

A new case for structural intervention: evidence from Wenzhounese relative clauses

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Abstract This paper is the first investigation of relative clauses (RCs) in Wenzhounese (a variety of Wu spoken in Southern Zhejiang province, China). We provide a raising analysis of Wenzhounese RCs and discuss two main families of hypotheses for the subject preference observed in postnominal RCs, namely the linear intervention hypothesis and the hierarchical intervention hypothesis. To examine the validity of these two hypotheses, we tested fifty-six children (aged 3–6) and twenty-six adults on their production of Wenzhounese RCs. Head-external (prenominal) RCs, head-internal RCs, doubling RCs and headless RCs were elicited. The results show a subject preference in the production of head-external and headless RCs in both groups, but an object preference in the production of head-internal and doubling RCs. These findings support the notion that intervention in movement chains is computed hierarchically, not linearly.

Keywords Wenzhounese · Relative clauses · Relativized Minimality · Acquisition hierarchy

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1 Introduction

The goal of this paper is twofold. On the one hand, we aim at providing a description and an analysis of relative clauses (RCs) in an under-studied language (Wenzhounese, a variety of Wu spoken in Southern Zhejiang province, China). Although Wenzhounese, like Mandarin, is one of the very few subject–verb–object (SVO) languages with prenominal RCs, it differs from Mandarin in several ways that shed light on the derivation of RCs. The second goal of this paper is to contribute new evidence on a lively debate on the acquisition of RCs, which in turn is related to an issue discussed in the psycholinguistic literature on processing, namely the subject/object asymmetry.

In the acquisition of postnominal RCs, a well-documented asymmetry between subject and object RCs is observed, with subject RCs being more easily produced than object RCs, for instance in English (e.g. Zukowski 2009), Italian (e.g. Guasti et al. 2012) and Hebrew (e.g. Friedmann et al. 2009). However, contrasting findings are reported for prenominal RCs, for instance in Mandarin (see Hu et al. 2016 and references therein) and in Cantonese (see Chan et al. 2018 and references therein). Examples of subject and object RCs in Mandarin are given in (1).

- (1) a. ___ hua waipo de xiaopengyou (Mandarin subject RCs)
 draw grandma REL child
 ‘the child that draws the grandma’
 b. waipo hua ___ de xiaopengyou (Mandarin object RCs)
 grandma draw REL child
 ‘the child that the grandma draws’

A parallel picture emerges in the literature on sentence processing. While a subject advantage is systematically observed with postnominal RCs, the picture is more controversial with prenominal RCs (see Yun et al. 2015 and references cited therein).

The subject/object asymmetry in RCs has been explained in terms of intervention (Friedmann et al. 2009; Belletti and Rizzi 2013; Hu et al. 2016). In a nutshell, the idea is that in an object RC the embedded subject intervenes in the dependency between the relative head and the object gap. In postnominal RCs, the subject intervenes between them both linearly and hierarchically. Therefore, it is very hard to decide whether intervention is hierarchical (expressed in terms of *c*-command) or linear (interpreted in terms of linear order). While the overwhelming majority of works within the framework of generative grammar assume that hierarchical intervention is the analytical category that better explains the subject/object asymmetry, there is not much evidence that early-produced postnominal RCs have a hierarchical structure to begin with. In fact, in the psycholinguistic literature, there is not a unanimous consensus, and the subject preference in postnominal RCs has been explained by a variety of factors, such as linear distance between filler and gap

(Gibson 1998, 2000). Establishing whether the subject preference holds also in languages with prenominal RCs is most important, as this will provide evidence for the hierarchical organization of children's RCs. If the subject preference is reliably found also in prenominal RCs, an explanation in terms of hierarchical intervention is required for early production as well, since in structures like (1b) (and in the Wenzhounese cases that we will analyze) the subject *waipo* 'grandma' hierarchically, but crucially not linearly, intervenes between the gap and the RC head *xiaopengyou* 'child'. Given this debate, Wenzhounese is particularly interesting, possibly more so than other languages with prenominal RCs like Mandarin. The reason is that, as we will see shortly, in addition to RCs of the Mandarin type, namely with an external head that follows the RC, Wenzhounese productively admits three other types of RCs. It is therefore possible to test the predictions of the hierarchical or linear account for each type of RC within the very same language. In this paper, we do this by running an experiment on the elicited production of RCs by children and adult Wenzhounese speakers.

We organize the paper as follows. Section 2 introduces the basic pattern of Wenzhounese RCs. Section 3 sketches a theoretical analysis of Wenzhounese RCs. In Sect. 4, we present the predictions that different theories make with respect to the subject/object preference in Wenzhounese RCs. Section 5 reports results from the experiment. Section 6 offers a general discussion and a conclusion.

2 The basic pattern of Wenzhounese relative clauses

Wenzhounese, also known as Oujiang or Dong'ou, is a variety of Wu, spoken by about five million people living in Southern Zhejiang province, China (Shen and Shen 2013:18). It is mutually *unintelligible* with Mandarin, and with some other varieties of Wu such as Shanghainese. Wenzhounese is one of the most used languages by Chinese people overseas. For instance, out of 277,570 Chinese immigrants in Italy, at least 70% come from the Southern Zhejiang province (Pedone 2013). Since Wenzhounese RCs have never been studied in any detail, in this paper we will proceed as follows. We will first present the pattern emerging from grammaticality judgments collected by the first author (a native speaker of Wenzhounese) and then compare this qualitative description with results emerging from an elicitation experiment.

Wenzhounese is an SVO language with frequent object–verb (OV) word order (Liu 2001). At a descriptive level, four main types of RCs can be distinguished in Wenzhounese: head-external RCs as in (2), head-internal RCs as in (3), “doubling RCs” in which the relative head surfaces both internally and externally as in (4), and headless RCs without an explicit head noun as in (5). Among these four types of RCs, our informants share the intuition that head-external RCs are the most typical RCs used by Wenzhou people in neutral context, while doubling RCs are the least

typical ones. From now on, examples are in Wenzhounese, unless differently specified.¹

- (2) a. __ fi³¹ η⁵² bo²¹ kəʔ⁰ m³⁴² η³³ (head-external RC, subject RC)
 draw grandma REL child
 ‘the child that draws the grandma’
 b. η⁵² bo²¹ fi³¹ __ kəʔ⁰ m³⁴² η³³ (head-external RC, object RC)
 grandma draw REL child
 ‘the child that the grandma draws’
- (3) η⁵² bo²¹ fi³¹ m³⁴² η³³ kəʔ⁰ (head-internal RC, ambiguous)
 grandma draw child REL
 ‘the grandma that draws the child’ or ‘the child that the grandma draws’
- (4) a. η⁵² bo²¹ fi³¹ m³⁴² η³³ kəʔ⁰ η⁵² bo²¹ (doubling RC, subject RC)
 grandma draw child REL grandma
 ‘the grandma that draws the child’
 b. η⁵² bo²¹ fi³¹ m³⁴² η³³ kəʔ⁰ m³⁴² η³³ (doubling RC, object RC)
 grandma draw child REL child
 ‘the child that the grandma draws’
- (5) a. __ fi³¹ η⁵² bo²¹ kəʔ⁰ (headless RC, subject RC)
 draw grandma REL
 ‘(the one) that draws the grandma’
 b. η⁵² bo²¹ fi³¹ __ kəʔ⁰ (headless RC, object RC)
 grandma draw REL
 ‘(the one) that the grandma draws’

As illustrated in (2), head-external RCs are prenominal, with the head noun following the RC. Instead, as shown in (3), in head-internal RCs the head noun sits inside the RC in its argument position and the relativizer particle *kəʔ⁰* indicates that the sentence is an RC. Note that the sentence in (3) can be interpreted as either a subject RC or an object RC and its interpretation is mainly determined contextually. In doubling RCs illustrated in (4) the head noun appears twice, once in its argument

¹ As Wenzhounese is an oral language, most of the examples in Wenzhounese are transcribed from the actual flow of speech of one native speaker (Y CZ, aged 30, from Wencheng, Wenzhou); if the examples are not transcribed from Y CZ’s actual flow, we specify it in a footnote. The pitch range is labeled with the digits from 1 to 5, corresponding to low, half-low, medium, half-high and high pitch, respectively (Chao 1930). For instance, {31} represents a pitch falling from the middle pitch to the bottom and {33} represents a level pitch at the middle of the pitch range. See Pan (1991) and Zheng Zhang (2008) for the description of the phonological system of Wenzhounese.

position inside the RC and once in the final position, after the relativizer particle.² In headless RCs exemplified in (5), neither an external nor an internal head appears. This is consistent with the fact that Wenzhounese admits null arguments both in subject and in object position.

