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Adult and child production of Quechua relative clauses

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Introduction

The present study explores the production of relative clauses by adult and child speakers of Quechua, a language spoken in several varieties, since Incan times, in the Andean countries of Peru, Ecuador, and Bolivia. Unfortunately, Quechua speakers do not produce many relative clauses in everyday speech. In an earlier investigation, over 20 hours of recorded spontaneous speech by adult and child Quechua speakers in southern Peru yielded a total of only four relative clauses (Courtney, 1998). These included a single relative clause in 185 adult, child-directed utterances and three subject-gap relatives in the productions of three children between the ages of 2;5 and 3;5. Since there were so few relative clauses in the naturalistic data, the present study employed an experimental procedure to elicit the production of Quechua relative clauses. The participants in this study were Peruvian children, aged 2;8 to 4;10, and adults living in the Huari province of the Department of Ancash. They are all speakers of Conchucos Quechua, a variety spoken in central Peru.

Quechua is an agglutinative language, and it is consistently left-branching. As one might expect, Quechua relative clauses are prenominal structures lacking both relative and resumptive pronouns (Keenan, 1985). The head of the relative clause, i.e., the Noun Phrase that is relativized, may occur clause-internally (in its theta position) or clause-externally, with the clause-external position reportedly far more common in adult Quechua. Also, Quechua speakers may produce relatives without any explicit head at all, herein labeled 'headless'.[1] The

[1] For Cole (1987) and Lefebvre & Muysken (1988), 'headless' is synonymous with 'internally-headed'. Here, I make a distinction between 'internally-headed' (with the head NP occurring inside the relative clause) and 'headless' (without an explicit head NP, either external or internal).

three possibilities are illustrated in (1)-(3). The underlined, relativized subject, *wambra* 'child' occurs as the internal head (IH) in (1) and as the external head (EH) in (2). Example (3) presents a relative clause with neither an internal nor an external head.

(1) [<u>wambra</u> waka maqaq]

child cow hit

'a/the child who hit a/the cow'

(2) [waka maqaq] <u>wambra</u>

cow hit child

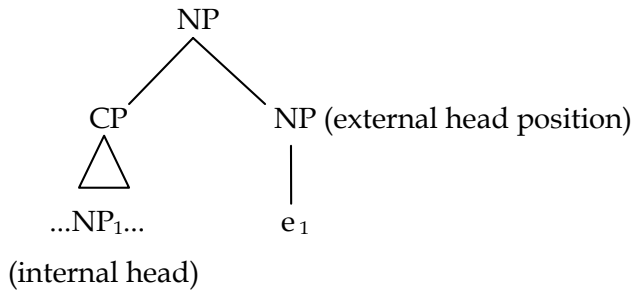
'a/the child who hit a/the cow'

(3) [waka maqaq]

cow hit

'(the) one that hit a/the cow'

According to Weber (1983), Cole (1987), and Lefebvre & Muysken (1988), who have written extensively on the Huallaga, Imbabura, and Cuzco varieties of Quechua, respectively, internal heads are co indexed with a null pronominal element in the external head position:

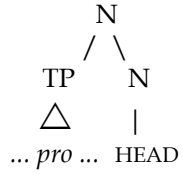


Cole and Lefebvre & Muysken have further maintained that the internal (lexical) head moves into external position at Logical Form. Thus, on this analysis, the lexical head is base-generated internally, in its theta position.[2]

Ease of production of relative clauses according to the function of the relativized Noun Phrase

It is possible that children acquiring Quechua may have less difficulty producing relative clause types that are linguistically less marked, suggesting an order of acquisition of relative clause types from less marked to more marked. In this regard, Keenan & Comrie's (1977) extensive exploration of typological/ implicational universals yielded an accessibility hierarchy for predicting the types of relative clauses a language will have, as shown in Figure 1. Accordingly, if a language has a relative clause of Type X (e.g., non-direct object relatives), it will also have any relative clause type higher in the hierarchy than Type X (i.e., subject and direct object relatives). As both Keenan (1985) and Comrie (1989) have observed, there are languages lacking relative and resumptive pronouns that do not relativize possessor NPs at all.

[2] Fukui & Takano (2000) have recently proposed a non-movement analysis for Japanese relative clauses, whereby the external head is generated in the external position, and the gap in the relative clause is *pro*:



Japanese relatives are similar to Quechua relative clauses. Nevertheless, exploration of this proposal for Quechua is beyond the scope of this study. Therefore, the issue of movement or lack of movement in the generation of Quechua relative clauses is not discussed here.

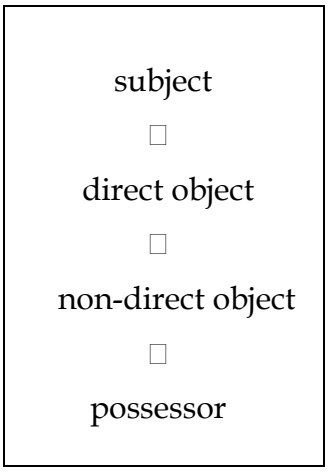


FIGURE 1: The accessibility hierarchy for relative clauses

Gass (1979a, 1979b) applied the accessibility hierarchy in second language acquisition. Based on an analysis of ESL data produced by speakers of several different native languages, Gass proposed that relative clause production by ESL learners can be predicted by the accessibility hierarchy; that is, ESL learners are initially more successful at producing relative clauses at the high end of the hierarchy. If Quechua-speaking adults produce all the relative clause types in the hierarchy, while children have comparatively greater difficulty producing the more marked types, there is support for the accessibility hierarchy as an indicator of order of acquisition of relative clause types. However, if adults also have difficulty producing the more marked types of relative clauses, comparative ease of processing must be considered.

