ISSN 2385-4138 (digital)
https://doi.org/10.5565/rev/isogloss.306

The production of relative clauses in Italian-speaking children with DLD

Fabrizio Arosio
University of Milano-Bicocca
fabrizio.arosio@unimib.it

Silvia Silleresi
University of Milano-Bicocca
silvia.silleresi@unimib.it

Maria Teresa Guasti
University of Milano-Bicocca
mariateresa.guasti@unimib.it

Received: 14-02-2023
Accepted: 05-05-2023
Published: 06-01-2024

How to cite: Arosio, Fabrizio, Silleresi, Silvia & Maria Teresa Guasti. 2024. The production of relative clauses in Italian-speaking children with DLD. *Isogloss. Open Journal of Romance Linguistics* 10(1)/2, 1-23.
DOI: https://doi.org/10.5565/rev/isogloss.306

Abstract

Children with Developmental Language Disorder (DLD) have been shown to struggle with the acquisition of complex structures requiring structural embedding and movement of a sentential element from its original position. This study examines the production of subject and object relative clauses (RCs) by Italian children, investigating whether: i) seven-year-old children with DLD are impaired in embedding or movement operations; ii) specific factors, such as animacy of the arguments, affect the production of sentences with movement and embedding, iii) the linguistic profile of children with DLD is qualitatively different from that of typically developing (TD) children. We elicited the production of RCs with animate and inanimate arguments in 12 Italian-speaking children with DLD (mean age = 7;2) and in two TD control groups: age matched (AM) and language matched (LM). Children with DLD produced fewer

RCs than either control group and made different errors, showing a slightly different developmental path. Animacy mismatch did not improve RC production in any group. Results suggest that seven-year-old children with DLD are in a transitional stage: they can use embedding but still have difficulties with movement operations, especially in object RCs. This indicates that the language competence of children with DLD improves with age, but long-distance dependencies continue to be challenging.

Keywords: Developmental Language Disorder, movement, embedding, relative clause, language development

1. Introduction

It has been reported that children with Developmental Language Disorder (DLD) face severe challenges in the production of complex syntactic structures requiring structural embedding and movement of a sentential element from its original position. This has been widely demonstrated in the case of A movement operations, e.g. passive structures (Leonard et al. 2003; Leonard et al. 2006; Riches 2013, a.o.), and A' movement operations, e.g. *wh*-questions (Stavrakaki 2006; Hamann 2006; Jakubowicz 2011; Arosio & Guasti 2019; Abu Bakar et al. 2022; a.o), as well as relative clauses (Håkansson & Hansson 2000; Stavrakaki 2002; Novogrodsky & Friedmann 2006; Contemori & Garaffa 2010; De López et al. 2014; Rakhlin et al. 2016; Wada et al. 2020; Wang & Yu 2021; 2022; a.o.)

In the literature, we find different models accounting for the grammatical deficit of children with DLD and for their pattern of development of complex syntactic structures. Although several accounts are available in the literature (Linearly-driven parsing by Cromer, 1978*;* Relativized-minimality by Friedmann, Belletti & Rizzi, 2009; Working memory by Archibald, 2017; a.o.), in this paper we will concentrate only on two explanatory models: the *hierarchical complex structures* model and the *deficit of thematic role assignment* model. The former considers the deficit as a structural problem due to an inability to construct hierarchical complex structures; the latter considers the deficit as a difficulty in handling long-distance dependencies involved in syntactic movement and assigning thematic roles to moved constituents in long-distance configurations. The hierarchical complex structure model (advocated by Håkansson & Hansson 2000; Schuele & Tolbert 2001; Contemori & Garaffa 2010) claims that hierarchical structural complexity represents a challenge for children with DLD, who appear to be unable to build a syntactic tree to its highest node, the CP node. The deficit of thematic role assignment approach (van der Lely 1998; Stavrakaki 2002; Novodrosky & Friedmann 2006) holds that the deficit is due to the optionality of the principle forcing movement or to the inability to transfer the thematic role to the moved element.

In this respect, an ideal construction to test the validity of the two models outlined above – in terms of developmental phases in acquisition – is the relative clause (RC) construction. An RC is a subordinate structure obtained by syntactic movement. If the hypothesis in hierarchical structure building is right, children with DLD should be unable to produce embedded structures, resorting to declarative clauses or structures in which subordination is avoided (e.g. coordination, juxtaposition of clauses). Conversely, if the proposal focusing exclusively on syntactic

movement is on the right track, children with DLD should adopt strategies to avoid movement operations, displaying errors in thematic role assignment.

The analysis of RC production in children with DLD must be conducted in parallel with the analysis of RC production in the unimpaired population, and consider the different developmental stages involved in its acquisition. This consideration brings us to a second theoretical issue closely related to the first one, namely what developmental pattern children with DLD exhibit. The data presented and discussed in the literature seem to fall into two main approaches. Some researchers (e.g., Hakansson & Hansson 2000; Stavrakaki 2002; van der Lely & Battell 2003; Contemori & Garaffa 2010; Rakhlin et al. 2016) present evidence for a qualitatively deviant pattern of linguistic development not assimilated to any of the stages characterizing the linguistic development of Typically Developing (TD) children, Other studies, however, (e.g., Rice, Wexler & Cleave 1995; Novogrodsky & Friedmann 2006; De López et al. 2014; Wada et al. 2020; Wang & Yu 2021) go in a different direction by offering evidence of a quantitative diversity in developmental pattern, arguing that children with DLD progress through the same developmental stages as their TD peers, albeit with some delay.

Before getting to our experimental study and taking a stand on such crucial issues, we will briefly review some research on the production of relative clauses in children with DLD and in TD children.

2. Previous Findings in TD children and children with DLD

We will first review the literature on the acquisition of relative clauses in TD children. A uniform result reported by all investigations is the marked asymmetry observed crosslinguistically at all ages in the comprehension and production of subject and object RCs (Adams 1990; Guasti & Cardinaletti 2003; Arosio, Adani & Guasti 2009; Adani 2010; Belletti & Contemori 2010; Contemori & Garaffa 2010; Costa, Lobo & Silva 2011; Courtney 2006; Guasti, Stavrakaki & Arosio 2012; Belletti et al. 2012; Gavarro et al. 2012; Gutierrez-Mangado & Ezeizabarrena 2012; Kwon et al. 2013; Bentea, Durrleman & Rizzi 2016; Lau & Tanaka 2021; a.m.o.). Focusing on Italian, while children understand and produce subject RCs by the age of 3, they still experience difficulties in the comprehension and production of object RCs at the age of 9. Belletti & Contemori (2010) showed that 3- to 5-year-old children resort to various simplification strategies while trying to cope with the difficulties posed by object RCs. They turn them into subject RCs, as in (1), either by reversing the thematic roles of the arguments, as in (2a), or by changing the relative head of the construction as in (2b). Occasionally, as shown by Guasti & Cardinaletti (2003), young TD children produce object RCs with a resumptive pronoun, as in (2c), or resumptive full DPs as in (2d).

(1) Il bambin-o che l-a signor-a pettin-a.
the.M.SG child-M.SG that the-F.SG lady-F.SG comb-PRS.3SG
'The child that the woman combs.'