In (2–5) the relativizer particle $kəʔ^0$ appears at the right periphery of the RC immediately preceding the external head (when this is present). However, the relativizer particle $kəʔ^0$ can be omitted in subject RCs with an external NP head, as exemplified in (6). The possibility of omitting the relativizer is probably related to the fact that the verb–object–subject (VOS) order suffices to signal unambiguously that the embedded clause is a RC.

- (6) fio^{31} $\eta\alpha^{52}$ bo^{21} m_3^{42} η^{33} (head-external RC, subject RC)
 draw grandma child
 ‘the child that draws the grandma’

By contrast, in head-external object RCs some special marker of relativization is always needed. If the canonical relativizer $kəʔ^0$ is omitted, a morphological unit formed by a demonstrative and a classifier usually occurs. As illustrated in (7), the demonstrative hai^{33} ‘that’ and the classifier kai^{42} precede the head noun.³

² No doubling is allowed if the head noun is modified, namely if the RC “head” is a phrase as opposed to a simple noun. This is shown by the ungrammaticality of (i), in which the intended head of the RC is the phrase ‘old picture’. This prohibition might be an instance of a general constraint against doubling a phrase (as opposed to a single word). Alternatively, if the doubling results from spelling out both copies of the relativization chain, it might be due to the fact that, strictly speaking, only the noun enters the relativization chain, as assumed by Cecchetto and Donati’s (2015) version of the raising analysis of RCs.

- (i) $*\eta\alpha^{52}$ bo^{21} s_1^{42} ζy^{33} l_3^{35} ei^{33} $p^{h_1}_{42}$ $kəʔ^0$ l_3^{35} ei^{33} $p^{h_1}_{42}$
 grandma like old picture REL old picture
 ‘the old picture that the grandma likes’

³ (i) is an example in which a demonstrative alone is used, and (ii) is an example with only a classifier.

- (i) $[[_{NP/S} \eta\alpha^{52} bo^{21} ma^{33} hai^{33} \eta\theta y^{33}] sa^{33} kai^{33} ts^{h_3}_{33} p^{h_1}_{42}]$
 grandma buy DEM fish three yuan money
 (ii) $[_{NP/S} \eta\alpha^{52} bo^{21} ma^{33} me^{13} \eta\theta y^{33}] sa^{33} kai^{33} ts^{h_3}_{33} p^{h_1}_{42}$
 grandma buy CL_{fish} fish three yuan money
 ‘The fish that the grandma bought cost three Chinese yuan.’

Wenzhounese RCs allow the three options illustrated in (7) and (i–ii). This differs from Mandarin and Cantonese RCs. The structure, in which the unit formed by a demonstrative and a classifier occurs internally to the RC, has been reported in Mandarin and Cantonese. In Mandarin, the demonstrative is obligatory and the classifier is optional (Wu 2009); in Cantonese, the opposite holds (Matthews and Yip 2001, 2003) (for more description on Sinitic languages, see Arcodia 2017). From this point of view, the case in Wenzhounese RCs is a combination of Mandarin and Cantonese RCs, likely due to the different status of classifiers in these languages (Cheng and Sybesma 2008) and language contact.

- (7) $\eta\alpha^{52}$ bo^{21} fo^{31} hai^{33} kai^{42} $m\grave{3}^{42}$ η^{33}
 grandma draw DEM CL child
 RC reading: ‘that child that the grandma draws’
 Declarative reading: ‘the grandma draws that child’

The obligatory presence of some device signaling that the sentence contains an object RC is probably due to the fact that without a relativizer, the object RC might be initially misanalyzed as a declarative SVO clause (see the declarative reading in (7)).

When the RC is head-internal, the relativizer $k\partial\partial^{\rho}$ cannot be omitted. If it were, the structure would be identical to an SVO sentence. Doubling RCs are similar to head-external RCs concerning the expression of the relativizer, namely, if the relativizer $k\partial\partial^{\rho}$ is omitted, the morphological unit formed by a demonstrative plus a classifier is required, as illustrated in (8).

- (8) $\eta\alpha^{52}$ bo^{21} fo^{31} $m\grave{3}^{42}$ η^{33} hai^{33} kai^{42} $m\grave{3}^{42}$ η^{33} (doubling RC, object RC)⁴
 grandma draw child DEM CL child
 ‘the child that the grandma draws’

There are reasons to believe that the demonstrative + classifier unit cannot be treated on a par with the relativizer particle $k\partial\partial^{\rho}$. One reason is that in the former type of RC the head noun must be definite, while in the latter type it can also be indefinite. This is related to the fact that the demonstrative (e.g. hai^{33} ‘that’ and kai^{42} ‘this’) is a deictic expression (i.e. ‘this one’ and ‘that one’). Therefore in (7), the head noun only refers to a designated definite entity (‘that child’), whereas in (2), the head noun can either be definite (‘that/the child’) or indefinite (‘a child’).

⁴ If the demonstrative and the classifier are present, the head noun can be omitted, but the sentence becomes ambiguous out of context, because the hai^{33} kai^{42} ‘that’ can either refer to $\eta\alpha^{52}$ bo^{21} ‘grandma’ or $m\grave{3}^{42}$ η^{33} ‘child’, as exemplified in (i).

- (i) $\eta\alpha^{52}$ bo^{21} fo^{31} $m\grave{3}^{42}$ η^{33} hai^{33} kai^{42} (ambiguous)
 grandma draw child DEM CL
 ‘the grandma that draws the child’ or ‘the child that the grandma draws’

The structure in (i) looks like an internal head with the morphological marker of relativization formed by the demonstrative plus classifier or a doubling in which the external head is null.

Crucially, the demonstrative+classifier unit can precede an NP regardless of the presence of the relativizer, as in (9a–b).⁵ Thus, we conclude that the best way to analyze the structures without the relativizer but with the demonstrative+classifier unit is to say that the relativizer is phonetically missing.