This is because the accessibility hierarchy may well be an epiphenomenon of increasing computational complexity in language processing. For example, it is a robust finding that in English, with SVO canonical word order and post-nominal relative clauses, subject-gap relative clauses are easier to comprehend than object-gap relatives (notably, Hakes, Evans & Brannon, 1976; Ford, 1983; Gordon, Hendrick & Johnson, 2001). Chinese also has SVO word order, but Chinese relative clauses are pre-nominal structures. Hsiao & Gibson (2003) discovered that it is

the subject-gap relative clauses which are the more difficult structures to process in Chinese, and they attribute this outcome to the mismatch in word order in relative and main clauses.

Observations of child Japanese and child Korean reported by O'Grady, Yamashita, Lee, Choo & Cho (2000) and of adult L2 Korean by O'Grady, Lee & Choo (2001), are more relevant because these languages are typologically similar to Quechua. All three languages have canonical SOV word order and pre-nominal relative clauses. O'Grady and colleagues found that young speakers of Japanese and Korean as well as L2 Korean learners have greater difficulty understanding object-gap relatives than subject-gap relatives. O'Grady (2003) reported the same asymmetry in the production of comparable gap-containing structures, *wh*-questions, in early Japanese; that is, the Japanese children had greater difficulty producing object-gap questions than subject-gap questions. O'Grady et al. (2000) attribute the greater difficulty in comprehending object-gap relatives to structural distance leading to increased computational complexity in sentence processing, and they extend the asymmetry to developmental order. Accordingly, children have a harder time interpreting a gap that is syntactically more distant, in terms of intervening nodes, from its filler (the nominal that is modified by the relative clause). If structural distance also determines difficulty of <u>production</u> of relative clauses, we might expect Quechua-speaking children to have more trouble producing object-gap relative clauses, as compared with their production of subject-gap relatives. In this regard, Diessel & Tomasello (2000) have observed that the earliest relative clauses produced spontaneously by English-speaking children include a much higher percentage (67.5%) of subject-gap relatives containing intransitive verbs than of object-gap relatives (22.5%); moreover, the percentage of oblique-gap relatives (i.e., non-direct object) is very low (only 5%). Diessel and Tomasello attribute the lower proportion of object-gap relatives to greater processing load.

Production of externally-headed, internally-headed, and headless relative clauses

Although adult Quechua speakers reportedly produce externally-headed relatives more frequently than internally-headed relatives, it is possible that young children may actually favor relative clauses with internal heads. For insight, we turn once again to findings reported by O'Grady et al. (2000) for child Korean. Like Quechua, Korean allows both head-internal and head-external relative clauses, with the head-external pattern more frequent in adult speech (O'Grady *et al.*, 2000). Nevertheless, the Korean children in the O'Grady *et al.* study initially produced more internally-headed relative clauses.

Cross-linguistic observations by Slobin (1985) also suggest that Quechua-speaking children will tend to produce, even favor, internally-headed relative clauses, with all nominal arguments occurring in the SOV word order required in other types of Quechua subordinate clauses and frequently observed in main clauses. (While the ordering of constituents in main clauses is very flexible in Quechua, the canonical order is SOV.) Slobin notes that the early subordinate clauses produced by children acquiring synthetic languages like Quechua resemble matrix clauses:

> ". . . children try to keep embedded clauses as much like main clauses as possible. The data repeatedly show attempts to express all the nominal arguments in embedded clauses, even though the parental language allows for or requires deletion. . . . overt marking of all sentence participants is an early and persistent characteristic of child language." (Slobin, 1985: 1221)

Because Slobin remarks that children typically prefer the analytic expression of arguments at first, we may also infer that children acquiring Quechua will produce comparatively few headless relative clauses, i.e., those lacking an internal or external head; that is, they will favor producing relative heads explicitly. In fact, as noted above, Quechua-speaking children initially

prefer the analytic expression of pronominal objects in main clauses, only later to produce the appropriate object-agreement morphology on the verb. Illustrative examples (4)-(5), each meaning 'S/he takes me', were produced spontaneously by the same child at different ages (Courtney, 1998).

(4) (2;6) *Noqa-ta pusa-n.

1SG pronoun-ACC take-3SG

(5) (2;8) Pusa-wa-n.

take-1OBJ-3SG

In light of these findings, the present study was designed to investigate two issues in adult and child production of Quechua relative clauses, as follows:

1. Do both adults and children relativize NPs functioning within the relative clause as subject, direct object, non-direct object, or possessor with equal ease? How might we account for any differences in adult and child performance?
2. In the production of adults and children, what is the comparative frequency of internally-headed, externally-headed, and headless relative clauses? How might we account for differences in adult and child performance?

Before describing the elicitation procedure, the relevant highlights of Quechua relative clauses are presented.

Quechua Relative Clauses

The basic features of Quechua relatives are illustrated in (6) - (14). In the first two examples, the head of the relative clause is *wambra* 'child', which appears internally in (6) and externally in (7). Since, in both instances, the head NP functions as the subject of the relative

clause, the embedded verb is a nonfinite form ending in the Agentive suffix: *maqa-q* 'hit + AGT'.[3] In (8), there is no expressed head or internal argument; that is, the relative clause is headless. In all three examples, the final constituent in the subordinate clause bears the Accusative Case suffix, *-ta*, since the entire clause is the direct object of the main verb *rika-* 'see'. In the examples, Internal Head is abbreviated as IH and External Head, as EH.

(6) [wambra waka maqa-q-ta] rika-rqa: IH is embedded Subject

child cow hit-AGT-ACC see-PAST-l SG

'I saw the child that hit the cow.'

(7) [waka maqa-q wambra-ta] rika-rqa: EH is embedded Subject

cow hit-AGT child-ACC see-PAST-1 SG

'I saw the child that hit the cow.'

(8) [maqa-q-ta] rika-rqa: Headless - embedded Subject

hit-AGT-ACC see-PAST-l SG

'I saw the one that hit (someone/something).'

It is important to note that the [Verb + AGT] construction is also used in Quechua as a pre-nominal modifier or as a NP, as in *macha-q runa* 'drunk man' and *macha-q* 'drunkard'. As relative clauses, the same NPs would be glossed as 'the man/ one who drinks'. However, such expressions are not necessarily ambiguous: in some [Verb-AGT + NP] combinations, the NP cannot grammatically serve as the subject of a finite verb, e.g., *chunya-q hirka* 'deserted mountain' but not **hirka chunya-n* 'the mountain is silent' (Weber, 1983).