(2)a. Il bambin-o che pettin-a l-a signor-a.
the.M.SG child-M.SG that comb-PRS.3SG the-F.SG lady-F.SG
'The child that combs the woman.'

b. L-a signor-a che pettin-a il bambin-o.
the-F.SG lady-F.SG who comb-PRS.3SG the.M.SG child-M.SG
'The woman that combs the child.'

c. Il bambino che la signor-a l-o pettina.
the-M.SG kid-M.SG that the-F.SG lady-F.SG it-MSG comb-PRS.3SG
lit. 'The child that the woman combs him.'

d. Il bambin-o che la signor-a pettin-a
the.M.SG kid-M.SG that the.F.SG lady-F.SG comb-PRS.3SG
il bambino.
the.M.SG kid-M.SG
lit.'The child that the woman combs the child.'

From the age of 5 / 6 years, children resort to a different strategy, namely passive RCs (Belletti & Contemori 2010), again turning an object RC into a subject RC by means of passivization, as in (3).

(3) Il bambin-o che è pettin-ato da=lla signor-a.
the.M.SG kid-M.SG that be.PRS.3SG comb-PTCP.M.SG by=the lady-F.SG
'The child that is combed by the woman.'

Various studies have shown that the difficulty children display with object relatives may be alleviated by the manipulation of *phi-features* with a semantic role associated with the +N (lexical N feature) shared between the head of the chain (object) and the intervener (subject) (see Relativized Minimality account in Friedmann, Belletti & Rizzi, 2009; Rizzi 1990, 2004, a.o.). In this regard, Guasti et al. (2012) found that object relative clauses with an inanimate head ('l'aereo che il bambino lava', *the plane that the child is washing*) are easier than those with an animate head ('il bambino che la mamma lava', *the child that the mother is washing*) at the age of 5, but not at the age of 9. Similar results have also been found in Arosio et al. (2011) for 9-year-old Italian-speaking children, and in Bentea et al. (2016) for French-speaking children over 6 years of age. The facilitatory effect can be attributed to the fact that object RCs with an inanimate head are more frequent in the input, as pointed out in Adani, Stegenwallner-Schutz & Nielsen (2017) (see also reference cited there). These authors also showed that animacy facilitates comprehension of object RCs in 3-year-old German-speaking children, but it is not relevant for older children (from 5 years old onwards). In line with this last result, some authors detect no effect for a mismatch in animacy in French-speaking children aged 4;8 to 6;3 (Durrleman & Bentea 2021) and in French-speaking children from 3 to 8 years old (Martini 2019). More needs to be understood about the impact of the animacy feature. In summary, the development of RCs in TD children displays a marked subject-object asymmetry. RC extraction from the object position is especially challenging and gives rise to various types of errors.

Several studies have been carried out on the comprehension and production of relative constructions in the DLD population. Since our work concentrates on production, we shall briefly review some of the cross-linguistic literature on the production of RCs in children with DLD. Among the studies whose results confirm the hypothesis of a structural deficit in the building of embedded sentences by children with DLD, we find the work by Håkansson & Hansson (2000). In their longitudinal study on the production and comprehension of RCs in pre-school 5-year-old language

impaired children and unimpaired 3;5-year-old Swedish children, they found that children with DLD had severe difficulties with relativization. This was shown by an apparent omission of the relative complementizer and by the insertion of a dummy place holder or filler in place of the complementizer; in this study children occasionally produced coordinated structures rather than RCs. Children participating in his study were tested twice on RC production; at time II, six months after the first interview, Håkansson & Hansson observed the appearance of the complementizer in the production of RCs. They accounted for this change in terms of a reorganization process in the children's grammar leading to the generation of a hierarchical relationship between clauses. A similar result was obtained in a study by Contemori & Garaffa (2010) on the comprehension and production of RCs by four Italian-speaking children with DLD aged 5;1 and two groups of four TD children (TD-1 mean age=4;9 and TD-2 mean age=3;8). Unimpaired children avoided producing the more complex object RCs by resorting to different rescue strategies, mentioned above. By contrast, the DLD group either produced no responses or produced declaratives in place of either subject or object RCs, thus featuring omission of the complementizer and avoidance of subordination. The results were taken as evidence of the children's inability to construct any kind of RC and as an indication of the absence of the CP layer in the DLD children's grammar.

According to the alternative proposal presented above, the deficit in producing RCs is rather connected with movement operations and thematic role assignment to moved constituents in children with DLD. This proposal is supported, among others, by Stavrakaki (2002), Novodrosky & Friedmann (2006) and De López et al. (2014). Stavrakaki (2002) tested the production of RCs in a group of 8-year-old Greek-speaking children with DLD and a group of TD Greek-speaking children. The children with DLD performed significantly lower than TD children; they produced significantly more declaratives and made a variety of errors. All the strategies children with DLD resorted to in their attempt to produce RC constructions have been interpreted as a specific impairment in the syntactic procedures involving movement and in the verification of formal features, such as morphological case. Novodrosky & Friedmann (2006) compared the production of RCs in 12-year-old Hebrew-speaking children with DLD (aged 9;3 to 14;6) and controls (aged 7;6 to 11). The children with DLD displayed difficulties in RC production, especially in that of object RCs. In the attempt to produce these structures DLD children resorted to a variety of strategies: they made thematic role reversal errors, transforming an object RC into a subject RC; they tried to reduce the number of arguments in the sentence by using reflexives, by producing object RCs with impersonal subjects or passive subject RCs; they produced relative head doubling and simple sentences. Crucially, children participating in this study never omitted the complementizer nor produced structural errors. The deficit exhibited by the group with DLD was, therefore, accounted for as an inability to transfer thematic roles to moved constituents in non-canonical sentences obtained through movement, rather than to a deficit in accessing the high nodes of the syntactic tree. In this line of thinking, it is often claimed that children with DLD compensate for their difficulties with syntactic operations via lexical-semantic knowledge (van Der Lely & Battell 2003). De López et al. (2014) investigated the comprehension and production of subject and object relative clauses in three groups of Danish-speaking children: those with DLD (mean age = 6;3 y.o.), language matched (LM) TD children (mean age = 6;4 y.o.) and age matched (AM) TD children (mean age = 6;3 y.o.). All children

performed better on RC comprehension than on RC production, and better on subject RCs than object RCs. Children with DLD produced fewer target relative clauses than the TD groups and various alternative strategies, such as passive object relatives. Moreover, they produced different types of errors with respect to their TD peers, such as more thematic role-reversal errors. According to the authors these results suggest that children with DLD are in a previous developmental stage than their TD peers and that their grammatical knowledge is delayed, but these differences are not attributable to problems in reorganizing the structure of subordinate clauses, since the children with DLD did not differ from the TD children in the type or number of complementizers they produced.

The two theories outlined above suggest different sources of syntactic impairment in children with DLD: structural versus movement-dependent. However, they are supported by studies that share a common, potentially misleading, feature: the studies supporting the view of a structural building deficit tested a young population of children with DLD (mean age=5;0 years), whereas the studies supporting the view of a movement-connected impairment concentrated on older children (ranging from 6 to 12 years). Since children with DLD develop, it is possible that the deficit is expressed differently at different ages. If this is correct, we should find a transition period in which we can observe difficulties with both structure building and movement.

3. Rationale of the study

In the light of the results obtained by previous studies, the present work aims at filling the gap in the literature by comparing the production of RCs in children with DLD to that of two control groups matched for chronological age and for language age. The present study focuses on children with DLD who are older than the children tested in studies supporting the structural deficit theory, but younger than those tested in some studies supporting the movement deficit theory. In addition, the study is carried out with Italian children and thus can be compared to Contemori & Garaffa (2010), who examined the production of younger children with DLD. In doing so, it adds new evidence that can contribute to the understanding of language impairments across languages.