- (9) a. $\text{fi}^{\text{31}} \eta\alpha^{\text{52}} \text{bo}^{\text{21}} \text{k}\alpha^{\text{0}} \text{hai}^{\text{33}} \text{kai}^{\text{42}} \text{m}\text{3}^{\text{42}} \eta^{\text{33}}$ (head-external RC, subject RC)
 draw grandma REL DEM CL child
 ‘the child that draws the grandma’
- b. $\text{fi}^{\text{31}} \eta\alpha^{\text{52}} \text{bo}^{\text{21}} \text{hai}^{\text{33}} \text{kai}^{\text{42}} \text{m}\text{3}^{\text{42}} \eta^{\text{33}}$ (head-external RC, subject RC)
 draw grandma DEM CL child
 ‘the child that draws the grandma’

3 Towards an analysis for Wenzhounese relative clauses

The theoretical debate on the syntax of RCs initially focused on postnominal RCs. Two main approaches have been proposed. According to the raising approach (see Vergnaud 1974; Kayne 1994; Bianchi 1999; Bhatt 2002; Donati and Cecchetto 2011; Cecchetto and Donati 2015), the “head” moves from its argument position inside the RC to a dedicated position in the left periphery, namely Spec,CP (see 10a). Under an alternative approach illustrated in (10b), the RC “head” does not move. Instead, a relative pronoun/operator (that can be phonologically null) moves to Spec,CP leaving a trace in the gap position that is identified through co-indexing with the RC “head” (cf. Chomsky 1981; Browning 1987 for two variants of this approach). For concreteness, in (10) a movement chain is indicated by inserting a trace.⁶

⁵ Also in head-internal and doubling RCs the demonstrative+classifier unit can occur with an overt relativizer.

- (i) $\text{hai}^{\text{33}} \text{kai}^{\text{42}} \eta\alpha^{\text{52}} \text{bo}^{\text{21}} \text{fi}^{\text{31}} \text{hai}^{\text{33}} \text{kai}^{\text{42}} \text{m}\text{3}^{\text{42}} \eta^{\text{33}} \text{k}\alpha^{\text{0}}$ (head-internal RC, ambiguous)
 DEM CL grandma draw DEM CL child REL
 ‘the grandma that draws the child’ or ‘the child that the grandma draws’
- (ii) $\eta\alpha^{\text{52}} \text{bo}^{\text{21}} \text{fi}^{\text{31}} \text{m}\text{3}^{\text{42}} \eta^{\text{33}} \text{k}\alpha^{\text{0}} \text{hai}^{\text{33}} \text{kai}^{\text{42}} \text{m}\text{3}^{\text{42}} \eta^{\text{33}}$ (doubling RC, object RC)
 grandma draw child REL DEM CL child
 ‘the child that the grandma draws’

⁶ There is in fact a third approach to RCs, the matching analysis (Chomsky 1965; Kayne 1975; Cinque 1978; Sauerland 2003; Hulse and Sauerland 2006). Under the matching analysis, like under the raising analysis, the gap inside the RC is transformationally related to the category that has moved to the left periphery of the RC. However, this category is phonologically deleted under (near) identity with the external head. So, according to the matching analysis, the internal head and the external head are *not* part of a movement chain, but are related by whatever mechanism links an elided constituent and its antecedent in ellipsis cases.

- (10) a. The picture [that I like most t_{picture}]
 b. The picture_i [OP_i that I like most t_{OP}]

As for studies that focus on Mandarin, Aoun and Li (2003) propose a raising approach to Mandarin RCs that contain a gap (as opposed to those containing a resumptive pronoun). More specifically, they assume that only an NP (as opposed to a full DP) moves out of the RC.⁷

In this paper we cannot provide a fully exhaustive analysis of RCs in Wenzhounese, partly because many aspects of this under-studied language need to be further investigated before a complete account can be proposed. So, we will stick to a level of analysis that is explicit enough to make predictions about the presence of the subject preference (if any) but will postpone other aspects of the syntax of RCs to future work. For example, we will discuss subject and object RCs, but not oblique RCs. Let us start with head-external RCs.

Analysis of head-external RCs There are several reasons that lead us to adopt a raising analysis. First, Wenzhounese RCs show strong island effects, as expected if their derivation involves movement of the head noun. This is shown by the ungrammaticality of (11), a head-external RC where the head noun is generated inside an *if*-clause.⁸

- (11) *[[dze³¹² z₁³¹² t_{boy} dɔ⁴² te⁴² dz₁³¹ Mary ?vai⁴² se³³ t_h⁴²] kə⁰ nɔ³¹² ŋ³¹]
 if arrive very late Mary be angry REL boy
 si⁴² le³¹² ts^hɔŋ³¹² miŋ³¹.
 very smart

Intended reading: ‘The boy who if (he) arrives very late Mary gets angry is smart.’

The second argument supporting the raising analysis is based on idioms (cf. Vergnaud 1974 for an early application of this diagnostic on French data). Take the Wenzhounese idiom ts^hɔŋ³²³ t^hi³³⁻¹¹ kuɔ³² (lit. *eat early morning*, meaning ‘eat breakfast’). As shown in (12), the noun ‘early morning’ can be relativized even when it is part of this idiom. Under the standard assumption that idiomatic expressions must form a unit at some level of representation, the grammaticality of (12) suggests that a copy of the noun ‘early morning’ is found in the argument position of the verb ‘eat’ and that from this position the noun has moved to the right periphery of the RC.

⁷ Aoun and Li (2003) propose that in RCs containing a resumptive pronoun the RC head is base-generated in the position in which it surfaces.

⁸ Under a non-raising analysis, the island effect might be attributed to the movement of the null operator that is co-indexed with the head noun. However, this would require auxiliary assumptions that are not needed if the raising analysis is adopted. For example, it would become necessary to postulate that the empty operator and the head noun cannot be identified through co-indexing at long distance.

- (12) ni³⁵ ts^hɿ³²³ — kəʔ⁰ t^hi³³⁻¹¹ kuo³² na³²³ŋ fu⁴⁵ ye⁴².
 you eat *t*_{breakfast} REL early morning very luxury
 ‘The breakfast that you eat is luxurious.’⁹

The third argument supporting the raising analysis is the presence of reconstruction effects (cf. Doron 1982 for an early discussion on this diagnostic). An RC like (13) is ambiguous in Wenzhounese (as its English counterpart is). It can mean that there is a specific woman that John is looking for (*de re* reading) or, alternatively, (13) admits a *de dicto* reading, under which John is not necessarily looking for a specific person. While the *de re* reading can be generated by reading off the structure with the head ‘woman’ in its superficial position, the *de dicto* reading can be easily explained only if the external head leaves a trace in the gap position, where it is in the scope of the intentional verb ‘look for’.¹⁰

- (13) John zaŋ³¹ kəʔ⁰ ŋy⁴² nan³¹
 John look for REL woman
 ‘woman that John is looking for’

We assume that the derivation of a head-external RC is as follows: the subject or object DP moves to a dedicated position in the right periphery, which we assume to be a specifier position linearized on the right. More specifically, since no material can intervene between REL and the external head, we assume that the latter sits in

⁹ This example is transcribed from the actual flow of speech of the native speaker CY (aged 35, from Lucheng, Wenzhou).

¹⁰ Aoun and Li (2003:175–177) distinguish argument RCs from oblique RCs in Mandarin because they display a different pattern of variable binding reconstruction. They argue that the RC head does reconstruct in argument relativization, so the head must have moved out of the RC. However, in adjunct relativization no variable binding is possible under reconstruction, so that the RC head must have been base-generated outside the RC. We do not apply the same diagnostics in Wenzhounese, because we see a potential problem with Aoun and Li’s (2003) data. In their examples, the quantifier and the bound variable occur in two coordinated RCs, cf. the Mandarin counterpart of (i). Banning a better understanding of the interaction of arguments placed in different stacked relatives, examples having a structure like (i) are not conclusive.

(i) I already saw the present that you gave to him_i that everyone_i thought that was the best

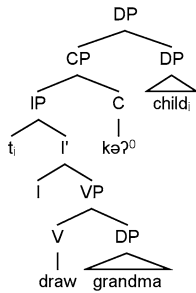
A more compelling case of variable binding reconstruction would be one in which the quantifier is inside the very same RC that the head (allegedly) reconstructs to, cf. (ii).