[3] Abbreviations for the Quechua suffixes that appear in the glosses are presented in APPENDIX I.

The next two examples, shown in (9)-(10), illustrate once again the contrast between internally-headed relative clauses, as in (9), and externally-headed relative clauses, as in (10). They also show that the verb within the relative clause takes on a different form when the head is not the embedded subject; that is, when the NP functions as direct object, indirect object, or an oblique constituent. In this case, the nonfinite verb form is *maqa-nqa-n* 'hit +ASP + 3SG'. The final suffix, *-n*, indicates the person of the subject within the relative clause, and the intermediate suffix, *-nqa-*, indicates action completed, ongoing, or at least begun--as contrasted with future/irrealis. Further note that the *in situ* direct-object head in (9) typically lacks the Accusative case inflection, *-ta*. By contrast, the raised head in (10) bears the Accusative inflection because it is the last constituent within the bracketed NP, and this entire NP is the complement of the main verb, *rika-* 'see'.

(9) [wambra waka maqa-nqa-n-ta] rika-rqa: IH is embedded Object

child cow hit-ASP-3SG-ACC see-PAST(l SG)

'I saw the cow that the child hit.'

(10) [wambra maqa-nqa-n waka-ta] rika-rqa: EH is embedded Object

child it-ASP-3SG cow-ACC see-PAST(1SG)

'I saw the cow that the child hit.'

In (11)-(12), the contrast between the internally- and externally-headed relative clauses is especially interesting because the head is an oblique constituent. When the head NP is internal, as in (11), it bears the Instrumental suffix, *-wan*, such that *qeru-wan* means 'with the stick'. When the head is external, as in (12), the case inflection on *qeru* is Accusative *-ta* because it is now the final constituent in the subordinate clause, and, as in (9), the entire embedded clause is the

direct object of *rika-* 'see'. For that reason, (12) is actually ambiguous: it could also mean, although improbably, 'I saw the stick that you hit.'

(11) [qeru-wan maqa-nqa-yki-ta] rika-rqa: IH is embedded Instrument

stick-INST hit-ASP-2SG-ACC see-PAST(l SG)

'I saw the stick with which you hit (something).'

(12) [maqa-nqa-yki qeru-ta] rika-rqa: EH is embedded Instrument

hit-ASP-2SG stick-ACC see-PAST(l SG)

'I saw the stick with which you hit (something).'

Example (13) illustrates a means available to Quechua speakers for relativizing possessor NPs in relative clauses equivalent to English structures containing the verbs 'to have' or 'to be', such as [*who has* ____ ADJ _____NOUN] and [*whose* _____NOUN *is* _____ADJ]. The suffix, *-yuq*, often described in Quechua grammars as indicating inalienable possession, might be glossed as 'possessing' in English, such that *hatun waka-yuq wambra*, literally means '(big cow)-possessing child'. There is no verb in this structure: Quechua lacks a verb equivalent to 'to have' and seldom expresses copular 'to be'. Thus, the Quechua version of this particular type of possessor-gap relative is less complex than the English counterparts, 'the child who has a big cow' and 'the child whose cow is big'. Finally, example (14) presents a sentence containing a more complex structure: a relative clause embedded within a relative clause.

(13) [hatun waka-yuq wambra-ta] rika-rqa: EH is embedded Possessor

big cow-POSS child-ACC see-PAST(1SG)

'I saw the child that has a big cow/whose cow is big.'

(14) [[[chuspi miku-q] waka-yuq]] wambra-ta] rika-rqa:

fly eat-AGT cow-POSS child-ACC see-PAST (1SG)

'I saw the child that has a cow that eats flies/ whose cow eats flies.'

Method

Participants

The adults and children recruited to participate in this study were all natives of the province of Huari in Ancash, (central) Peru. The town of Huari, capital of the province, has approximately 5000 inhabitants. Located at 10,000 feet in the mountains of the southern Conchucos region, Huari is surrounded by steep hills where scattered villages are to be found at even higher elevations. The chief occupation in the region is farming, with entire families devoted year-round to the tasks of cultivating crops, especially corn and potatoes, and tending to the family livestock, typically consisting of a few cows, pigs, sheep, and poultry. The families are large, and the farming plots are small. Moreover, the economy in the entire region is stagnant, with very few employment opportunities beyond farming. Life for people throughout the Conchucos region is fraught with financial hardship; hence, the socioeconomic status of all the participants is low, even by Peruvian standards.

In the town of Huari itself, nearly everyone is bilingual in Quechua and Spanish. Quechua predominates in the outlying villages, where one may still encounter monolingual adult speakers. The children in these villages acquire Quechua as their first language, and many typically struggle to learn Spanish through the bilingual programs in place at local elementary schools. Also, many of these children have little experience of books, even pictures, before they start school, and parents often cannot afford to purchase the notebooks, pencils, and textbooks their children need for school. Nonetheless, the children enjoy games and stories, especially when the stories are enacted with toy figures of people, animals, and objects.

In this setting, 67 participants were recruited for the study, 20 adults and 47 children, aged 2;8 to 4;10 (mean age = 3;7). The adult participants were recruited from both the town of Huari and the surrounding villages. The children all came from different villages in the Huari area. All the participants were native speakers of Conchucos Quechua.