Given previous literature and considering the age of the children with DLD interviewed, we expect children with DLD participating in our study to be able to cope with syntactic structure building up to its CP node, although they may still resort to structures without embedding. We also expect them to fall behind in the production of relative clauses with respect to chronological age matched children. They may also respond less accurately than language matched children. In addition, if children with DLD compensate with lexical-semantic knowledge, they should be better with relative clauses with inanimate objects (for a review on feature dissimilarities between the head and the intervener and on their nature – morphosyntactic, semantic, phonological – see Bentea, Durrleman & Rizzi 2016).[1]

[1] From Bentea, Durrleman & Rizzi (2016:34) “A less selective perspective to the identification of features favoring the resolution of A’-dependencies is adopted by the so-called “similarity-based” approach to interference[…], according to which any featural dissimilarity between the target and the intervener is of help (i.e. dissimilarity not just in

4. The study

4.1. Participants

We recruited 36 monolingual Italian-speaking children as participants. One group of twelve children (2 females) met the criteria for DLD (mean age=7;2 years, SD=8 months; range=5;8-8;3). One group of 12 TD children were the same chronological age, and served as age controls while one group of 12 younger TD children were the same linguistic age and served as language controls. All the children were administered an RC elicitation task, the standardized receptive grammar test TCGB (Chilosi, Cipriani, Giorgi, Fazzi & Pfanner 1995), the standardized receptive vocabulary test PPVT (Dunn, L.M. & Dunn L.M. Italian version by Stella, Pizzioli & Tressoldi 2000) and the standardized Raven's Coloured Progressive Matrices test (Raven, Court, & Raven 1998; Belacchi, Scalisi, Cannoni & Cornoldi 2008). The TCGB is a standardized test evaluating grammatical comprehension using a picture selection task. It evaluates the comprehension of simple sentences including transitive active constructions, locative prepositional phrases, negation, and some complex sentences such as those containing a few relative clauses and passive constructions.

The children with DLD had been referred to speech centers because of difficulty with oral language and had been diagnosed based on standard inclusion and exclusion criteria by an expert clinician (ICD-10; World Health Organization 1992). All the children scored within the normal range on the standardized intelligence test (nonverbal IQ > 85; *Colored progressive Matrices*; Raven 1998). To be included in the study, each child with DLD had to score 1.5 SD below the mean for his/her age on two linguistic tests (TCGB: receptive syntax or PPVT: receptive vocabulary) or 2 SD below the mean on one of the two tests. A group of 12 TD monolingual Italian-speaking children matched for chronological age and gender (mean age = 7;2 years, SD = 9 months; range = 5;9-8;2) participated in the study as age matched controls and a group of 12 TD children matched for gender and language ability based on their TCGB score (mean age = 5;5, SD = 7 months; range = 3;9-6;2) participated in the study as language matched controls. The age matched (AM) children were within 3 months of age of a child in the DLD group; language matched (LM) controls were each within ±4 point scores on the TCGB of a child in the DLD group. All children in the control groups were developing language in a typical fashion, based on teacher and parent reports. T-tests revealed no significant differences between children with DLD and AM control children in age (t (20) = -0.20, p = 0.83). Moreover, children with DLD and LM children did not differ in the scores on the TCGB (t (29)-0.19, p = 0.85)).[2] Table 1 summarizes these pieces of information about the populations.

morphosyntactically relevant features, but also in purely semantic, or purely phonological features; see Belletti et al. (2012) for discussion). In that approach, animacy impacts performance because it acts as a semantic cue and therefore facilitates theta-role assignment, quite irrespective of the structural realization and role of the feature."

[2] The two groups did not differ in their scores on PPVT either (t(20)=0.11, p=0.91).

Table 1. Mean age (SDs) in months, means of raw scores (SDs) and Z scores (SDs) on the PPVT and TCGB. Means of raw scores (SDs) on the Raven's test of children with DLD and their TD controls.

	AGE in months mean (SD)	**PPVT raw score mean (SD)**	**PPVT Z score mean (SD)**	**TCGB raw score mean (SD)**	**TCGB Z score Mean (SD)**	**Raven raw score mean (SD)**
DLD	85.83 (8.78)	75.50 (25.04)	-1.28 (1.00)	13.38 (5.85)	-3.70 (2.10)	21.75 (4.53)
AM	86.58 (9.59)	109.92 (19.99)	0.27 (0.85)	3.92 (4.26)	-0.21 (0.89)	25.67 (7.93)
LM	65.83 (7.29)	73.25 (18.20)	-0.23 (0.66)	14.04 (6.57)	0.03 (0.49)	17.91 (3.98)

The testing of children with DLD took place at the speech rehabilitation centers where they were under treatment, while control participants were tested at their school.[3] Testing was performed by a trained researcher. Informed consent prior to testing was obtained from the children's parents. Parents, teachers, educators and speech and language therapists have been informed of the results of the study during dedicated meetings. The study was approved by the Ethics committee of the University of Milano-Bicocca according to the standards of the Helsinki Declaration (1964).

4.2. Materials and methods

Data were gathered by using an elicitation task modelled after Hamburger and Crain (1982) with the exception that the story was video recorded, told by a female voice and presented through a portable computer. The task was administered by an experimenter who manipulated a blindfolded puppet. In each story in the videos, one assistant manipulated two identical characters or objects that differed by an action they carried out or in which they were involved as patients. After each child watched the story, the assistant in the video pointed to one of the two characters or objects and asked the child what s/he would say to the blindfolded puppet if s/he wanted him to touch one of the two characters or objects. We elicited 12 subject and 12 object RCs. In each set, 6 RCs included two animate NPs and 6 included an animate NP subject and an inanimate NP object. For RCs with two animate NPs, we had one NP singular and one plural so that only one agreed with the verb and the sentence was not ambiguous in Italian. Number on the NPs was counterbalanced. For object RCs with inanimate objects, this manipulation was not necessary, as disambiguation was ensured by the pragmatic context (the only exception being items 8 and 20, where the sentences contained a plural object "flowers", which is more natural in the context of watering, see Appendix). The complete list of elicited RCs is in the Appendix. The

[3] Children with DLD were additionally tested in Arosio's et al. (2014) on a clitic production task; 11/12 children had a score on target productions <75% which identifies DLD children with 94% sensitivity and 87% specificity. This additional measure suggests severe morphosyntactic production problems in the DLD participants.

children's responses were transcribed on site on a sheet by one experimenter and tape recorded for a further check by another experimenter.

4.3. Scoring, reliability, and error coding

All the material was scored by one experimenter and checked by a second one. Any disagreement was resolved by discussion. Children's responses were first scored for correctness. There were two types of correct RCs. One type consisted in the production of an RC respecting the target thematic structure and featuring embedding. A second type was a reduced RC, which we considered a simplified structure. In the first type, different simplifications or manipulations were observed, however. Starting from the target subject RC in (4a) and target object RC in (4b), we classified the correct responses as in (5).

(4) a. I delfin-i che tir-ano l'anatra. (Target Subject RC)
The.M.PL dolphin-M.PL that pull-PRS.3PL the=duck.SG
'The dolphins that pull the duck.'
b. L'asin-o che i cani lav-ano. (Target Object RC)
the=donkey-M.SG that the-MPL dog-PL wash- PRS.3PL
'The donkey that the dogs wash.'