(ii) I already saw the picture of him_i that everyone_i likes

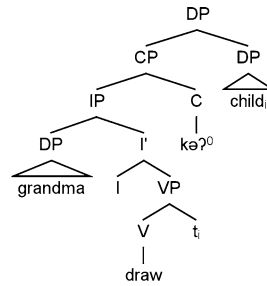
However, cases like (ii) introduce further complications, as extensively discussed by Cecchetto (2005). For this reason, in the text we use the simpler scope reconstruction diagnostics.

the right-branching specifier position of the head-final projection headed by the relativizer REL.¹¹ We schematically represent our analysis of Wenzhounese head-external RCs in (14) (for convenience, we use English words in each terminal node).¹²

(14) a. Subject RCs



b. Object RCs



Analysis of head-internal RCs The raising analysis, proposed for head-external RCs, has the advantage that the alternation between head-internal and head-external can be naturally explained. If the head moves by Spell-out, a head-external RC surfaces. If the head does not move (at least overtly), a head-internal RC surfaces. We assume that in head-internal RCs movement of the head noun takes place at LF. This is consistent with the fact that the counterpart of (11) in which the head noun is internal, namely (15), is also ungrammatical. This indicates that strong island effects (extraction from an *if*-clause) are observed with LF movement.

¹¹ As the reader can verify, an alternative “remnant movement” analysis compatible with Kayne’s (1994) antisymmetric approach would be very complex, since several instances of movements are needed to derive the clause final placement of both REL and the head noun. In the absence of independent evidence, this alternative derivation raises the question of what triggers the necessary instances of remnant movement.

¹² The analysis in (14) tacitly assumes reprojection movement, namely it implies that the RC head can provide the label after having been moved. See Cecchetto and Donati (2015) for extensive motivation in favor of the existence of this type of movement. In head-internal RCs no (overt) movement takes place by definition. In this case, the relativizer *kəʔ⁰* cannot be omitted. We assume that its presence is obligatory because, in the absence of a reprojection movement, a nominalizing category is required to turn a CP into an NP.

- (15) *[[dʒe³¹² zɿ³¹² nø³¹² ŋ³¹ dɔ⁴² te⁴² dʒɿ³¹ Mary ʔvai⁴² sɛ³³ tʃ^h₁⁴²] kəʔ⁰]
 if boy arrive very late Mary be angry REL
 si⁴² le³¹² ts^hɔŋ³¹² miŋ³¹.

very smart

Intended reading: ‘The boy who if (he) arrives very late Mary gets angry is smart.’

Analysis of doubling RCs We propose that doubling RCs are the result of the configuration in which both copies of the movement chain can be spelled-out. That movement is confirmed by the occurrence of island effects: (16), the doubling version of (11) is as bad as (11), suggesting that doubling cannot be assimilated to a resumptive strategy used to avoid island effects.

- (16) *[[dʒe³¹² zɿ³¹² nø³¹² ŋ³¹ dɔ⁴² te⁴² dʒɿ³¹ Mary ʔvai⁴² sɛ³³ tʃ^h₁⁴²] kəʔ⁰]
 if boy arrive very late Mary be angry REL
 nø³¹² ŋ³¹] si⁴² le³¹² ts^hɔŋ³¹² miŋ³¹.
 boy very smart

Intended reading: ‘The boy who if (he) arrives very late Mary gets angry is smart.’

An important issue that we must leave open is under what conditions both copies of a chain can be spelled-out. Although this is by no means the default option, cases of doubling have been described, crucially including A-bar dependencies (Cinque 2011; Branchini et al. 2013), so Wenzhounese is not a unicum in this respect.

Analysis of headless RCs A priori the analysis for headless RCs is very challenging, since very little structure is visible (remember that Wenzhounese admits null NP arguments). In principle, “headless RC” might be a spurious category: some headless RCs might be head-external RCs (the external head being, of course, silent), while others might be head-internal RCs, again with the internal head being silent. The result of our experimental studies will provide admittedly indirect evidence that the right analysis for headless RCs is the one in which they are head-external (see General discussion).

4 Wenzhounese relative clauses and the debate on subject/object preference

Having sketched an analysis for Wenzhounese RCs, we can proceed to discuss the prediction that this analysis makes with respect to the subject preference. Several hypotheses have been proposed to explain the subject preference for postnominal RCs, e.g. the word-order hypothesis (Bever 1970), the parallel-function hypothesis (Sheldon 1974), the perspective maintenance (MacWhinney 1977, 1982), the accessibility hierarchy (Keenan and Comrie 1977) and the entropy reduction

hypothesis (Hale 2006) (for more references, see Yun et al. 2015). In the current study, we mainly consider two main families of hypothesis: the linear intervention hypothesis and the hierarchical intervention hypothesis. According to the first type of explanation, what makes postnominal subject RCs easier to produce and/or process is the fact that the subject gap is closer in linear distance to the RC head than the object gap is (Gibson 1998, 2000). The underlying intuition is that more distant sentential material is more difficult to reactivate in memory than closer material. Adopting this perspective, everything else being equal, postnominal object RCs are more difficult because the subject is bound to intervene between the RC head and the object gap, while there is no linear intervener between the RC head and the subject gap in postnominal subject RCs.

The second type of explanation is in terms of hierarchical (as opposed to linear) intervention. For concreteness, we consider here a specific implementation of the hierarchical intervention approach, namely Friedmann's et al. (2009) featural Relativized Minimality approach, which in turn stems from Grillo's (2005, 2009) Generalized Minimality approach.

According to Friedmann et al. (2009), the subject preference in postnominal RCs is ultimately explained as an instance of Rizzi's (1990) Relativized Minimality principle. The original Relativized Minimality principle was intended to explain the presence of island effects in *wh*-islands, illustrated by (17). In (17) the expression 'who' acts as an intervener because it c-commands the trace of 'what' and shares with it the morphological feature $-wh$.

(17) ?? What do you wonder who bought t_{what} ?

A crucial aspect of Relativized Minimality-type approaches is that intervention arises only if the intervener and the moving category share some relevant features. In classical cases of Relativized Minimality like (17) the feature that creates an intervention effect can be easily identified as the *wh*-feature. But what is the feature shared by the external head and by the subject of the RC? According to Friedmann et al. (2009), intervention is triggered whenever the intervening determiner D selects a lexical restriction (but see Cecchetto and Donati 2015: chapter 5 for a different implementation of the minimality approach, where the intervention-triggering feature is the categorial feature D). We acknowledge that the most straightforward extension of the featural Relativized Minimality approach to Wenzhounese requires assuming a D layer in Sinitic, but we think that the core intuition underlying the minimality approach is independent from this specific assumption about the D layer, as the problematic configuration is the one in which an argument DP (or NP) creates an intervention for the chain of another argument DP (or NP).

A final preliminary clarification is needed here. While early applications of the Relativized Minimality principle were meant to capture cases of ungrammaticality or, at any rate, of sentences that are degraded, like (17), more recent extensions of the Relativized Minimality to child grammar changed the picture somewhat. The hypothesis defended by Friedmann et al. (2009), and accepted in much later work in acquisition, is that there are cases of intervention that make a sentence hard to

process in adult grammar and make the same sentence impossible for a child to produce or to understand, due to the more limited computational resources the child has access to.

Having set the stage, let us see what the two families of explanation predict for each type of Wenzhounese RC.