The Elicitation Procedure

The protocol employed for eliciting restrictive relative clauses was adapted from experimental procedures developed by Crain, McKee & Emiliani (1990). In the test procedure, each participant plays a game with two investigators (herein referred to as A and B), both local native-speaking women familiar to many of the participants. At the beginning of the game, Investigator A shows two toy figures of the same type, e.g., two children or two ducks, together to the participant and Investigator B. The participant and Investigator B both watch as Investigator A manipulates the two figures so that they perform different actions, e.g., one eating oranges and the other eating bananas. In this enactment, Investigator B makes use of additional props, as needed for the particular actions. As each figure performs the action, Investigator A describes the action in one sentence, e.g., 'This duck eats oranges. And this duck eats bananas.' After Investigator A repeats the sequence once, Investigator B then puts on a blindfold. With Investigator B now unable to see, Investigator A points to one of the figures. She asks the participant to help out Investigator B, who is now unable to see, by verbally identifying which figure is being pointed to. On removing the blindfold, Investigator B is able to identify the appropriate figure by making use of the information provided in the participant's response. The protocol used in the first experimental trial provides an illustration of the procedure:

(15)	Kay allqu-qa allapa-m awlla-n.	Y pasaypa-m kay-kaq allqu-qa miku-n.
	this dog-TOP a lot-EV bark-3SG	and a lot-EV this-DET dog-TOP eat-3SG

'This dog barks a lot. And this dog eats a lot.'

Mayqan-kaq allqu-ta-taq tuqri-yka:?

which-DET dog-ACC-? point-PROG-1SG

'Which dog am I pointing to?'

This game, illustrated in Figure 2, requires the participant to respond with a modifier that provides enough information to enable the blindfolded experimenter to identify the member of the pair that has been singled out. All the lexical information the participant needs in the response has already been presented in the descriptions of the two actions. Thus, the format provides a pragmatically sound means of eliciting restrictive relative clauses.

FIGURE 2: The relative clause elicitation procedure

The test comprises a total of eight experimental trials, two for each type of gap: subject, direct object, non-direct object, and possessor.[4] The two trials for non-direct objects are designed to

[4] The entire protocol is presented in APPENDIX II.

elicit different oblique constituents, one Locative and one Instrumental. For all the trials, the figures have been selected to represent entities familiar to all the participants, e.g., local animals, tools, foods, and appropriately dressed figures of children. In order to learn the game, each participant started off with a few practice trials requiring responses with restrictive modifiers that are not relative clauses, e.g., 'This duck is fat. And this duck is thin.' The number of practice trials required for learning the game varied from a minimum of 3 to a maximum of 5 for some participants, especially the younger children. In this way, the experimental trials were not begun until it was clear that the children had no difficulty understanding that the blindfolded person needed their instructions. Four test versions were prepared, each with a different ordering of the experimental trials. Additionally, the test versions were assigned randomly to the participants. For each participant, the entire procedure was taped and later transcribed by the investigators.

Results

Errors

Responses were coded as errors if they manifested one or more deficiencies in the following features: (1) head selection, (2) verb form, (3) nominal inflection, and (4) word order. Global errors (5) are those that are either inappropriate responses or exhibit multiple errors. Examples (16)-(17) present child and adult responses, each containing an error in head selection or the verb form, for items #1 and #4, respectively. For each item, the correct response, externally-headed version, is provided first. Note that, typically, the verb form error results from the respondent's providing a finite verb form instead of the required form for relative clauses, ending in *–q* or *–nqa-*.

(16) (a) Correct EH response for #1: pasaypa/allapa awlla-q allqu-ta

a lot bark-AGT dog-ACC

'the dog that barks a lot'

(16) (b) Adult error – wrong head: allapa awlla-q kaq wambra-ta

a lot bark-AGT DET child-ACC

'the child that barks a lot'

(16) (c) Child error – finite verb: pasaypa awlla-n

a lot bark-3SG

'(It) barks a lot.'

(17) (a) Correct EH response for #4: patu lanqu-nqa-n chuspi-ta

duck step on-ASP-3SG fly-ACC

'the fly that the duck stepped on'

(17) (b) Adult error – finite verb: patu lanqu-yka-n chuspi-ta

duck step on-PROG-3SG fly-ACC

'The duck is stepping on the fly.'

(17) (c) Child error – wrong head: lanqu-nqa-n patu-ta

step on-ASP-3SG duck-ACC

'the duck that (it) stepped on'

Examples (18)-(19) present child and adult responses, each containing an error in nominal inflection or a global error, for items #7 and #8, respectively. Again, for each item, the correct response, externally-headed version, is provided first. Note in (18) that the same error of nominal inflection (underlined in each case) is made by both the adult and the child. The adult and child responses in (19) exhibit multiple errors of nominal inflection and word order.

(18) (a) Correct EH response for #7: rumi/sanao:ria-(yuq) mati-yuq waka-ta
stone/carrot-(POSS) plate-POSS cow-ACC
'the cow whose plate has stones/carrots'

(18) (b) Adult error – nominal inflection: rumi-yuq mati-<u>ta</u> waka-ta
stone-POSS plate-ACC cow-ACC

(18) (c) Child error – nominal inflection: sanao:ria-yuq mati-<u>ta</u> tsay waka-ta
carrot-POSS plate-ACC that cow-ACC

(19) (a) Correct response for #8: peskadu miku-q patu-yuq wambra-ta
fish eat-AGT duck-POSS child-ACC
'the child whose duck eats fish'

(19) (b) Adult error – global: peskadu-ta patu miku-q kaq wambra-ta
fish-ACC duck eat-AGT DET child-ACC

(19) (c) Child error – global: patu-ta wamra-ta peskadu-ta miku-yka-q-ta
duck-ACC child-ACC fish-ACC eat-POSS-AGT-ACC

The adult and child means for error-free responses as well as for errors by type are presented in Table 1.

TABLE 1: Mean number of errors by type and age group

	Error-free	Head	Verb	Nom. inflection	Word order	Global
Adult	6.90	0.30	0.25	0.20	0.15	0.20
Child	4.79	0.62	0.94	0.11	0.13	1.23

With regard to the relative number of error-free responses produced by adults and children, a two-tailed t-test was computed comparing the means for the two age groups. As one would expect, the adults produced significantly more error-free responses than the children, $t(65) = 4.52$, $p < 0.01$. A Pearson correlation was also performed for the child responses in order to investigate the relationship between age and error production, yielding the finding that age varied inversely with error production, $r = -.42$, $p < 0.01$ (two-tailed). The children produced significantly more inflectional errors than the adults, in both verb forms, $t(65) = 3.83$, $p < 0.05$ and nominal morphology, $t(65) = 3.92$, $p < 0.05$, and they produced more global errors. A Pearson correlation yielded a significant inverse relationship between children's age and number of global errors, $r = -.58$, $p < 0.01$ (two-tailed).