(5) Classification of children's correct responses:
a. Target responses: the expected responses, as in (4).[4]
b. Reduced head responses: the relative head was reduced and expressed by a demonstrative pronoun (e.g., *quelli che tirano l'anatra* (the ones that pull the duck)).
c. Passive RC responses: the verb in the RC was passivized and the object RC was turned into a subject RC. The auxiliary "be" was used most of the time, but also "venire" (to get) was used, and in some cases a passive causative, were employed (e.g., *NP si fa lavare da NP* (NP gets himself washed by NP)). The passive RC featured the presence of the by-phrase, most of the time (e.g.,

[4] Target responses included sentences as in (4), as well as a few object RCs in which the object was also expressed by a resumptive pronoun in the embedded clause, as in (i), or the object relative head was doubled, as in (ii).

(i) L'asin-o che i can-i lo lav-ano
The=donkey-SG that the.M.PL dog-PL it-M.SG wash- PRS.3PL

(ii) L'asin-o che i cani lav-ano l'asino
the.donkey-SG that the.M.PL dog.PL wash- PRS.3PL the=donkey-SG

Sentence (i) is found in sub-standard varieties and in colloquial Italian. We decided to include sentences (i) and (ii) in the target category, as they feature the formation of an RC and the target structure is correctly expressed. In addition, there were very few instances of these sentences and even by removing them from the target category the results of the analyses did not change (one instance of sentence (i) in the DLD group, five in the LM group; two instances of (ii) in the DLD group, one in the LM group).

l'asino che è/viene lavato dai cani (the donkey that is/gets washed by the dogs)). Passive RCs were only used when an object RC was elicited.

d. Object RCs with a null subject: the RC is correct and the subject is null, an option available in Italian, as it is a null subject language (e.g*., l'asino che lavano* (the donkey that (they) wash)).

e. Reduced object RC: this structure included a "passive" past participle verb. It is limited to object RCs and included the by-phrase, most of the time (e.g., *l'asino lavato dai cani* (the donkey washed by the dogs)).[5]

In addition to the correct responses classified in (5a-e), erroneous constructions were produced. Errors mostly occurred when object RCs were elicited. Given our goal, we distinguished two types of errors: embedding errors and no-embedding errors, as in (6a-b).

(6) Classification of the children's errors:[6]

a. Embedding errors: RCs with different embedding errors. Thematic role errors, reverse head errors, intransitive RCs or ambiguous RCs. In thematic role errors, the thematic structure was not respected, and the roles were reversed. In reverse head errors, the thematic structure was respected, but the head of the RC was not the target one; with this structure, the restrictive function of the RC was disregarded. In intransitive RC errors, the children produced RCs with only one argument where the transitive verb was replaced by an intransitive one. In

[5] We decided to classify reduced object RCs as correct responses, because their syntactic structure involves a covert relative clause (in other words embedding). Especially when the reduced object RC expresses the by-phrase, it must contain a relative construction and not an adjectival one (*l'asino lavato dai cani/the donkey washed by the dog* vs. *l'asino lavato/the donkey washed*).

[6] Here are some examples of the children's errors reported in (6):

(iii) L'asin-o che i can-i lav-ano (target sentence)
the.donkey-SG that the-M.PL dog-PL wash-PRS.3PL
a. L'asino che lava i cani (thematic-role)
the=donkey-SG that wash- PRS.3SG the-MPL dog-PL
b. I can-i che lav-ano l'asin-o (reverse-head)
the-M.PL dog-PL that wash-PRS.3PL the=donkey-SG
c. L'asin-o che lav-a (intransitive)
the.donkey-SG that wash- PRS.3SG
d. Gli asin-i che lav-ano i can-i (ambiguous)
the.donkey-PL that wash-PRS.3PL the.M.PL dog-PL
e. L'asin-o (head-alone)
the=donkey-SG
f. Lav-ano i can-i (fragments)
wash-PRS.3PL the.MPL dog-PL
g. L'asin-o lav-a i can-i (declaratives)
the.donkey-SG wash- PRS.3SG the.M.PL dog-PL

ambiguous RCs, the number on the arguments was changed and it was not possible to decide whether the children produced a subject or an object RC.

b. No-embedding errors: sentences without embedding: production of the RC head alone, sentence fragments, declarative sentences.

Given this classification, the statistical analysis of the errors was based on 2 categories: RC with embedding errors and sentences with no-embedding.

5. Results

We obtained 288 responses from each group for a total of 864 responses. Of these, 23 had to be excluded, as later inspections of the recordings showed that the experimenter helped the child during item production. Thus, the analyses were conducted on 841 responses. Means and SDs of correct RCs with embedding (including target RCs, RCs with a reduced head, passive subject RCs and object RCs with a null subject), means and SDs of reduced object RCs and means and SDs of errors, as a function of sentence type and animacy are reported in Table 2.

Table 2. Percentages and SDs of correct RCs with embedding, reduced object RCs and total errors as a function of sentence type (subject/object) and animacy (A=animate, I=Inanimate) in children with DLD, language matched controls (LM) and chronological age controls (AM).

	CORRECT RC WITH EMBEDDING				**REDUCED OBJECT RC**		**EMBEDDING ERRORS & NO-EMBEDDING**			
	SUBJECT		**OBJECT**		**OBJECT**		**SUBJECT**		**OBJECT**	
	A	**I**	**A**	**I**	**A**	**I**	**A**	**I**	**A**	**I**
DLD	66 (48)	70 (46)	29 (46)	36 (48)	9 (29)	12 (33)	34 (48)	30 (46)	62 (48)	52 (50)
LM	90 (30)	92 (28)	62 (49)	49 (50)	6 (23)	6 (23)	10 (30)	8 (28)	32 (47)	45 (50)
AM	95 (21)	97 (17)	73 (45)	80 (40)	9 (29)	6 (24)	4 (21)	3 (17)	18 (39)	14 (34)

As shown in Table 2, both LM and AM controls produced more RCs with embedding than children with DLD; in addition, subject RCs were more frequently produced than object RCs and this was so regardless of whether the head was animate or inanimate. In other words, the animacy feature did not seem to impact on children's production. All groups produced a small and equal number of reduced object RCs. Notably this structure was used only when an object RC was elicited and both when the object was animate or inanimate.

These findings are supported by statistical analyses. As the data are categorical (accuracy), we used a mixed logit model with proportion of produced structure as

dependent variable, *Group*, *Sentence type* and *Animacy* as fixed factors, and *subject* and *item* as random factors. We ran several analyses for each of the response categories identified in (5) and (6) and for each of them we made a preliminary analysis to establish which fixed and/or random factor should be added to fit the model and needed to be included (Baayen 2011). We carried out the analyses in R (R Core Team 2022). In all models we chose *DLD*, *object RC* and *Animate* as reference categories, i.e., categories against which all others are compared). In all the models, the sign of the coefficient for the fixed factors assumes a positive value when the odd probability for the dependent variable increases relative to the reference category (*DLD* or *object RC*). We first run an analysis on the total of correct RC responses (5a-d) with fixed factors, *Group* [$\chi^2(2) = 11.97$, $p<0.01$] and *Sentence type* [$\chi^2(1) = 41.51$, $p<0.001$], since they contributed to the model's fit. Animacy did not contribute to the model's fit and was not included ($p = 0.84$); likewise, the interaction between the factors was not significant. Table 3 (Correct RC analysis) summarizes the results of the analysis of correct RC response production (5a-d). As can be seen in Table 3, the positive coefficients indicate that the accuracy in the production of correct RCs increases in the two control groups relative to children with DLD. It also increases when subject RCs are elicited relative to when object RCs are prompted. As for reduced object RC responses (as classified in 5e), no significant effect was found.