Head-external RCs If distance is computed linearly, an object preference should be observed. By contrast, if the subject preference observed in postnominal RCs is due to hierarchical intervention, namely if it is a minimality effect, a subject preference should be observed in Wenzhounese head-external RCs. As made clear by the representation (14b), the subject intervenes hierarchically between the RC head and its trace, although it does not intervene linearly.

Head-internal RCs The approach based on linear distance does not make any precise prediction here. In the superficial representation, there are no filler-gap dependencies to begin with; therefore, no linear distance can be computed to begin with. As for the approach based on hierarchical intervention, the situation is different. We have assumed that head-external and head-internal RCs differ in the timing of movement. Movement is before Spell-out in the former construction, but takes place at LF in the latter. Therefore, it might appear that the same prediction (subject preference) arises as in the case of head-external RCs, since at the end of the day (namely after LF movement) the same configuration arises. However, we need to keep in mind that the “gap position” (namely the position occupied by the gap in head-external RCs) is filled in head-internal RCs. As gap identification is notoriously challenging for the parser, especially when the gap precedes its filler, this might play a role.

Doubling RCs In principle, a linear intervention account would predict a preference for object RCs, while a hierarchical intervention account would predict a preference for subject RCs. However, as we pointed out for head-internal RCs, the fact that the “gap position” is filled might play a role, as an overt copy might be easier to retrieve than a gap.

Headless RCs If the structure involves an underlying external head, the predictions that apply to head-external RCs apply here as well. Alternatively, if the structure involves an underlying internal head, the predictions that apply to head-internal RCs apply here.

We can now turn to our experimental findings about child and adult production of Wenzhounese RCs.

5 Elicitation study

We carried out an elicited production experiment with children whose dominant language is Wenzhounese and adults who were Wenzhounese–Mandarin bilingual speakers with Wenzhounese as their first language. Monolingual Wenzhounese-speaking adults are not easy to find, as Mandarin is the official language of China and its use in school and in official contexts has been enforced since 1956 (SCP RC 1956). Therefore, we had to compare Wenzhounese-dominant children (namely

children who have not yet entered the education system where Mandarin is used) to Wenzhounese–Mandarin bilingual adults.

5.1 Methods

5.1.1 Participants

The study tested 56 children aged 3 years, 0 months to 6 years, 10 months (3;0–6;10, $M = 5;3$, $SD = 1.17$) and 26 adults (aged 25;1–48;11, $M = 34;8$, $SD = 7.23$). For all children the dominant language was Wenzhounese. They lived in Wencheng (China), a prefecture where Wenzhounese is dominant. Mandarin Chinese, the official language in China, is also spoken by children’s parents alongside Wenzhounese, but in a limited way. Given that Mandarin Chinese is the language used at school and that all the tested children had not yet enrolled in primary school at the time of testing, their exposure to Mandarin was very limited. All the adult participants were Wenzhounese–Mandarin bilingual speakers with Wenzhounese as their first language.

5.1.2 Materials and procedure

We used an elicitation task adapted from Hu et al. (2016), which was modeled after Novogrodsky and Friedmann (2006). In the task, the experimenter presented two options and asked the children to choose one. To elicit subject RCs the lead-in in (18a) was used and to elicit object RCs the lead-in in (18b) was employed.¹³

- (18) a. $\text{jau}^{35} \text{le}^{35} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \cdot \text{?ji}^{323} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \text{ho}^{31} \eta\alpha^{52} \text{bo}^{21} \cdot \text{?ji}^{323} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \text{ho}^{31} \eta\alpha^{52} \text{koj}^{33} \cdot \text{ni}^{35} \text{s} \eta^{42} \text{cy}^{33} \eta\alpha\text{u}^{312} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \text{?}$
 ‘There are two children. One child draws the grandma. Another child draws the grandpa. Which child do you like?’
- b. $\text{jau}^{35} \text{le}^{35} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \cdot \eta\alpha^{52} \text{bo}^{21} \text{ho}^{31} \text{?ji}^{323} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \cdot \eta\alpha^{52} \text{koj}^{33} \text{ho}^{31} \text{?ji}^{323} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \cdot \text{ni}^{35} \text{s} \eta^{42} \text{cy}^{33} \eta\alpha\text{u}^{312} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \text{?}$
 ‘There are two children. The grandma draws one child. The grandpa draws another child. Which child do you like?’

We constructed 20 experimental items, half designed to elicit subject RCs and the other half designed to elicit object RCs. We used fifteen transitive verbs to create the stimuli: five verbs used in both conditions (i.e. ho^{31} ‘draw’, pu^3 ‘help’, ?la^{33} ‘hold hands’, du^{33} ‘hug’ and $\text{t}^h \text{i} \eta^{33}$ ‘kiss’), five verbs only in the subject RC condition

¹³ Instead of using *Ni xiang dang na ge xiaopengyou?* ‘Which child do you want to be?’ in Hu’s et al. (2016) Mandarin study, we used $\text{ni}^{35} \text{s} \eta^{42} \text{cy}^{33} \eta\alpha\text{u}^{312} \text{kai}^{42} \text{m}^3 \text{m}^{42} \eta^{33} \text{?}$ ‘Which child do you like?’, because the latter elicitation question is more colloquial in Wenzhounese according to Wenzhounese native speakers’ judgment.

(i.e. *ma*³⁵ ‘buy’, *ha*¹³ ‘drink’, *tʃ^hɿ*³⁵ ‘eat’, *tɛ*¹³ ‘play’ and *ɛi*¹³ ‘wash’) and five verbs only in the object RC condition (i.e. *ɬziɛ*⁴² ‘call’, *pai*³³ ‘carry’, *liɛ*³¹² ‘chase’, *taŋ*⁵⁴ ‘wait’ and *tɕiɛ*³⁵ ‘pick up’). The experimental items were presented in a randomized order.

We tested all the participants individually in a quiet room at home. Each participant received two warm-up items, and no feedback was given.

5.1.3 Coding

The responses were divided into five categories: head-external RCs, head-internal RCs, doubling RCs, headless RCs and “other responses”. Refusals to participate in the task were scored as null responses, and were excluded from the analysis.

We coded head-external RCs in terms of different types of gaps. If it had a subject gap, it was coded as head-external subject RC, as in (19a), and if it had an object gap, it was coded as head-external object RC, as in (19b).

- (19) a. $_$ *fi*³¹ *ŋa*⁵² *bo*²¹ *kəʔ*⁰ *mɜ*⁴² *ŋ*³³
 draw grandma REL child
 ‘the child that draws the grandma’
- b. *ŋa*⁵² *bo*²¹ *fi*³¹ $_$ *kəʔ*⁰ *mɜ*⁴² *ŋ*³³
 grandma draw REL child
 ‘the child that the grandma draws’

We also examined head-external RCs without the relativizer. As discussed earlier, due to the non-canonical VOS order, (20a) was coded as a subject RC; if the unit formed by a demonstrative plus a classifier is present before the head noun, as in (20b), the RC was coded as an object RC.¹⁴ Given that utterances such as (20b) were elicited with a context, they do not involve ambiguity between a RC reading and a declarative reading, unlike the example (7) above. (20b) admits only the RC reading in the context of elicitation.

- (20) a. (*ŋ*³⁴ *sɿ*⁴² *ɕy*³³) [*fi*³¹ *ŋa*⁵² *bo*²¹ *mɜ*⁴² *ŋ*³³]
 I like draw grandma child
 ‘(I like) the child that draws the grandma.’
- b. (*ŋ*³⁴ *sɿ*⁴² *ɕy*³³) [*ŋa*⁵² *bo*²¹ *fi*³¹ *hai*³³ *kai*⁴² *mɜ*⁴² *ŋ*³³].
 I like grandma draw DEM CL child
 ‘(I like) that child (that) the grandma draws.’

