (especially because Clancy's, 2020 statistical model found no difference in Japanese clause chain length between the nine-panel cartoon task and the video re-telling task), it could be the case that study design is less important than general preferences of each speech community for clause chain length; Alan Rumsey (p.c., 2020) reports that clause chains of 10 or more clauses are rare in even narrative adult Ku Waru, in contrast to adult Nungon, Japanese, and Korean (average clause chain length in adult narratives is unknown for Turkish and Pitjantjatjara).

Switch-Reference and Topic Continuity Within Chains: Is Co-referentiality Preferred Early?

Developmental patterns for switch-reference and topic continuity in clause chaining languages are highly language-specific. Co-referentiality of the subjects of adjacent chained clauses ("same-subject") or non-co-referentiality ("different-subject") is obligatorily morphologically indicated through switch-reference marking on medial verbs in Ku Waru and Nungon (as in example 2); in Pitjantjatjara, different-subject is indicated through a free particle. In Japanese, Korean, and Turkish, switch-reference is not indicated morphologically, but medial verb morphemes indicating particular inter-clausal semantic relations tend to be associated with same-subject or different-subject contexts, or allow either. In Japanese and Korean, for example, the medial verb suffix denoting "simultaneity" predominantly favors cross-clause subject

TABLE 2 | Clause chaining early acquisition results from the longitudinal studies.

	Age range, onset of 2-clause chains	Age range, onset of 3-5-clause chains	Age range, onset of different-subject chains	First inter-clause semantics
Japanese	2;0–2;1	Unknown	Unknown	Sequential, manner
Korean	1;11–2;0 (2 children[a])	2;0–2;4 (2 children)	1;11–2;0 (2 children)	Listing/additive, sequential, manner
Ku Waru	1;9–2;0 (2 children); 2;7–2;9 (2 children)	2;8–3;3 (only 3-clause chains)[b]	4;7 (1 child)	Idiomatic/formulaic, sequential
Nungon	2;4–2;5 (2 children)	3;1 (2 children; 1 only 3-clause chains, 1 3–5-clause chains)	2;11 (2 children)	Sequential, aspectual
Pitjantjatjara	2;8 (1 child)	5;3 (1 child)	4;1 (1 child)	Sequential, idiomatic
Turkish	2;4–2;6	5;0	Unknown	Sequential, aspectual

[a]Because the longitudinal studies all involved staggered ages, the child counts in parentheses represent the total number of children in each study whose data were captured at this particular stage. For instance, of the 3 Nungon children in Sarvasy (2020), child 1 was studied from ages 1;1 through 2;4, child 2 from 2;1 through 3;3, and child 3 from 2;10 through 3;3. Only the two younger children's data (child 1 and child 2) show evidence of the earliest clause chain productions (at 2;4 and 2;5), and only the two older children's data (child 2 and child 3) show evidence of the onset of 3–5-clause chains (at 3;1 for both). [b]Note that the Ku Waru data represent a possible exception to the generalization that 3–5-clause chains are not ordered, developmentally. 3 children produce maximally 3-clause chains from the onset of longer chains at 2;8–3;3 to the end of the study periods for them (2;11, 3;0, and 3;8). The fourth child produces maximally 3-clause chains between 3;3 and 3;9, then produces maximally 4-clause chains between 3;10 and the end of the study period (4;9). However, the numbers of long chains are very few for all children (for instance, there are just 3 utterances with 3-clause chains for 2 children).

maintenance, whereas the suffix denoting "additive" allows for either subject maintenance or a change in subject. In Turkish, the medial verb forms that can function in either same-subject or different-subject contexts are accompanied by null pronouns in same-subject contexts and explicit pronouns in different-subject contexts.

The early 2-clause chains produced by children acquiring Ku Waru, Nungon, and Pitjantjatjara all involve cross-clause subject maintenance. One Nungon child produced only same-subject chains from 2;4 through 2;10, after which she produced her first different-subject chains. However, that child produced very few 2-clause chains at all in that period, so sample size could be a factor here. Ku Waru children show a pronounced delay in production of different-subject chains, with the first token produced at 4;7 by the oldest child in that study; this is likely related to a strong preference in that language for subject maintenance throughout chains (see below). Children acquiring Pitjantjatjara also produce different-subject chains after a sizable delay, by around 4;1.

For Korean, children's earliest 2-clause chains are a mix of same- and different-subject chains. The earliest clause chains produced by Japanese children employ the -te medial verb form in same-subject contexts (Clancy, 1985), and it is unclear when children begin to produce different-subject chains in Japanese. Previous work on Turkish acquisition reported that children's first medial verb forms are a mix of those permitting only subject maintenance, and those allowing for either subject maintenance or subject switch (Slobin, 1995, pp. 350–351).

Overall, the data on early productions of switch-reference in clause chains indicate a strong effect of language-specific input, rather than constants of cognitive constraints. The marked developmental delay in production of different-subject clause chains by children acquiring Ku Waru and Pitjantjatjara can be attributed in large part to the very low proportions of different-subject clause chains in child-directed adult speech in these languages. In most Ku Waru transcripts, 100% of adult clause chains involve a single subject that is maintained throughout the chain (Rumsey et al., 2020). Pitjantjatjara is

similar; all but one adult clause chain token in the sample were same-subject (Defina, 2020). On the other hand, Korean children produce same- and different-subject chains from early on, as the target language provides both. Nungon data indicate something similar: at the age when children's clause chain production increases (around 2;11), they produce a mix of same- and different-subject clause chains, just as Nungon adults do consistently.

DISCUSSION

This comparative study of the acquisition of clause chaining across six typologically diverse languages contributes several insights to research on the acquisition of complex sentence structures.