TABLE 2: Mean number of correct responses by experimental trial

Relativized NP	Trial No.	Adults (N = 20)	Children (N = 47)	Mann-Whitney tests significance (1-tailed)
Subject	1	0.95	0.68	$p < 0.05$
Subject	2	0.95	0.64	$p < 0.01$
Direct object	3	0.90	0.70	$p < 0.05$
Direct object	4	0.90	0.79	$p = 0.14$

Locative	5	0.90	0.72	$p = 0.06$
Instrumental	6	0.85	0.60	$p < 0.05$
Possessive	7	0.90	0.62	$p < 0.05$
Possessive	8	0.50	0.06	$p < 0.01$

Table 2 presents the mean number of correct responses produced by the adults and the children for each type of relativized constituent and item, as well as the outcomes of one-tailed Mann-Whitney tests conducted to compare the adult and child means. The results of these analyses show that the adults produced significantly more correct responses than the children for all items except #4 and #5, i.e., the second direct-object gap relative and the locative-gap relative, respectively. Not surprisingly, the adults outperformed the children on nearly every individual experimental item. Also, 9 of the 20 adults responded correctly for all 8 items. While none of the children responded correctly for every item, 17 children, all aged 42-58 months, provided correct responses for 6 or 7 items.

What is surprising is the finding that, for the first seven items, none of the elicited relative clauses was more difficult to produce than any other, for both children and adults. That is, additional nonparametric tests failed to yield significant differences in the mean number of correct responses among any pairs of items #1 through #7, for either adults or children. In fact, a nondirectional Wilcoxon test computed to compare children's performance in producing subject-gap relatives (M=1.32) and object-gap relatives (M=1.49) showed that children produce the two types of relatives with equal ease (p = .12). Adult and child performance on item #8, the second trial eliciting a possessor-gap relative, presents a different picture. There is a dramatic decrease in the adult and child means of the number of correct responses, and, for both age

groups, these means differ significantly from those obtained for all the other test items. This is illustrated graphically in Figure 3.

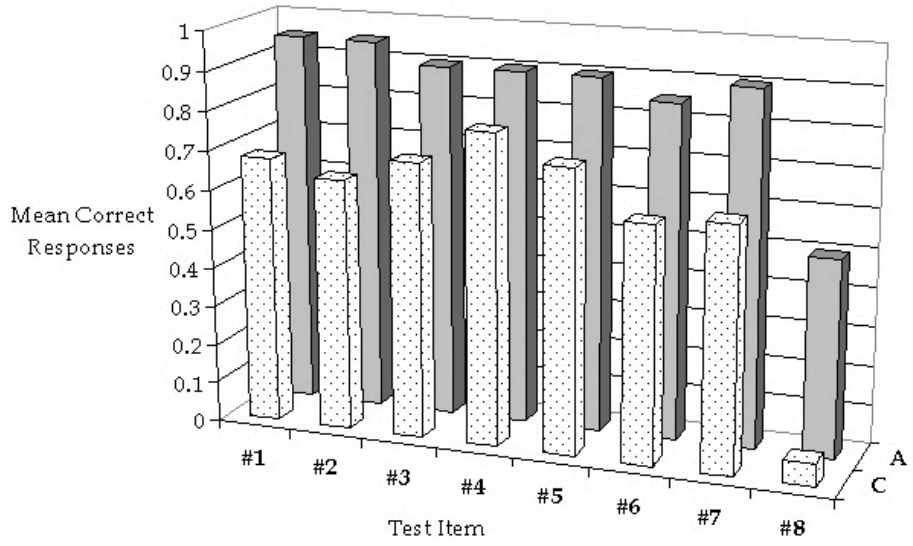


FIGURE 3: Means of correct responses for each test item by age group

(A = Adult; C = Child)

Responses reflecting different perspectives on the scene

Occasionally, the participants, both children and adults, disregard information provided in the original situation. These "shortcut responses", while appropriate in the test situation, fail to include one of the elements provided in the situation. There are a few responses of this type for items #2, #5, and #8, but the shortcut response is particularly prevalent for items #6 and #7. Sample responses of this type for items #6 and #7, respectively, are presented in (18)-(19), with the shortcut response shown on the left, and the complete response provided in brackets on the right.

(18) (a) adult: waka maqa-q kaq qeru-ta waka-ta maqa-nqa-n qeru-ta

cow hit-AGT DET stick-ACC cow-ACC hit-ASP-3SG stick-ACC

		‘the cow-hitting stick’	‘the stick that she hit the cow with’
(18) (b)	child:	chuspi wanu-tsi-q qeru-ta	chuspi-ta wanu-tsi-nqa-n geru-ta
		fly die-CAUS-AGT stick-ACC	fly-ACC die-CAUS-ASP-3SG stick-ACC
		‘the fly-killing stick”	‘the stick that she killed the fly with’

In (18), the participants have not acknowledged the Actor (i.e., *wambra* ‘the child’) in their responses to the question, “Which stick . . .?”. Nevertheless, these shortcuts are successful responses because they are grammatical constructions that adequately identify the entity pointed at in the related scene. In (19) (a-b), the respondents have not included one of the entities in the described scene: the plate (*mati*).