The second category is head-internal RCs. As we said earlier, without context, head-internal RCs (21) can either be interpreted as a subject RC or an object RC. Although we recognize that this is less than optimal, in absence of a better criterion,

¹⁴ In our study, we did not observe the RCs using the classifier alone (see footnote 3).

a head-internal RC was coded as a subject RC if the sentence was elicited with the subject lead-in, and was coded as an object RC if it was elicited with an object lead-in.

- (21) $\eta\alpha^{52}$ bo^{21} fo^{31} $m3^{42}$ η^{33} $k\alpha\eta^0$
 grandma draw child REL
 Interpretation (with the subject RC context): ‘the child that draws the grandma’
 Interpretation (with the object RC context): ‘the child that the grandma draws’

The third category is doubling RCs. We coded them as subject RCs, if the double was in subject position inside the RC, as in (22a); we coded them as object RCs, if the double was in object position, as in (22b).

- (22) a. $m3^{42}$ η^{33} fo^{31} $\eta\alpha^{52}$ bo^{21} $k\alpha\eta^0$ $m3^{42}$ η^{33}
 child draw grandma REL child
 ‘the child that draws the grandma’
 b. $\eta\alpha^{52}$ bo^{21} fo^{31} $m3^{42}$ η^{33} $k\alpha\eta^0$ $m3^{42}$ η^{33}
 grandma draw child REL child
 ‘the child that the grandma draws’

The fourth category is headless RCs. If there is a subject gap, we coded them as headless subject RCs (23a), and if there is an object gap, we coded them as headless object RCs (23b).

- (23) a. ___ fo^{31} $\eta\alpha^{52}$ bo^{21} $k\alpha\eta^0$
 draw grandma REL
 ‘the one that draws the grandma’
 b. $\eta\alpha^{52}$ bo^{21} fo^{31} ___ $k\alpha\eta^0$
 grandma draw REL
 ‘the one that the grandma draws’

The remainder of responses was coded as “other responses”. We divided them into seven types: (i) NP utterances such as $\eta\alpha^{52}$ bo^{21} ‘grandma’ or $\eta\alpha^{52}$ bo^{21} $m3^{42}$ η^{33} ‘grandma child’, (ii) NP *de* NP utterances such as $\eta\alpha^{52}$ bo^{21} $k\alpha\eta^0$ $m3^{42}$ η^{33} ‘the child of the grandma’, (iii) declarative utterances such as fo^{31} $\eta\alpha^{52}$ bo^{21} ‘draw the grandma’ and $\eta\alpha^{52}$ bo^{21} fo^{31} ‘the grandma draws’, (iv) reversal utterances (i.e., instead of producing object RCs like (19b), subject RCs like (19a) were produced), (v) relativizer doubling utterances as exemplified in (24a–b), (vi) demonstrative utterances as exemplified in (24c) and (vii) passive RCs as exemplified in (24d). The

demonstrative utterance (24c) is not easy to categorize, as it can be analyzed as having an internal head with the morphological marker of relativization (i.e. the demonstrative plus classifier) or as a case of doubling with a null external head (see footnote 4). The passive RC (24d) is a grammatical structure, but was rarely produced by our participants, and thus is categorized in “other responses”.

- (24) a. fio^{31} $\text{ŋ}\text{a}^{52}$ bo^{21} $\text{k}\text{ə}\text{ʔ}^0$ $\text{m}\text{ɜ}^{42}$ ŋ^{33} $\text{k}\text{ə}\text{ʔ}^0$
 draw grandma REL child REL
 ‘the child that draws the grandma’
- b. $\text{ŋ}\text{a}^{52}$ bo^{21} $\text{k}\text{ə}\text{ʔ}^0$ fio^{31} $\text{m}\text{ɜ}^{42}$ ŋ^{33} $\text{k}\text{ə}\text{ʔ}^0$
 grandma REL draw child REL
 ‘the child that the grandma draws’
- c. $\text{ŋ}\text{a}^{52}$ bo^{21} fio^{31} $\text{m}\text{ɜ}^{42}$ ŋ^{33} hai^{33} kai^{42}
 grandma draw child DEM CL
 ‘that (child) (that) the grandma draws the child’
- d. $\text{k}^{\text{h}}\text{a}^{54}$ $\text{ŋ}\text{a}^{52}$ bo^{21} fio^{31} $\text{k}\text{ə}\text{ʔ}^0$ $\text{m}\text{ɜ}^{42}$ ŋ^{33}
 PASSIVE grandma draw REL child
 ‘the child that is drawn by the grandma’

5.2 Results

For the group of children, 11 null responses were discarded, hence the experiment yielded a total of 1109 responses, including 558 responses in the subject RC condition and 551 responses in the object RC condition. For the group of adults, the experiment yielded a total of 520 responses, with a half in the subject RC condition and the other half in the object RC condition. Table 1 presents percentages and raw scores of target RCs (i.e. head-external, head-internal, doubling and headless RCs) and “other responses” elicited in each condition. Clearly, children produced more target RCs in the subject RC condition than in the object RC condition, and the percentage of target RCs in each condition is lower in children than in adults.

We further calculated five categories out of the total responses in each group in order to illustrate a full picture of the different types of RC. As shown in Table 2, in both groups, head-external RCs are more frequent than head-internal RCs, doubling RCs and headless RCs.

We contrasted the proportion of RCs (including head-external, head-internal, doubling and headless RCs) with the proportion of “other responses”. The data were fitted to a mixed-effects model with Condition (i.e. subject vs. object RCs) and Group (i.e. children vs. adults) as fixed factors and subjects and items as random factors, using the *lme4* software package in the R environment (Bates et al. 2015; R Core Team 2015). The reference level for the Condition factor was object RCs, while for the Group factor it was children. Expectedly, the main effect of Condition ($\beta = -1.65$, $z = -5.02$, $p < .001$) and the main effect of Group ($\beta = -4.16$, $z = -8.59$, $p < .001$) were found. There was no interaction of Condition by Group ($\beta = 0.10$, $z = 0.33$, $p = .74$). The results reveal that when subject RCs were elicited, both groups were more likely to respond with RCs.

Table 1 Percentages (%) and raw scores (N) of target RCs and “other responses” in each condition in each group

	Children		Adults	
	%	N	%	N
Subject RC condition				
Target RCs	48.6	271/558	99.6	259/260
Other responses	51.4	287/558	0.4	1/260
Object RC condition				
Target RCs	13.2	73/551	93.8	244/260
Other responses	86.8	478/551	6.2	16/260

Table 2 Percentages (%) and raw scores (N) of head-external RCs, head-internal RCs, doubling RCs, headless RCs and “other responses” in each group (total number of responses is 1109 for children and 520 for adults)

Sentence type	Children		Adults	
	%	N	%	N
Head-external RCs	22.1	245	71	369
Head-internal RCs	1.8	20	7.1	37
Doubling RCs	0.5	6	6.5	34
Headless RCs	6.6	73	12.1	63
Other responses	69	765	3.3	17

In the following, we report a series of analyses to investigate whether there is a clear subject/object asymmetry in different types of RCs. We will lay out the analysis of head-external RCs, the analysis of head-internal and doubling RCs and the analysis of headless RCs. We will also report on “other responses”.

5.2.1 Subject versus object RCs in the production of head-external RCs

Table 3 presents percentages and raw scores of head-external subject and object RCs (out of all head-external RCs produced in each group). Results show that both children and adults produced more head-external subject RCs than head-external object RCs.