Table 3. Summary of the analyses of correct RC, Target RC and reduced head structure production.

Correct RC analysis (log-likelihood = - 361.3).				
Predictor	Coefficient	SE	*t-test*	p
(Intercept)	-1.58	0.60	-2.61	< 0.001
Group (ref. Cat.=DLD)				
Group = AM	3.04	0.86	3.51	< 0.001
Group = LM	2.08	0.84	2.47	< 0.05
Sentence type (ref. Cat.=OBJ)				
Sentence= SUB	2.33	0.24	9.35	< 0.001
Note. Random effects for *subject* and *item* had an SD of 1.94 and 0.25, respectively.				

Target RC analysis (log-likelihood = - 372.3).				
Predictor	Coefficient	SE	*t-test*	p
(Intercept)	-2.81	0.70	-4.0	< 0.001
Group (ref. Cat.=DLD)				
Group = AM	1.79	0.94	1.91	= 0.056
Sentence type (ref. Cat.=OBJ)				
Sentence= SUB	2.86	0.32	7.87	< 0.001
Note. Random effects for *subject* and *item* had an SD of 2.19 and 0.55, respectively.				

Reduced head analysis (log-likelihood = - 222.6).				
Predictor	Coefficient	SE	*t-test*	p
(Intercept)	-6.16	0.0009	-6644.0	< 0.001
Group (ref. Cat.=DLD)				
Group = AM	-0.14	0.0009	-161.5	< 0.001
Group = LM	4.23	0.0009	4571.3	< 0.001
Sentence type (ref. Cat.=OBJ)				
Sentence=SUB	1.43	0.0009	1551.6	< 0.001
Note. Random effects for *subject* and *item* had an SD of 3.09 and 0.85, respectively.				

As we described in (5), correct RC structures included four types: target structures, reduced head structures, passive subject RCs and object RCs with null subjects. These last two structures were only used when an object RC was elicited. The Means and SDs of each structure as a function of extraction site are reported in Table 4 (percentages do not add up to 100% as reduced RCs and errors are not included in this table). RCs with animate and inanimate objects are conflated, as *Animacy* did not contribute to the fit of the models in the statistical analysis. In general, although children with DLD produce embedded RCs, they struggle more than the other two groups of children.

Table 4. Means and SDs of relative clauses with embedding as a function of the type of structure and sentence type (subject/object) in children with DLD, as well as language matched (LM) and chronological age matched (AM) control children

	TARGET		**REDUCED HEAD**		**PASSIVE**	**NULL**
	SUBJECT	**OBJECT**	**SUBJECT**	**OBJECT**	**OBJECT**	**OBJECT**
DLD	53 (50)	16 (37)	12 (21)	4 (21)	5 (22)	6 (24)
LM	80(40)	39(49)	43 (46)	29 (46)	15 (35)	3 (16)
AM	48 (50)	9 (29)	16 (29)	9 (29)	27 (44)	2 (12)

As we can see from Table 4, LM children produced more target structures than those with DLD. In addition, subject RCs frequently took the target form in all three groups, while object RCs rarely did. Subject RCs took the reduced head form more frequently than object RCs and were produced more frequently by LM children than by those with DLD; DLD children produced this structure less frequently than AM children. When an object RC was elicited, a passive RC or a relative with a null subject was produced in a small number of cases. These findings are confirmed by statistical analysis. In the analysis of production of target RCs, a preliminary analysis showed that *Group* [$\chi^2(2) = 6.45$, $p=0.03$] and *Sentence type* [$\chi^2(1) = 37.55$, $p<0.001$] contributed to the model's fit, whereas *Animacy* did not [$p=0.37$]. The fixed effects of the final model including *Group* and *Sentence type* as factors are summarized in Table 3 (Target analysis). As the Table shows, only AM children produced more target RCs than DLD and there were more target subjects than target object RCs.

As for the analysis of the production of RCs with reduced heads, since *Group* [$\chi^2(2)=12.04$, $p<0,01$] and *Sentence type* [$\chi^2(1)=8.73.4$, $p<0.01$] added significant

information to the fit of the model they were added as fixed factors. The analysis of the production of RCs with a reduced head suggests that children with DLD reduced the head of the RC less than LM children, but more than AM children. In addition, there was more head reduction in subject than in object RCs. These findings are summarized in Table 3 (Reduced head analysis).

Both passive subject RCs (5c), RCs with a null subject (5d) and reduced RCs (with no embedding) (5e) were employed in the case of object RCs. However, no significant effect was observed for these structures.

Successively, we analyzed which types of errors were produced. There was a total of 256 errors distributed into two categories: errors in relative clauses with embedding, featuring various errors (6a) and structures without embedding (6b). Table 5 reports the percentages of errors calculated on the total number of scorable responses. Errors in RCs with embedded structures (6a) were produced mostly when object RCs were elicited and, more frequently by DLD children than AM children. When making these errors, children turned an object RC into a subject RC, produced an ambiguous structure or a relative clause with an intransitive verb. Errors resulting in structures not featuring embedding (6b) were more frequent among children with DLD than those in either control group and were more frequent in the case of object RCs.

Table 5. Percentages and SDs of the various types of errors produced as a function of the type of structure and of sentence type (subject/object) in DLD, LM and AM children.

	EMBEDDING ERRORS		**NO EMBEDDING ERRORS**		**OTHER RESPONSES**	
	SUBJECT	**OBJECT**	**SUBJECT**	**OBJECT**	**SUBJECT**	**OBJECT**
DLD	3(5)	16(18)	8(11)	19(18)	8(11)	17(19)
LM	1(4)	27(20)	7(5)	6(12)	1(4)	6(3)
AM	1(3)	5(10)	3(5)	9(11)	0	4(6)

In the analysis of error production in embedded structures, the data was fit to a model including *Group* [$\chi^2(2) = 8.7$, $p=0.01$] and *Sentence type* [$\chi^2(1) = 40.45$, $p<0.0001$] as factors. As shown by the coefficients in Table 6 (Embedding error analysis), the probability of producing this type of error decreases only from children with DLD to AM children; it also decreases from object to subject relatives. In the analysis of error production in non-embedded structures, *Group* [$\chi^2(2) = 15.9$, $p<0.01$] and *Sentence type* [$\chi^2(1) = 10.33$, $p<0.01$] significantly contributed to the model's fit and were added as factors. As shown by the coefficients in Table 6 (No embedding error analysis), the probability of producing this type of error decreases from DLD children to AM and LM children. It also decreases from object to subject RCs. In summary, children with DLD tend to err more and to produce structures in which embedding is avoided. In this respect, they adopt this strategy more often than younger controls.

Table 6. Summary of the analyses of error production.

Embedding error analysis (log-likelihood = - 192.7).

Predictor	Coefficient	SE	*t-test*	p
(Intercept)	-1.98	0.44	-4.51	< 0.001
Group (ref. Cat.=DLD)				
Group = AM	-1.38	0.67	-2.04	< 0.05
Sentence type (ref. Cat.=OBJ)				
Sentence=SUB	-2.92	0.45	-6.43	< 0.001

Note. Random effects for *subject* and *item* had an SD of 1.151 and 8.815e-05, respectively.