Early Semantically Complex, Error-Free Production

In five of the six languages, 2-clause chain production begins between 2;0 and 2;6. This timing is similar to the early production of complement clauses in French (Dye, 2005) and Polish (Smoczyńska, 1985), relative clause-like structures in English (Diessel, 2004) and French (Dye, 2005), and adverbial and coordinate clauses in child English (Clark, 2003; Diessel, 2004). However, early clause chains differ from early clause combinations in other languages in two ways. First, Diessel (2004) proposed that children's earliest complement and relative clauses in English involve a single semantic proposition. This is clearly not the case with children's early clause chains for at least some of the languages studied here (Japanese, Korean, Nungon, Turkish), where early chains describe two temporally sequential distinct concrete actions or events. Second, early clause chains are morphologically well-formed, whereas the early adverbial and coordinate clauses in English tend to be morphologically lacking (usually omitting conjunctions).

Quick Progression in Number of Clauses Combined Into Sentences

Here, study of clause chaining adds a further dimension – number of clauses combined – to the existing literature on complex sentence development (summarized in Lust et al., 2015). For all six languages, children begin by producing only 2-clause chains. It takes at least a month and in most cases several months, or even several years, for children to produce longer chains (usually, in the first instance, of 3–5 clauses). Beyond the 2-clause stage, chain length is generally open, not limited to three clauses. This transition can be likened to the well-known developmental phenomenon in which children transition from the 2-word to the multi-word stage, in which children combine not just three but several words at a time.[3]

Early Ability to Indicate Relations Across Linked Clauses

Sarvasy (2020) suggested that switch-reference marking in clause chains could pose a cognitive hurdle for children, in that it apparently requires speakers to plan chains at least two clauses at a time (to be able to mark in advance whether the subject of the upcoming clause will be the same or different). Sarvasy (2020) proposed that children had three hypothetical options to mitigate the cognitive demands of switch-reference marking: (a) produce other types of complex sentences (which do not require such cross-clause reference tracking) before ever producing clause chains; (b) use only same-subject chains, to avoid having to track subjects; or (c) use morphologically reduced medial verbs to avoid either same-subject or different-subject marking within clause chains. Sarvasy (2020) showed that children acquiring Nungon do not pursue strategy (a) or (c), whereas there is limited evidence that one child uses strategy (b) for about 5 months (2;5–2;10). The use of same-subject chains for a much more extended period by Ku Waru and Pitjantjatjara children probably stems from distributions in the ambient language. Because some medial verb forms in Japanese, Korean, and Turkish allow for either subject maintenance or switch across clauses, children acquiring these languages are potentially spared the challenge of advance planning because they do not have to commit in advance to subject maintenance or switch.

CONCLUSION

In sum, most children, regardless of language, show the ability to produce complex 2-clause sentences (or precursors of these) from around their second birthday. However, children acquiring some clause chaining languages seem to do this with more semantic and lexical flexibility than attested for early subordination in other languages; well-formed

morphology, unlike early coordination in other languages; early expansion from two to more clauses; and an early ability to plan across clauses, flagging information about the subject of the next clause in advance. In our view, the features of clause chaining that facilitate acquisition include medial verbs' formal and semantic simplicity, their consistent occurrence in the prosodically salient clause-final position (*vid.* Slobin, 1973), and the predictable use of clause chains by adults in semantic contexts involving temporally sequential events/actions, unlike complex syntax in languages like English (Barker and Pederson, 2009).

Of the source studies, only one (Sarvasy, 2020) compared clause chain development with that of coordination and subordination in a single language. Sarvasy (2020) showed that two children acquiring Nungon show marked upticks in production of all three complex sentence types around age 2;11, and from that point on, Nungon clause chain counts greatly outpaced counts of subordinate and coordinate sentences in child speech. It remains to be seen whether other "clause chaining languages" show similar patterns, with clause chains preferred over other complex sentence types in early child productions.

We further suggest that the clause chaining/non-clause chaining language distinction be applied to re-evaluate earlier results in studies of descriptions of motion events. Earlier work has shown that children learning particular languages (such as Korean) express more semantic components of motion (Path, Manner, Cause) per utterance unit than children learning other languages (e.g., English, French) (Choi, 2014). This cross-linguistic difference was typically discussed in terms of Talmy's typology of lexicalization of motion events, i.e., verb- versus satellite-framed languages (Talmy, 1985). However, the use of clause chains in Korean could serve as an alternative explanation: children learning a clause chaining language can link several clauses in one utterance, enabling them to express several components of a motion event, whereas children learning a non-clause chaining language are restricted (by the input language) to linking maximally about two clauses (e.g., one main and one subordinate clause).

Finally, the studies compared in this paper are diverse in many respects, beginning with the extreme differences between the speech communities' lifestyles, from the industrialized, mid-to-high-socioeconomic-status children in the Eurasian language studies to the remote, traditional small communities in the Pacific language studies. The studies further differed in number of target children, children's ages, elicitation task types, or naturalistic data collection methods. Systematic investigation of children's production of clause chains in a more controlled manner – targeting, for instance, clause chain distribution across different discourse genres in child speech – remains on the horizon.

DATA AVAILABILITY STATEMENT

This study does not involve any direct research but only cites published data. Requests to access the data analyzed in this article should thus be directed to the relevant researchers for each of the six language studies.

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[3]More speculatively, one might compare these stages in acquisition to the literature on infants'/toddlers' comprehension of number concepts, showing that the difference between 1 and 2 is salient, but between 3 and a few more is not (Xu et al., 2005; Condry and Spelke, 2008).

ETHICS STATEMENT

AUTHOR CONTRIBUTIONS

HS and SC contributed to the writing and data analysis. Both authors contributed to the article and approved the submitted version.

FUNDING

ACKNOWLEDGMENTS

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