All the responses were fitted to a mixed-effects model with Condition (i.e. subject vs. object RCs) and Group (i.e. children vs. adults) as fixed factors and subjects and items as random factors. The main effect of Condition ($\beta = -1.09$, $z = -6.58$, $p < .001$) and the main effect of Group ($\beta = -2.32$, $z = -7.03$, $p < .001$) were significant. The interaction of Condition by Group was also significant ($\beta = -0.40$, $z = -4.30$, $p < .001$), due to the fact that the difference between subject and object RCs was bigger in children than in adults. To scrutinize this interaction,

Table 3 Percentages (%) and raw scores (N) of head-external subject and object RCs in each group

Sentence type	Children		Adults	
	%	N	%	N
Subject RCs	80.8	198/245	55.3	204/369
Object RCs	19.2	47/245	44.7	165/369

Table 4 Percentages (%) and raw scores (N) of subject and object RCs in head-internal RCs and doubling RCs in each group

Sentence type	Children		Adults	
	%	N	%	N
Head-internal RCs				
Subject RCs	15	3/20	5.4	2/37
Object RCs	85	17/20	94.6	35/37
Doubling RCs				
Subject RCs	16.7	1/6	8.8	3/34
Object RCs	83.3	5/6	91.2	31/34

we further analyzed each group separately. The data were fitted into mixed-effects models, only including Condition (i.e. subject vs. object RCs) as fixed factor and subjects and items as random factors. In both the children and the adults group, the main effect of Condition was significant ($\beta = 3.05$, $z = 7.17$, $p < .001$, and $\beta = 1.30$, $z = 4.37$, $p < .001$, respectively).

In addition, we calculated the number of responses with the omission of the relativizer $kəʔ^0$ like (20). There were 37 responses from children, including 33 utterances in subject RCs and 4 in object RCs; there were 39 responses from adults, including 33 utterances in subject RCs and 6 in object RCs. We submitted the responses to a Chi square analysis and no difference was detected between the two groups ($\chi^2(1) = 0.35$, $p > .25$).

5.2.2 Subject versus object RCs in the production of head-internal RCs and doubling RCs

Table 4 presents percentages and raw scores of head-internal subject and object RCs (out of all head-internal RCs produced in each group) and doubling subject and object RCs (out of all doubling RCs produced in each group). In both head-internal RCs and doubling RCs, the percentages of subject RCs are lower than that of object

RCs. Note that only 6 doubling RCs were produced by children, which is very few.¹⁵

At the descriptive level, a clear prevalence of object RCs emerges from Table 4 in both children and adults and for both head-internal RCs and doubling RCs. However, since children produced very few doubling RCs, we examined whether these RCs appear only for certain verbs. To this effect, we calculated the numbers of utterances with different verbs in the object RC condition. Among 5 utterances of doubling object RCs produced by children, 4 verbs (out of 10) were used, namely, *du*³³ ‘hug’, *pu*³³ ‘help’, *lie*³¹² ‘chase’ and *tɕie*³⁵ ‘pick up’; among 31 utterances of doubling object RCs produced by adults, all the verbs were used. As for head-internal RCs, both children and adults produced them with all the verbs.

Given that head-internal and doubling RCs were few as compared with head-external RCs, we decided to increase statistical power by running an analysis in which head-internal RCs and doubling RCs are collapsed under a unique category. The rationale for doing this is that having an overt internal head can be seen as a way to avoid or alleviate subject intervention. Arguably, subject intervention is alleviated in head-internal object RCs and in doubling object RCs, since identification of the lower link of the chain is made easier by the fact that, instead of a gap, an overt copy occurs.

We fitted all the responses to a mixed-effects model with Condition (i.e. subject vs. object RCs) and Group (i.e. children vs. adults) as fixed factors and subjects and items as random factors. The main effect of Condition ($\beta = 1.39$, $z = 5.95$, $p < .001$) and the main effect of Group ($\beta = -0.96$, $z = -2.59$, $p < .01$) were significant. Also the interaction Condition by Group was significant ($\beta = -0.43$, $z = -2.03$, $p < .05$). To explore this interaction, we further fitted the responses in each group to additional models, only including Condition (i.e. subject vs. object RCs) as fixed factor and an intercept for random effects of subjects and items. The main effect of Condition was significant in children ($\beta = -1.87$, $z = -3.00$, $p < .01$) and in adults ($\beta = -3.82$, $z = -5.84$, $p < .001$), showing that more object RCs were produced than subject RCs, i.e., an object advantage was observed in this case.

5.2.3 Subject versus object RCs in the production of headless RCs

Table 5 presents percentages and raw scores of headless subject and object RCs in each group. As is evident in the table, headless subject RCs are much more than headless object RCs.

The responses were fitted into a mixed-effects model, including Condition (i.e. subject vs. object RCs) and Group (i.e. children vs. adults) as fixed factor and subjects and items as random factors. The main effect of Condition was statistically

¹⁵ Among 6 doubling RCs produced by children, 2 utterances are the following.

- (i) (η ³⁴ s₁⁴² cy³³) η a⁵² bo²¹ fi^o³¹ m₃⁴² η ³³ kəʔ⁰ naŋ³¹
 I like grandma draw child REL people
 ‘(I like) the child that the grandma draws’

In (i), the head noun is more general than the noun inside the RC. This type of doubling RC is not rare across languages (see Cinque 2011).

Table 5 Percentages (%) and raw scores (N) of subject and object RCs in headless RCs in each group

Groups	Children		Adults	
	%	N	%	N
Subject RCs	94.5	69/73	79.4	50/63
Object RCs	5.5	4/73	20.6	13/63

Table 6 Percentages (%) and raw scores (N) of “other responses” in each group

Sentence type	Children		Adults	
	%	N	%	N
NP utterances	17.9	199/1109	0	0
NP <i>de</i> NP utterances	6.9	77/1109	0	0
Declarative utterances	41.7	463/1109	0	0
Reversal utterances	1.6	18/1109	0	0
Relativizer doubling	0.5	6/1109	0	0
Demonstrative utterances	0.2	2/1109	3.1	16/520
Passive RCs	0	0	0.2	1/520

significant ($\beta = -1.78$, $z = -8.20$, $p < .001$), confirming that headless subject RCs were more frequently produced than headless object RCs. The main effect of Group was not significant ($\beta = -0.27$, $z = -0.57$, $p = .60$), and neither was the interaction of Condition by Group ($\beta = -0.14$, $z = -0.67$, $p = .51$). These results indicate that the performance of children and that of adults were not different.

5.2.4 The analysis of “other responses”

Table 6 shows percentages and raw scores of different strategies adopted by children and adults when they failed in producing RCs. Children responded with different types of structures, while adults only produced demonstrative responses and passive RCs.

As is evident from Table 6, children adopted the simplified strategies such as NP, NP *de* NP and declarative utterances frequently. This result is similar to the finding of the Mandarin study (Hu et al. 2016).

In addition, we observed 6 cases of relativizer doubling errors produced by children. This error was not observed in Mandarin (Hu et al. 2016), but it has been reported in Palestinian Arabic (Botwinik et al. 2015).

Passive RCs were extremely rare, with only one utterance produced by adults. This result is in contrast to the observation in Mandarin studies (Hsu et al. 2009; Hu et al. 2016), which reported a large number of productions of passivization.

5.2.5 Summary

To sum up, there are three main findings. First, head-internal RCs and doubling RCs were produced, although they were much less frequent than head-external RCs. Second, a subject preference in the production of head-external RCs emerged in both children and adult groups, whereas the opposite held for head-internal and doubling RCs. Finally, a subject preference emerged for headless RCs.