No-embedding error analysis (log-likelihood = - 155.7).

Predictor	Coefficient	SE	*t-test*	p
(Intercept)	-1.83	0.47	-3.84	< 0.001
Group (ref. Cat.=DLD)				
Group = AM	-3.24	0.94	-3.43	< 0.01
Group = LM	-1.64	0.69	-2.37	< 0.05
Sentence type (ref. Cat.=OBJ)				
Sentence=SUB	-1.41	0.42	-3.3	< 0.001

Note. Random effects for *subject* and *item* had an SD of 1.53 and 0.52, respectively.

Summarizing, children with DLD produced fewer correct RCs with embedding than AM children, as expected, but also fewer than LM children, that is, they produced fewer structures with embedding than younger typically developing children. Like the other two groups, they were weaker on object than on subject RCs. AM children attempted to produce RCs by reducing the head and they did so to a greater extent than children with DLD. This may indicate that even simplified RCs are difficult for children with DLD. Children with DLD produced more errors resulting in RCs featuring embedding than did AM children and produced more errors resulting in non-embedded structures than did both control groups. Taken together, these findings suggest that children with DLD can produce relatives, but they remain challenging for them. Various pieces of evidence indicate that embedding, which is used by children with DLD, is still challenging for them and, unlike AM matched children, they have not developed any simplification strategy.

6. Discussion

The theoretical issues identified in the introduction as relevant research questions to investigate are the following:

i) whether the deficit in children with DLD lies in syntactic structure building or in movement;
ii) whether children with DLD are sensitive to animacy as a simplification cue to RC production;

iii) whether children with DLD display a similar, albeit delayed, developmental pattern as that of unimpaired children or whether they exhibit different stages of acquisition reflected in their (qualitative) error pattern.

We aimed at providing an answer to these issues by carrying out an investigation of the production of relative clauses, which involves embedding and thus structure building and movement.

Our findings show that children with DLD performed worse than the control groups, although they produce a fair number of relative clauses with embedding. Reframed into theoretical terms, the results suggest that the impairment in the production of RCs is only partly linked to their structure building capacity. Children with DLD can produce embedded structures, but fewer and less well than LM children. They have difficulty with the movement operation, as well. Witness the fact that, like the control groups, they are more challenged with object than with subject RCs. Putting these facts in a broader perspective and considering the two opposite views stemming from previous literature, we suggest the 7-year-old children with DLD participating in our study are in an intermediate developmental stage between pre-school children with DLD interviewed in studies supporting the structure building approach (aged 5 years) (Håkansson & Hansson 2000; Schuele & Tolbert 2001; Contemori & Garaffa 2010) and older school-aged children with DLD interviewed in studies supporting the movement deficit approach (van der Lely 1998; Stavrakaki 2002; Novodrosky & Friedmann 2006). Therefore, knowledge of embedding is not yet fully developed in pre-school children with DLD and they opt for strategies where subordination can be avoided, such as through the production of declarative, conjoined, and coordinated structures. At a later stage, at least starting from age 7 years, our results show that children with DLD develop a better understanding and competence of embedded constructions. Although still far behind their matched peers, they are able to produce RCs, but display difficulties with movement-driven operations and sometimes fall back on structures used in a previous stage. Under this view, the results obtained by previous studies can be reconciled by assuming that they stem from the different ages of the children interviewed and from the different developmental stages investigated. Thus, we can conclude that, with respect to our first question, our data support the idea of a deficit in embedding that is on its way to being resolved and a deficit in syntactic movement that is evident, at least at the age of 7 years. Animacy did not influence the production of RCs in any group. This is in agreement with most of the studies that tested the effect of animacy in TD children (Guasti et al. 2012; Arosio et al. 2011; Bentea et al. 2016; Adani, Stegenwallner-Schutz & Nielsen 2017; Durrleman & Bentea 2021; Martini 2019). While this aspect may deserve further exploration, we may note that the complexity of RCs obscures the role of this feature.

Considering the third question, concerning the developmental pattern of acquisition of RCs displayed by children with DLD as compared to TD children, children with DLD were not only weaker than control children, but they displayed a moderately different profile with respect to LM children. In this respect, they seem to have more difficulties than younger children, as even producing reduced head RCs was less frequent in the DLD group than in the LM one. When it comes to errors, children with DLD differed from control children in producing a higher number of structures that did not feature embedding. All these facts seem to suggest that there is a delay, but also that this delay is not uniform and that children with DLD advance in

their language development in a somewhat different manner than control children, suggesting some deviance from the typical path of acquisition. In this respect, our results suggest that the developmental pattern in DLD and in TD children differ from both a quantitative and a qualitative point of view (cf. Rice, Wexler & Cleave 1995; Novogrodsky & Friedmann 2006; De López et al. 2014; Wada et al. 2020; Wang & Yu 2021; 2022). Children with DLD produce fewer target RCs and show a delay in the production of these structures with respect to their TD peers (quantitative difference). They also display a (qualitative) deviance that emerges in the avoidance of RCs with reduced heads (even at 7 years of age) and the production of alternative structures that are not employed by TD children (AM and LM).

Our findings raise a further issue for the clinical practice. Children with DLD were matched with 5-year-old TD children for receptive syntax, based on a standardized test used in the clinical practice in Italy. Interestingly, this test includes RCs. However, the 7-year-old children with DLD participating in our study were weaker than chronologically aged and language matched children in the production of RCs. Thus, since the production modality is an important facet in the diagnosis of DLD, this gap will need to be filled by future investigation.

Acknowledgments

This study was supported by a grant from the “Crosslinguistic language diagnosis”. Life Long Learning Program TRA-STUCOR 2007 - 1992 / 001 – 001. 135295-LLP-2007-UK-Ka1scr to Maria Teresa Guasti. We would like to thank the children who participated in the study, their families and the speech-language therapists, who recruited the children. Fabrizio Arosio and Maria Teresa Guasti are responsible for design of the study, all authors are responsible for data analysis, Fabrizio Arosio and Silvia Silleresi wrote the first draft. Maria Teresa Guasti commented on the draft. Fabrizio Arosio is responsible for sections 5 and 6, Silvia Silleresi for sections 2 and 4 and Maria Teresa Guasti for sections 1 and 3.

References

Abu Bakar, NoroSofiah, Smith, Guiditta, Razak, Rogayah A., & Garraffa, Maria.2022. The comprehension and production of Wh-questions among Malay children with developmental language disorders: Climbing the syntactic tree. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.948992

Adams, Catherine. 1990. Syntactic comprehension in children with expressive language impairment. British Journal of Disorders of Communication, 25(2), 149-171. doi: 10.3109/13682829009011971

Adani, Flavia. 2010. Re-thinking the acquisition of Relative Clauses in Italian: towards a grammatically-based account. Journal of Child Language 22, 1-25. doi: 10.1017/S0305000909990250

Adani, Flavia, Stegenwallner-Schütz, Maja, & Niesel Talea. 2017. The Peaceful Co-existence of Input Frequency and Structural Intervention Effects on the

Comprehension of Complex Sentences in German-Speaking Children. Frontiers in Psychology 8, 1590. https://doi.org/10.3389/fpsyg.2017.01590

Archibald, Lisa M. 2017. Working memory and language learning: A review. Child Language Teaching and Therapy, 33(1), 5-17. http://doi.org/10.1177/0265659016654206

Arosio, Fabrizio, Adani, Flava, & Guasti Maria Teresa. 2009. Grammatical features in the comprehension of Italian Relative Clauses by children. In A. Gavarrò et al. Merging Features: Computation, Interpretation and Acquisition. Oxford University Press.

