biolinguistics

The Externalization Component as the Locus of Specific Impairments

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In the last years, Chomsky has defended a strong divide between a core, thought-related component of the faculty of language (FL), and a peripheral, sensory-motor dedicated one, in support of which he has mostly drawn from design and evolutionary arguments. This paper adds to these lines of reasoning some evidence from forms of language impairment that, it is argued, may be understood as selectively affecting the latter component (Externalization). Previous accounts suggest that certain variants of specific language impairment (SLI) affect the Syntax–Phonology interface, including the Morphology component. The Linearization converter is also argued to be typically affected, so one might refer to such variants of SLI as instances of a specific externalization impairment (SEXTI). The data presented here suggest comprehension difficulties with object relative clauses in children with SLI, which, contrary to previous analyses, are argued to be due to linearization problems. The main objective of this paper is to illustrate how clinical linguistics may help to define aspects of the evolved linguistic phenotype, like the above-mentioned divide.

Keywords: externalization, linearization, specific language impairment, language phenotype

> *Understanding a language involves transforming linear order to structural order.*
> Lucien Tesnière (1959: 12)

1.   Introduction

Chomsky has lately endorsed a general architecture of the Faculty of Language based on a strong divide between a (core) thought-related part—a Language of Thought (LOT) and "quite possibly the only such LOT" (Chomsky 2016: 13), and a (peripheral) externalization channel. Accordingly, the Minimalist Program might well be now described as based on a dualist stance, namely one that differentiates between a LOT system and an Externalization module (EXT), which serves the former in a limited range of public uses (Berwick & Chomsky 2016, Chomsky 2013, 2016).

Chomsky has mostly drawn from design and evolutionary arguments in support of this dualist architecture. On the one hand, LOT appears to be uniform across the species, as well as the locus of the kinds of optimization criteria known as 'third factor' effects (Chomsky 2005), while EXT is putatively the source of all linguistic imperfections, including variation (Chomsky 2010). On the other hand, a recursive LOT appears to be the hallmark of human uniqueness, as well as a relatively recent evolutionary innovation, while EXT—if conceived of out of its LOT-devoted functionality, which is scarcely present in other species—purportedly is the human variant of an old, widely shared animal vocal-learning skill (Berwick & Chomsky 2011, 2016). Such issues are certainly controversial and deserve close scrutiny, but in this paper we are going to sidestep such a task and point instead to an extra source of evidence in defense of Chomsky's divide, namely, some clinical evidence provided by our ongoing project on specific language impairment (SLI). In a nutshell, we shall propose that certain forms of SLI selectively affect the EXT component—as previously claimed by Corver et al. (2012) and Leivada (2015), while leaving the core language essentials spared.

The idea that SLI may be due to difficulties in the mapping of adult-like syntactic representations onto proper sound representations—and the other way around—has been, certainly enough, previously raised. No one, to our knowledge, has made the further specification that linearization, a crucial stage in the syntax–phonology interface, may be also impaired in this particular family of SLI affectations. If our suggestion is on track, then the cases to be presented and interpreted below would conform a natural class along with other affectations more closely related with motor instructing and execution. Section 2 will be devoted to describe our empirical findings in a particular area of affectation in Spanish speakers with SLI—namely, comprehension of object relative clauses. We first justify the relevance of such an area in regards to the issue of concern, and then we present our materials, participants, and results. A linearization-based interpretation of these results will be offered in section 3, where we also contrast our suggestions with previous ideas aimed at explaining similar results in other populations. Once the idea is motivated that a family of SLI affectations putatively extend throughout the entire EXT component, in section 4 we argue that, at least in the population of our case studies, the essentials of core computations, as envisioned by the Minimalist Program, do not appear to be equally affected. With this aim, we shall resort to tests regarding other grammatical phenomena that we are presently conducting in parallel to the ones presented in the previous sections. These data will hopefully support the contention that an asymmetry exists between aspects of SLI affectations that fits with Chomsky's basic architectural divide. Some concluding remarks close the paper.

2. Object-Relatives Comprehension in Speakers with SLI

2.1. *Why Does It Matter?*

Relative clauses are particularly challenging from a developmental perspective.

Children start to produce them around 3;0 (Crain et al. 1990, Frizelle et al. 2017, Varlokosta & Armon-Lotem 1998, de Villiers et al. 1994), but a delay is observed on the comprehension side, which does not stabilize until around 6;0 (Adams 1990, Håkansson & Hansson 2000, Leonard 1998, Roth 1984, Sheldon 1974, Tavakolian 1981, de Villiers et al. 1994). This is an unexpected fact, given the 'comprehension first' pattern that generally holds in acquisition (Hirsh-Pasek & Golinkoff 1996). Since SLI is very reasonably to be conceptualized as the outcome of a delayed developmental schedule (Rice et al. 1995), it is also a highly reasonable expectation that typical point affectations of SLI are to be more acutely found in areas that are generally critical in acquisition. This is why comprehension of relative sentences in cases of SLI became a focus of empirical attention of our research.