(19) (a)	adult:	sanaöria-yuq kaq waka-ta	sanaöria-(yuq) mati-yuq waka-ta
		carrot-POSS DET cow-ACC	carrot-(POSS) plate-POSS cow-ACC
		‘the cow that has carrots’	‘the cow whose plate has carrots’
(19) (b)	child:	rumi-yuq waka-ta	rumi-(yuq) mati-yuq waka-ta
		stone-POSS cow-ta	stone-(POSS) plate-POSS cow-ACC
		‘the cow that has stones”	‘the cow whose plate has stones’
(19) (c)	adult:	rumi miku-q waka-ta	[See (19) (b)]
		stone eat-AGT cow-ACC	
		‘the cow that eats stones’	
(19) (d)	child:	sanaöria-ta miku-q waka-ta	[See (19) (a)]
		carrot-ACC eat-AGT cow-ACC	
		‘the cow that eats carrots’	

Finally, in (19) (c-d), neither respondent has included the plate, but both have added a verb: to eat (*miku*-). Again, there is nothing wrong with the responses presented in (19) because they are all well-formed, and they adequately distinguish the entity singled out for identification in the test situation. Responses such as those presented in (18)-(19) merely express different perspectives on the events depicted in the test situations. As noted by Tomasello & Brooks (1999), speakers make use of different linguistic structures in order to vary the perspective on a scene, in this way focusing on a particular part of an event.

Heads

A two-tailed t-test was conducted comparing the means in the number of headed relative clauses produced by the adults (M = 4.80) and the children (M = 2.25). The adults produced significantly more headed relatives than the children, t (65) = 4.17, $p < 0.01$. A In the children, there was a significant relationship between age and the production of headed relatives, r = .42, $p < 0.01$ (two-tailed). With respect to the headed relatives produced by adults and children, the means reveal that, for both age groups, externally headed relatives greatly outnumber relative clauses with internal heads [Adults: M_{EHRC} = 4.15 and M_{IHRC} = 0.65; Children: M_{EHRC} = 2.09 and M_{IHRC} = 0.17]. Taken together and contrary to what one might expect, these findings suggest that children initially produce headless relatives, eventually producing predominantly externally-headed relatives. There is no stage at which children produce any more internally headed relative clauses than adults do.

In summary, the foregoing analyses support the following findings:

1. For the children, direct object-gap relatives are no more difficult to produce than subject-gap relatives. In fact, child and adult participants produce subject-gap, object-gap, and oblique constituent-gap relatives with equal ease, although adults generally produce fewer errors than the children.

2. The response performance for the second of the possessor-gap items dropped precipitously for both adults and children.

3. Adults produce more headed relatives than children, and the number of headed relatives produced by Quechua speakers increases with age.

4. Both adults and children produce far more externally-headed relative clauses than internally-headed relatives.

Discussion

Errors

By comparing the adult and child performances, it seems possible to sort out which errors are developmental and which result from momentary lapses in production performance. Because both adults and children produced head selection and word order errors, with no significant difference in the means, it is likely that these are performance errors. By contrast, the significant differences in the means for global and inflectional errors, both verbal and nominal, suggest a developmental process in the ability to produce Quechua relative clauses.

It is surprising, in light of the data presented from the typologically similar languages, Korean and Japanese (O'Grady et al., 2000), that Quechua-speaking children produce subject-gap and direct object-gap relatives with equal ease. O'Grady *et al.* propose that direct object-gap relatives, exemplified in (22b), should be more difficult for children to process because the extracted head is more deeply embedded than the extracted subject shown in (22a).

(22) (a) [$_S$___ wambra maqa-q] runa

child hit-AGT man

'the man that hit the child'

(22) (b) [$_S$ runa [$_{VP}$ ___ maqa-nqa-n]] wambra

man hit-ASP-3SG child

'the child that the man hit'

Perhaps children produce object-gap relatives with comparative ease because the word order in externally-headed object-gap relative clauses (SVO) would be less marked in Quechua than that of externally-headed subject-gap relatives (OVS). Recall Hsiao & Gibson's (2003) assertion that prenominal subject-gap relative clauses are more difficult for Chinese speakers to comprehend than object-gap relatives because there is a mismatch in word order between subject-gap relatives and main clauses.

While this account is plausible, the children were in fact quite successful at producing relative clauses of all the types presented on Keenan & Comrie's (1977) accessibility hierarchy, even though the subject-gap verbal morphology (*-q*) differs from that of the other gap types (*-nqa-*). For each of the first seven test items, which cover all the relative clause types in the hierarchy, the lowest correct response mean was 0.60 for children and 0.85 for adults. With regard to item #7, the first elicited possessor-gap relative clause, an appropriate response, shown in (23), required use of the possessor suffix *-yuq,* which is attached only to nouns because Quechua lacks a verb meaning 'to have'. Accordingly, there is no extraction involved in the production of this type of relative clause.

(23) rumi-yuq mati-yuq waka

stone-POSS plate-POSS cow (literal: '[[stone-possessing]-plate]-possessing] cow')

'the cow that has a plate that has stones/ whose plate has stones'

By contrast, item #8, which called for the response presented in (24), was extremely problematic for both children and adults. Almost none of the children provided an appropriate response (*M* = 0.06), and only half of the adults responded correctly (*M* = 0.50); also, incorrect responses frequently exhibited multiple errors.

(24) [[$_S$ ___ chuspi miku-q] patu-yuq]] wambra

fly eat-AGT duck-POSS child (literal: '[[fly-eating]-duck]-possessing] child')

'the child that has a duck that eats flies/ whose duck eats flies.'

Here, there is a clear processing cost in assembling the relative clause, perhaps because production involves two steps: (a) assembling an externally-headed subject-gap relative ([$_S$ ___ *chuspi miku-q*] *patu*) and (b) affixation of the possessor suffix to the extracted subject (*patu-yuq*). In this regard, it would interesting to observe child and adult production of relative clauses with double subject extractions, such as [*sara miku-q*] [*wallpa suwa-q*]] *warma* ('the woman that stole the hen that ate the corn'; literal: 'the [corn-eating]-hen]-stealing] woman'), from Wölck (1987: 46), who states, "Psycholinguistically, the Quechua speaker appears first to discharge everything that is secondary before moving to the main idea s/he wishes to communicate. " (translated from Spanish). The English grammar also allows the formation of NPs with recursive pre-nominal constituents in complex genitive determiners, e.g., *the girl in the red dress's brother's best friend's mother-in-law*, but that does not mean that they are easy for English speakers to comprehend or produce.