Arosio, Fabrizio., Guasti, Maria Teresa, & Stucchi, Natale. 2011. Disambiguating information and memory resources in children's processing of Italian relative clauses. Journal of psycholinguistic research, 40, 137-154. https://doi.org/10.1007/s10936-010-9160-0

Arosio, Fabrizio, Branchini, Chiara, Barbieri, Lina, & Guasti, Maria Teresa. 2014. Failure to produce direct object clitic pronouns as a clinical marker of SLI in school-aged Italian speaking children. Clinical linguistics & phonetics, 28(9), 639-663. https://doi.org/10.3109/02699206.2013.877081

Arosio, Fabrizio, & Guasti, Maria Teresa. 2019. The production of wh-questions in Italian-speaking children with SLI. Clinical linguistics & phonetics, 33(4), 349-375. doi: 10.1080/02699206.2018.1517191

Avrutin, Sergey. 2000. Comprehension of Wh-questions by children and Broca's aphasics. Brian and Language 52(2), 314-27.

Baayen, R.Haraald. 2011. languageR: Data sets and functions with "Analyzing Linguistic Data: A practical introduction to statistics". Retrieved February 1, 2015. http://cran.r-project.org/web/packages/languageR/.

Belacchi, Carmen, Scalisi, Teresa Gloria, Cannoni, Eleonora, & Cornoldi, Cesare. 2008. Manuale CPM. Coloured Progressive Matrices. Standardizzazione italiana. Firenze: Giunti O.S. Organizzazioni Speciali.

Belletti, Adriana, & Contemori, Carla. 2010. Intervention and Attraction. On the production of Subject and Object Relatives by Italian (young) children and adults. In, J. Costa, A. Castro, M. Lobo, F. Pratas (eds.), Language Acquisition and Development, 3. Proceedings of Gala 2009, CSP, Cambridge, UK. 39-52.

Belletti, Adriana, Friedmann, Naama, Brunato, Dominique, & Rizzi, Luigi. 2012. Does gender make a difference? Comparing the effect of gender on children's comprehension of relative clauses in Hebrew and Italian. Lingua, 122(10), 1053-1069. https://doi.org/10.1016/j.lingua.2012.02.007

Bentea, Anamaria, Durrleman, Stephanie, & Rizzi, Luigi. 2016. Refining intervention: The acquisition of featural relations in object A-bar dependencies. Lingua, 169, 21-41. http://dx.doi.org/10.1016/j.lingua.2015.10.001

Bortolini, Umberta, Arfè, Barbara, Caselli, M.Cristina, Degasperi, Luisa, Deevy, Patricia, & Leonard, Laurence. 2006. Clinical markers for specific language impairment in Italian: the contribution of clitics and non-word repetition. International Journal of Language and Communication disorders 41, 695-712. doi: 10.1080/13682820600570831

Chilosi, Anna Maria, Cipriani, Paola. 1995. Test di Comprensione grammaticale per i bambini. Pisa: Edizioni del Cerro.

Contemori, Carla, & Garaffa, Maria. 2010. Comparison of modalities in SLI syntax: A study on the comprehension and production of non-canonical sentences. Lingua 120, 1950-65. doi: 10.1016/j.lingua.2010.02.011

Costa, João, Lobo, Maria, & Silva, Carolina. 2011. Subject–object asymmetries in the acquisition of Portuguese relative clauses: Adults vs. children. Lingua, 121(6), 1083-1100. https://doi.org/10.1016/j.lingua.2011.02.001

Courtney, Ellen H. 2006. Adult and child production of Quechua relative clauses. First Language, 26(3), 317-338. https://doi.org/10.1177/0142723706062677

Cromer, Richard. F. 1978. Hierarchical disability in the syntax of aphasic children. International Journal of Behavioral Development 1, 391–402. https://doi.org/10.1177/016502547800100408

De López, Kristine Jensen, Olsen, Lone Sundahl, & Chondrogianni, Vasiliki. 2014. Annoying Danish relatives: Comprehension and production of relative clauses by Danish children with and without SLI. Journal of child language, 41(1), 51-83. https://doi.org/10.1017/S0305000912000517

De Vincenzi, Maria, Arduino, Lisa, Ciccarelli, Luisa, & Job, Remo. 1999. Parsing strategies in children comprehension of interrogative sentences. In Bagnara, S. (eds.), Proceedings of the European Conference on Cognitive Science. Rome: Istituto di Psicologia del CNR. 301–308.

Dunn, Lloyd M., & Dunn, Leota M. 2000. Peabody - Test di Vocabolario Recettivo - P.P.V.T.-R. Peabody Picture Vocabulary Test – Revised. Adattamento italiano e standardizzazione a cura di: Giacomo Stella – Pizzioli, C., Tressoldi, P.E., Omega Edizioni.

Durrleman, Stephanie, & Bentea, Anamaria. 2021. "Locality in the acquisition of object A'-dependencies: insights from French", Glossa: a journal of general linguistics 6(1): 106. doi: https://doi.org/10.16995/glossa.5876

Friedmann, Naama, Belletti, Adriana, & Rizzi, Luigi. 2009. Relativized relatives. Types of intervention in the acquisition of A-bar dependencies. Lingua 199, 67-88. https://doi.org/10.1016/j.lingua.2008.09.002

Gavarró, Anna, Cunill, Arnau, Muntané, Miriam, & Reguant, Marc. 2012. The acquisition of Catalan relatives: Structure and processing. Revue Roumaine de Linguistique, LVII, 2: 183-201.

Guasti, Maria Teresa. (1996). The acquisition of Italian interrogatives. In H. Clahsen (eds.),Generative perspectives on language acquisition. Amsterdam: John Benjamins. 241-269.

Guasti, Maria Teresa, & Cardinaletti, Anna. 2003. Relative Clause formation in Romance child production. Probus 15, 47-8. https://doi.org/10.1515/prbs.2003.005

Guasti, Maria Teresa, Branchini, Chiara, Arosio, Fabrizio, & Vernice, Mirta. 2012. A developmental study of subject and object relative clauses in Italian. Revue Roumaine de Linguistique 57(2), 105-116

Guasti, Maria Teresa, Stavrakaki, Stavroula, & Arosio, Fabrizio. 2012. Cross-linguistic differences and similarities in the acquisition of relative clauses: Evidence from Greek. Lingua 122(6), 700-713. https://doi.org/10.1016/j.lingua.2012.02.001

Gutierrez-Mangado, M. Juncal, & Ezeizabarrena, Maria José. 2012. Asymmetry in child comprehension and production of Basque subject and object relative clauses. BUCLD 36 Online Proceedings Supplement. http://www. bu. edu/bucld/files/2012/07/Gutierrez-Mangado-36. Pdf-

Håkansson, Gisela, & Hansson, Kristina. 2000. Comprehension and production of reltive clauses: a comparison between Swedish impaired and unimpaired children. Journal of Child Language, 313-333. https://doi.org/10.1017/S0305000900004128

Hamann, Cornelia. 2006. Speculations about early syntax: The production of wh-questions by normally developing French children and French children with SLI. Catalan Journal of Linguistics, 5, 143-189. doi: 10.5565/rev/catjl.82