6 General discussion and conclusion

To reiterate, the main theoretical question that we addressed in this paper is whether distance and intervention in movement chains is to be computed linearly or hierarchically. Head-external RCs in Wenzhounese are the ideal case study in this respect because the RC head follows its trace but c-commands it. As the effect of intervention in RCs is particularly visible in child grammar, in order to investigate this issue we pursued an experimental investigation involving children and a control group of adults. The results of the experiment showed a preference for subject RCs in Wenzhounese head-external RCs, which is consistent with recent acquisition studies (see Hsu et al. 2009; Hu et al. 2016 for Mandarin; Lau 2016 for Cantonese).¹⁶ This suggests to us that intervention is to be defined in terms of c-command, not in terms of linear order. The intervention effect impacts heavily on young children, who produce very few object RCs, while the number of object RCs increases in the adult group, as expected (as is well-known, in the adult population the processing difficulty of object RCs needs to be detected by experimental tasks such as reading times measure and eye tracking). Interestingly, a subject preference also holds in the production of headless RCs. This indicates that the correct analysis of headless RCs involves an external head occurring in the underlying structure. Notably, the opposite pattern emerged in Wenzhounese head-internal RCs and doubling RCs, where object RCs were more frequently produced than subject RCs (although we have to acknowledge that the number of items produced by children was low). As the explanation in terms of linear intervention is clearly incompatible with results concerning head-external RCs, we need to find another explanation for the object preference with head-internal RCs and doubling RCs. Furthermore, we

¹⁶ An anonymous reviewer wonders whether the subject preference might have been an artifact of the experimental design, i.e., the fact that the stimuli made “child/children” the topic of the discourse. Recall that the material included sentences such as “there are two children...” and then questions like “which child do you like”. Under this view, head-external subject RCs might be analyzed as sentences involving a topic in the right peripheral position, preceded by a clause including a null subject. We do not adopt this analysis for the following reasons. First, topics are typically on the left in Wenzhounese and not on the right. Second, the presence of the relativizer would be unjustified in such a topicalization structure. Third, on a more experimental side, the subject advantage has been observed in several languages (e.g. Hebrew: Novogrodsky and Friedmann 2006; Italian: Contemori and Belletti 2014) using the same methods as in the current study, but, crucially, also using a different method, in which the concern raised by the reviewer does not apply (Hamburger and Crain 1982 for a description of the methodology; Guasti and Cardinaletti 2003; Guasti et al. 2012, for the use of the methodology to elicit subject and object RCs). This cross-validation confirms the reliability of our elicitation method.

have evidence that the movement account that we have proposed for head-external RCs should be maintained for head-internal and doubling RCs (for example, island effects emerge in all types of RCs). Therefore, it is not at all straightforward to attribute the object preference to a different analysis for head-internal and doubling RCs.

A hint is suggested by what head-internal RCs and doubling RCs have in common, namely that there is no gap inside the RC, since the “gap position” is filled in both cases by the RC head. As discussed in the psycholinguistic literature, gap identification is challenging for the parser, and “backward gap identification” (namely the configuration where the gap precedes the filler) even more so (cf. Fodor 1983 for an early observation in this direction). This configuration is found in head-external RCs but, crucially, not in head-internal and doubling RCs. We conjecture that a gap avoidance strategy can explain why most head-internal and doubling RCs were object RCs: remember that head-internal and doubling RCs are grammatical options in Wenzhounese (they are accepted by native speakers). So, when an object RC meaning must be expressed, there are three syntactic options available: head-external, head-internal and doubling RCs. Given that the object RC configuration introduces a specific challenge, namely there is hierarchical intervention by the subject, a further challenge, namely backward gap identification tends to be avoided. This can be done by producing structures in which the “gap position” is filled. When a subject RC meaning must be expressed, the same three syntactic options are available in principle but this time the structure is easy enough for the gap avoidance strategy to not be required (although not altogether excluded: some head-internal and doubling RCs were produced). The idea we are proposing is very close in spirit to Hawkins’ (1999) Gap Avoidance Hypothesis. Hawkins, based on ample cross-linguistic evidence, argues that gaps tend to be avoided in proportion to the processing difficulty of the environments in which they (could) occur.

Assuming this perspective, Wenzhounese is far from being a unicum: in elicitation studies, it has been found that participants may not produce the target response, when this is complex, and revert to sentences that have an equivalent meaning as the target but are structurally simpler. For instance, the existing literature investigating the production of Cantonese and Mandarin RCs has reported that children (and/or adults) responded with head-internal RCs and RCs with resumptives when object RCs are elicited (Hsu et al. 2009; Hu et al. 2016; Lau 2016). Similarly, passive constructions are used to avoid object RCs in a variety of languages (see below for references and examples). Our findings (and the explanation that we are proposing) are consistent with what has been reported for head-internal RCs in Korean (Cho 1999; cited in Jeon and Kim 2007). Cho (1999) found that Korean-speaking children between four and seven years of age produced more subject RCs than object RCs of the head-external type, while the opposite holds for head-internal RCs.

Notice that in our analysis the gap avoidance strategy is not a last resort strategy, like the insertion of a resumptive pronoun during the derivation of a sentence to avoid or alleviate an island effect. In fact, island effects are *not* obviated in head-internal and doubling RCs, as we showed in Sect. 3. Instead, we think that the gap avoidance strategy is more similar to cases where an easier structure (say the passive

subject RC “the boy that is kissed by the grandma”) is produced instead of a more complex structure (say the object RC “the boy that grandma kisses”) when the two sentences have the same (or a very similar) meaning.

The replacement of an object RC by a passive subject RC by both children and adults is reported by various studies for different languages (Hsu et al. 2009; Hu et al. 2016 for Mandarin; Contemori and Belletti 2014 for Italian; Lau 2016 for Cantonese a.o.). We did not observe this in Wenzhounese, though. We think that two factors played a role in the absence of passives. The first one is the availability of head-internal and doubling RCs as optional structures to produce, as explained above. The second one is the peculiar status of passivization in Wenzhounese. To be concrete, let’s compare it with Mandarin. In Mandarin, passive sentences can be long passives, in which the passive morpheme (e.g. *bei*) is followed by an NP and a VP, or short passives, in which *bei* is followed by the VP (Huang et al. 2009:112). By contrast, as noted by You (1981:119), Wenzhounese passive sentences typically are only “long passive” as in (25a) (cf. the ungrammaticality of the “short passive” version in (25b), where the passive marker $k^h a^{54}$ is followed directly by the VP). Cross-linguistic studies on acquisition have shown that long passives are more difficult to acquire than short passives (Liu and Ning 2009; Armon-Lotem et al. 2016). Given that Wenzhounese only allows long passives and children in our study were relatively young, we conjecture that we did not observe passive RCs because presumably long passives are not simpler than object RCs.

- (25) a. mɜ⁴² ɲ³³ k^ha⁵⁴ ɲa⁵² bo²¹ kəʔ⁰.
 child PASSIVE grandma draw
 ‘The child is drawn by the grandma.’
 b. *mɜ⁴² ɲ³³ k^ha⁵⁴ kəʔ⁰.
 child PASSIVE draw
 ‘The child is drawn by the one.’

To sum up, in this paper, we presented a systematic description of Wenzhounese RCs and showed that head-external, head-internal, doubling and headless RCs are all possible. In particular, the data of the current study support the view that hierarchy and intervention (computed in terms of *c*-command, as opposed to linear distance) are the analytical categories that can provide an explanation for the production patterns of Wenzhounese RCs by children and adults.

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