To sum up, analysis of the errors made by Quechua-speaking children and adults suggests that the accessibility hierarchy is indeed an epiphenomenon of increasing computational complexity in language processing. Children and adults experience similar

processing difficulties in relative clause production, and young Quechua speakers successfully produce all the relative clause types presented in the hierarchy.

Head

The children produced proportionately more headless relative clauses than the adults for every type of gap. This outcome is at odds with Slobin's (1985) cross-linguistic observation that children will tend to express all the arguments in subordinate clauses, even when the adult grammar allows argument ellipsis. Also, the dearth of internally-headed relative clauses in the child responses contrasts with O'Grady et al.'s (2000) finding for the Korean children, who initially produced proportionately more relatives with internal heads even though Korean-speaking adults produce externally-headed relatives more frequently. Rather than proceeding developmentally from internally-headed relatives to externally-headed relatives to headless relatives, the Quechua-speaking children's development appears to go in the opposite direction. How might we account for this developmental sequence? Two factors may shed light on this puzzle.

First, it is important to consider why adults would ever choose to produce relative clauses with internal heads. Over half of the adult IHRCs were responses requiring the relativization of oblique constituents or the more complex possessor-gap relative elicited in item #8. These are provided in (25)-(27), and, for comparison, two of the more typical adult EHRC responses are also presented in each example. As suggested in the glosses for (25) and (26), the responses with externally-headed relative clauses are ambiguous because the oblique constituent loses its base case inflection on movement out of the embedded clause. Although the EHRC responses are readily interpreted in the given context, the IHRC responses in (25) and (26) have only one construal, regardless of context. This contrast suggests that adults may

produce relative clauses with internal heads in situations where the ambiguous, externally-headed counterparts might invite the wrong interpretation.

(25) (a) Wallpa mati-chu: miku-nqa-n kaq-ta [IHRC: Locative Head]

hen plate-LOC eat-ASP-3SG DET-ACC

'the plate which the hen eats eats in'

(25) (b) Wallpa miku-nqa-n kaq mati-ta [EHRC: Locative Head]

hen eat-ASP-3SG DET plate-ACC

'the plate which the hen eats (in)'

(26) (a) Wambra qeru-wan waka-ta maqa-nqa-n kaq-ta [IHRC: Instrumental Head]

child stick-INSTR cow-ACC hit-ASP-3SG DET-ACC

'the stick which the child hit the cow with'

(26) (b) Waka maqa-nqa-n kaq qeru-ta [EHRC: Instrumental Head]

cow hit-ASP-3SG DET stick-ACC

'the stick (s/he) hit the cow (with)' / 'the stick which the cow hit'

However, as indicated in the glosses for (27), both responses for the computationally complex item #8, it is the internally-headed relative clause which is ambiguous. In this case, one can only suppose that it is easier for the respondent to produce the version of the relative clause that does not require extraction.

(27) (a) wambra-pa patu-n chuspi-ta miku-nqa-n kaq-ta [IHRC: Possessor Head]

child-GEN duck-3POSS fly-ACC eat-ASP-3SG DET-ACC

literal: 'the child's duck eats flies that one'

'the child whose duck eats flies' / 'the fly that the child's duck eats'

(27) (b) chuspi miku-q patu-yuq wambra-ta [EHRC: Possessor Head]

fly eat-AGT duck-POSS child-ACC

literal: 'the fly-eating duck-possessing child'

'the child whose duck eats flies'

Whatever the reason adults may occasionally favor internally-headed relatives, these clauses are longer and morphologically more complex than the externally-headed counterparts. For instance, the externally-headed relatives in (25)-(26) would surely be easier for children to produce than the relatives with internal heads.

It may be that the Quechua-speaking children simply prefer the briefest response possible, and headless relatives were certainly pragmatically appropriate in the experimental discourse situation. However, another explanation merits consideration, an account that is based on the previously mentioned use of Quechua nominalized verb forms as modifiers and as nouns. This is illustrated in examples (28)-(29).

(28) yanapa-q runa-ta rika: allin runa-ta rika:

help-AGT man-ACC see-1SG good man-ACC see-1SG

'I see the/a helping man.' 'I see the/a good man.'

(29) yanapa-q-ta rika: allin-ta rika:

help-AGT-ACC see-1SG good-ACC see-1SG

'I see the/a helper.' 'I see the/a good one.'

In these examples, the nominalized form *yanapa-q*, which literally means 'who helps', functions like *allin* 'good' both as a modifier (28) and as a noun (29). As previously mentioned, Weber presents examples of [Verb-AGT + Noun] combinations in which the noun could not grammatically serve as the relativized subject of the verb. The following examples from Weber (1983:32) have been numbered as (30)-(31) for convenience.

(30) chunya-q hirka

be silent-AGT mountain

'deserted mountain'

(31) *hirka chunya-n

mountain be silent-3SG

'the mountain is silent'

The examples show that the *hirka* 'mountain' can be modified by the Agentive form *chunya-q* 'deserted', while *hirka* cannot occur as the subject of the finite form *chunya-n*.

In light of these data, it is plausible that young children may start off construing forms such as *yanapaq* 'helper, one who helps' as simple nouns and prenominal modifiers in constructions of the type [(modifier) noun]. This would account for the comparatively large percentage of headless relatives produced by children, as well as the paucity of relatives with internal heads. On this analysis, then, any early preference for one type of relative over another would have nothing to do with such phenomena as argument ellipsis and canonical word order (Slobin, 1985). It is plausible that such combinations as *yanapaq runa* are not represented as clauses in the early Quechua grammar. Finally, the equal ease with which the children produce subject- and direct object-gap relatives makes sense if structure dependence is a factor only in

the production of relatives that have been analyzed by children as true embedded clauses (O'Grady, Yamashita, Lee, Choo & Cho, 2000).