Hamburger, Henry, & Crain, Stephen. 1982. Relative acquisition. In S. Kuczaj (eds.), Language development, vol. I: syntax and semantics. Hillsdale, NJ: Lawrence Erlbaum. 245-74

Ho, Connie Suk-Han, Chan, David Wai-Ock., Tsang, Sik-Man, & Lee, Suk-Han. 2002. The cognitive profile and multiple-deficit hypothesis in Chinese developmental dyslexia. Developmental Psychology 38, 543–53. doi: 10.1037//0012-1649.38.4.543

Jakubowicz, Celia. 2011. Measuring derivational complexity: New evidence from typically developing and SLI learners of L1 French. Lingua, 121(3), 339-351. https://doi.org/10.1016/j.lingua.2010.10.006

Lau, Elaine. & Tanaka, Nozomi. 2021. The subject advantage in relative clauses: A review. Glossa: A Journal of General Linguistics, 6(1), 1-34. https://doi.org/10.5334/gjgl.1343

Leonard, Laurence. B. 1995. Functional categories in the grammars of children with specific language impairment. Journal of Speech and Hearing Research 38, 1270-1283. https://doi.org/10.1044/jshr.3806.1270

Leonard, Laurence. B., Wong, Anita M. Y., Deevy, Patricia, Stokes, Stephanie F., & Fletcher, Paul. 2006. The production of passives by children with specific language impairment: Acquiring English or Cantonese. Applied Psycholinguistics, 27(2), 267-299. https://doi.org/10.1017/S0142716406060280

Leonard, Laurence. B., Deevy, Patricia, Miller, Carol A., Rauf, Leila, Charest, Monique, & Kurtz, Robert. 2003. Surface forms and grammatical functions: past tense and passive participle use by children with specific language impairment. Journal of Speech, Language & Hearing Research, 46(1). doi: 10.1044/1092-4388(2003/004)

Kwon, Nayoung, Kluender, Robert, Kutas, Marta, & Polinsky, Maria. 2013. Subject/object processing asymmetries in Korean relative clauses: Evidence from ERP data. Language, 89(3), 537. doi: 10.1353/lan.2013.0044

Marini, Andrea, Tavano, Alessandro & Fabbro, Franco. 2008. Assessment of linguistic abilities in Italian children with Specific Language Impairment. Neuropsychologia, 46(11), 2816-2823. https://doi.org/10.1016/j.neuropsychologia.2008.05.013

Martini, Karen. 2019. Animacy does not help French-speaking children in the repetition of object relatives. In Guijarro-Fuentes, Pedro & Suárez Gómez, Cristina (eds.), Proceedings of GALA 2017. Language acquisition and development, 221–241. Newcastle-upon-Tyne: Cambridge Scholars Publishing.

Novogrodsky, Rama, & Friedmann, Naama. 2006. The production of relative clauses in syntactic SLI: A window to the nature of the impairment. Advances in Speech-Language Pathology 8(4), 364-375. https://doi.org/10.1080/14417040600919496

O'Grady, William. 2005. How children learn language. London: Cambridge University Press.

Rakhlin, Natalia, Kornilov, Sergey A., Kornilova, Tatiana V., & Grigorenko, Elena L. 2016. Syntactic complexity effects of Russian relative clause sentences in children with and without developmental language disorder. Language Acquisition, 23(4), 333-360. doi: 10.1080/10489223.2016.1179312

Raven, John, Court, J.H., & Raven, Jean C. 1998. Raven Manual, Section 1 (General overview) and Section 2 (Coloured Progressive Matrices). Oxford, UK: Oxford Psychologist Press.

R Core Team (2022) R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna. https://www.R-project.org.

Rice, Mabel, Wexler, Kenneth, & Cleave, Patricia. 1995. Specific Language Impairment as a period of extended optional infinitive. Journal of Speech and Hearing Research 38, 850-863. doi: 10.1044/jshr.3804.850

Rizzi, Luigi. (1990) Relativized Minimality. MIT Press: Cambridge. Mass.

Rizzi, Luigi. (2004) "Locality and the left periphery.", in A. Belletti ed., Structures and Beyond: The cartography of syntactic structures, Vol. 3., Oxford University Press, New York 223-251.

Riches, Nick G. 2013. Treating the passive in children with specific language impairment: A usage-based approach. Child Language Teaching and Therapy, 29(2), 155-169. https://doi.org/10.1177/0265659012466667

Santelmann, Lynn. 1998. The acquisition of verb movement and spec-head relationships in child Swedish. In D. Adger, S. Pintzuk, B. Plunkett, and G. Tsoulas, (eds.), Specifiers: Minimalist approaches. Oxford: Oxford University Press.

Schuele, C. Melanie, & Nicholls, Lisa M. 2000. Subject relative clauses: Evidence of continued linguistic vulnerability in children with specific language impairment. Clinical Linguistics and Phonetics 14, 563-585. https://doi.org/10.1080/026992000750048116

Schuele, C. Melanie, & Tolbert, Leslie. 2001. Omissions of obligatory relative markers in children with specific language impairment. Clinical Linguistics and Phonetics, 15, 257-274. https://doi.org/10.1080/02699200010017805

Stavrakaki, Stavroula. 2002. A-bar movement constructions in children with SLI: evidence for deficits in the syntactic component of language. In Fava, E. (eds.), Clinical Linguistics: Theory and Applications in Speech Pathology and Therapy. Current Issues in Linguistic Theory. John Benjamins, Amsterdam and Philadelphia. 131-153. https://doi.org/10.1075/cilt.227.12sta

Stavrakaki, Stavroula. 2006. Developmental perspectives on Specific Language Impairment: Evidence from the production of wh-questions by Greek SLI children over time. Advances in Speech Language Pathology, 8(4), 384-396. https://doi.org/10.1080/14417040600880714

Stromswold, Karin. 1995. The acquisition of subject and object WH-questions. Language acquisition 4, 5-48. https://doi.org/10.1080/10489223.1995.9671658

van der Lely, Heather K.J. 1998. SLI in children: Movement, Economy and Deficits in the Computational-Syntactic System. Language Acquisition 7(2-4), 161-193. https://doi.org/10.1207/s15327817la0702-4_4

van der Lely, Heather K.J., & Battell, Jakie. 2003. WH-movement in children with grammatical SLI: a test of the RDDR Hypothesis. Language 79(1), 53-181.

Wang, Haiyan, & Yu, Haopeng. 2021. The Production of Relatives in Mandarin Children With Specific Language Impairment–From the Perspective of Edge Feature Underspecification Hypothesis. Frontiers in Psychology, 12, 705526 https://doi.org/10.3389/fpsyg.2021.705526

Wang, Haiyan, & Yu, Haopeng. 2022. The Repetition of Relative Clauses in Mandarin Children with Developmental Language Disorder. Language Acquisition, 1-24. https://doi.org/10.1080/10489223.2022.2147839

Wada, Rebekah, Gillam, Sandra Laing, & Gillam, Ronald B. 2020. The use of structural priming and focused recasts to facilitate the production of subject-and object-focused relative clauses by school-age children with and without developmental language disorder. American Journal of Speech-Language Pathology, 29(4), 1883-1895. https://doi.org/10.1044/2020_AJSLP-19-00090

World Health Organization. 2004. International Statistical Classification of Diseases and Health Related Problems (The) ICD-10. Second Edition. WHO Press. Geneva, Switzerland.