At some point, however, children must reanalyze the [nominalized Verb + Noun] construction as a relative clause. This reanalysis may be triggered as the result of the child's eventually attending to the presence of arguments occurring before the nominalized verb, e.g., *serbesa upyaq runa* 'the man who drinks beer'. However, the mere occurrence of an internal argument is probably not sufficient to trigger reanalysis of the construction as a relative clause, since the construction could be construed as a nominal compound, such as *beer-drinking* or *beer drinker* in English. A likely candidate for trigger is the child's attention to inflectional elements affixed to the nominalized verb form, as illustrated in (32)–(34). (The additional inflectional elements are underlined.)

(32) maqa-<u>ma</u>-q runa

hit-1OBJ-AGT man

'the man who hit(s) me'

(33) miku-nqa-<u>yki</u> papa

eat-ASP-2SG potato

'the potatoes that you are eating/have eaten'

(34)	upya-<u>ya</u>-q	vs.	upya-q-<u>kuna</u>
	drink-PL-AGT		drink-AGT-PL
	'they used to drink'		'the drinkers'

In (32), a first-person object marker occurs in the nominalized verb form, making the entire structure a true relative clause. In like manner, the second-person inflection on the nominalized verb in (33) indicates that the verb has a subject. Finally, the contrasting examples in (34) illustrate the possibility of appending different plural inflections to the Agentive forms, depending on whether they are nouns (*-kuna*) or verbs (*-ya-*). Surely awareness of this distinction would lead the child to two different analyses, one for a plural noun and the other for a plural verb. On the present view, internally-headed relative clauses would be a comparatively late productive development in the child grammar, especially considering that they are longer and morphologically more complex and that adults produce them sparingly for specific purposes.

Conclusion

This study marks a beginning in the exploration of child acquisition of Quechua relative clauses. The procedure used for formal elicitation of relative clauses has proved effective, although the experiment must be replicated for different types of relative clauses. For example, an additional study might investigate production of relative clauses that serve as matrix clause subjects, indirect objects, and other constituents, since all the relative clauses in the present study served as direct objects of the matrix verb, *tuqri-* 'point to'. It will also be interesting to observe comprehension of relative clauses with more deeply embedded heads and multiply recursive extractions.

This study provides evidence that both Quechua-speaking adults and children produce all the relative clause types in the accessibility hierarchy with equal ease. Production performance improves with age as children become better at producing relatives with the appropriate inflectional suffixes. Because adults and children experience processing difficulty in producing relative clauses, particularly those that call for multiple embedding or extraction,

the accessibility hierarchy is not a useful indicator of order of acquisition of relative clauses; that is, comparative markedness of relative clause type is not a developmental factor in Quechua relative clause production. The analysis also illustrates an aspect of Quechua language acquisition that may start off with a linguistic construction, e.g., [Verb-AGT (noun)], construed through analogy as [(modifier) noun]. (Tomasello & Brooks, 1999; Tomasello, 2000). Subsequently, once children attend to the inflectional information provided in the input, they reanalyze the construction [Verb-AGT (noun)] as a subject-gap relative clause.

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APPENDIX I: Terms for abbreviations and interlinear glosses

Independent suffixes

TOP – Topic marker	-qa
EV – Evidential marker	-m

The form *kaq* is a determiner (DET) or marker of specificity used to single out a member of a set.

Nominal suffixes

ACC – Accusative	-ta
LOC – Locative	-chu:
INSTR – Instrumental	-wan
GEN – Genitive	-pa
POSS – Possessive	-yuq
3POSS – 3rd Person Possessor	-n
PL – Plural	-kuna

Verbal Suffixes

AGT – Agentive	-q
ASP – Aspectual	-nqa-
PAST – Past Tense	-rqa-
PROG – Progressive	-yka-
1OBJ – First-person object	-wa-/ -ma-
1SG – First-person subject	(elongated final vowel)
2SG – Second-person subject	-yki
3SG – Third-person subject	-n
PL – Plural subject	-ya-
CAUS – Causative	-tsi-

APPENDIX II: Elicitation Protocols

Subject gap

(1) Kay allquqa allapam awllan. Y pasaypam kaykaq allquqa mikun.

'This dog barks a lot. And this dog eats a lot.'

Mayqankaq allqutata . . .?

'Which dog . . .?'

(2) Kay waka naranhatam mikun. Y kaykaq wakaqa platanustam mikun.

'This cow eats oranges. And this cow eats bananas.'

Mayqankaq wakata . . .?

'Which cow . . .?'

Direct Object gap

(3) Wambra kay allquta mutsarqan. Y wambra kaykaq allquta maqarqan.

'The child kissed this dog. And the child hit this dog.'

Mayqankaq allqutata . . .?

'Which dog . . .?'

(4) Patu kay chuspita tipshirqan. Y patu kaykaq chuspita lanquran.

'The duck nipped this fly. And the duck stepped on this fly.'

Mayqankaq chuspita . . .?

'Which fly . . .?

Oblique constituent (non-direct object) gap

(5) Wallpa kaykaq matichü [LOCATIVE] mikun. Y kuchiqa kaykaq matichü mikun.

'The hen eats in (from) this plate. And the pig eats in (from) this plate.'

Mayqankaq matita . . .?

'Which plate . . .?

(6) Wambra kay qeruwan [INSTRUMENTAL] chuspita wanutsin.

'The child kills the fly with this stick.'

Y wambra kaykaq qeruwan wakata maqan. Mayqankaq qerutata . . .?

'And the child hits the cow with this stick. Which stick . . .?'

Possessor gap

(7) Sanaöriayuq kaykan kay wakapa [GENITIVE] matin.

'This cow's plate has carrots.'

Y kaykaq wakapa matinqa rumiyuq kaykan. Mayqankaq wakatata . . .?

'And this cow's plate has stones. Which cow . . .?'

(8) Peskaduta kay wambrapa [GENITIVE] patun mikun.

'This child's duck eats fish.'

Y kaykaq wambrapa patunqa chuspitam mikun. Mayqankaq wambrata . . .?

'And this child's duck eats flies. Which child . . . ?'