In the next subsections, the results of a series of tests of comprehension of relative clauses in a population of Spanish-speaking children with SLI are offered first, which clearly confirm a subject–object asymmetry trend previously observed in other languages (Adams 1990, Friedmann & Novogrodsky 2004, Håkansson & Hansson 2000, Stavrakaki 2001, van der Lely & Harris 1990). We then formulate an interpretation of this asymmetry as due to difficulties in converting the flat incoming stimulus into the hierarchical structure on which the target thought representation crucially relies on, which is different from the ones offered in prior approaches to the issue, such as 'crossing/theta-roles' (Friedmann & Novogrodsky 2007) or 'conjoined/parallel' (Sheldon 1974, Tavakolian 1981) based explanations. We argue that these interpretations, while insightful, actually offer as 'explanans' what rather is part of the 'explanandum,' while the new 'linearization' based interpretation appears to be apt to capture some unexpected connections of this phenomenon with other areas of SLI affectation.

2.2.   Materials, Participants, and Results

In order to verify the difficulties of Spanish-speaking children with relative clauses, we conducted a test comprising 20 items, namely, 10 items containing a subject relative clause like (1a) and 10 items containing an object relative clause like (1b):

(1)   *Spanish*
    a.   ¿Cuál es la   chica que viste   al   chico?
            which is DET-FEM girl   REL dresses to-DET-MASC boy
            'Which is the girl that is dressing the boy?'
    b.   ¿Cuál es la   chica a la   que peina el   chico?
            which is DET-FEM girl   to DET-FEM REL combs DET-MASC boy
            'Which is the girl that the boy is combing?'

Sentences were offered in a computer screen, along with two color images (see Figure 1 below), only one of which matched the sentence's content in terms of theta-role/gender. Agents were always in the left part of the image, and patients in the right part. For the sake of naturalness, relative clauses were

embedded within an interrogative construction—isolated relatives correspond to an uncommon utterance type. Sentences were 8 to 10 words long (subject relatives: 8/9, object relatives: 10). Variation was thus small and we disregarded this factor as asking for control.

Prior to the test, a couple of training samples were displayed to children on a computer screen, one with a subject relative and another one with an object relative. Sentences were read by an adult, who then asked children to choose the image that best matched the example. After that, a circle appeared around the target image, while the accompanying image was crossed out in blue. After guaranteeing that the participants understood the logic of the test, answers started to be recorded. Each pair of images (A and B) appeared on the screen together with a sentence that correctly described just one of them (A or B). Sentences were reread as many times as requested and no time limit was established to perform each trial. A new pair of images was only displayed after an answer was provided to the previous one. Children were simply asked to say A or B aloud.
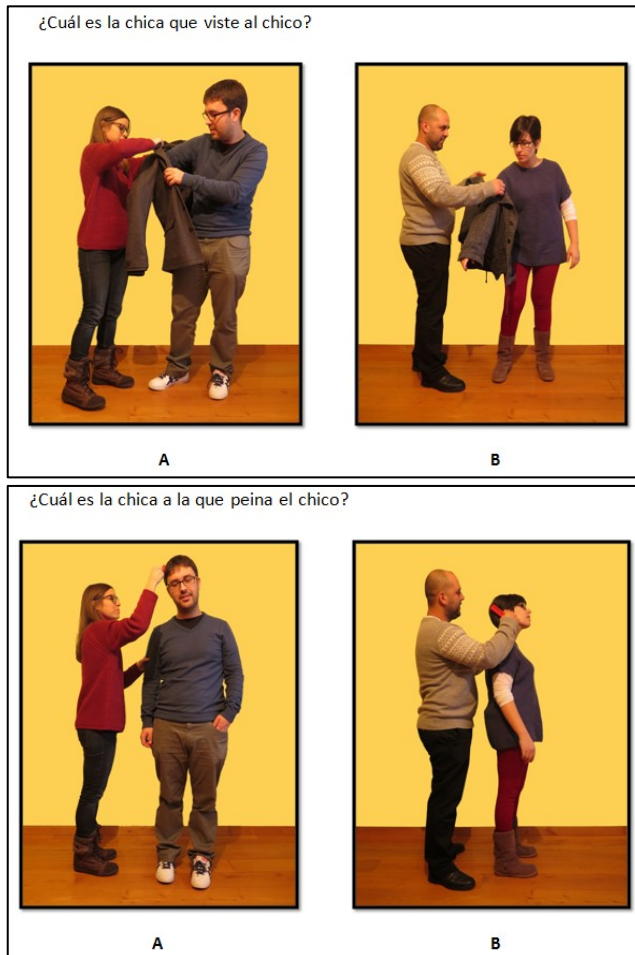

Figure 1: Images corresponding to the examples in (1) in the trials. Upper image: Which is the girl that is dressing the boy?*; lower image:* Which is the boy that the girl is combing?

Tests were carried out by 20 children with SLI (6 females, 14 males) from different locations of Spain, in age ranging from 6;8 to 15;0 (mean 11;2), as well as by 20 unimpaired children matched for chronological age who served as controls. Participants with SLI had an official diagnosis, and they had passed tests that confirmed that no other associated deficits presented such as within the autism spectrum. They attended regular schools and received special support either there or in some other institution. Controls were chosen corresponding to similar socio-economic status (medium/high). Children were speakers of different variants of Spanish: from Asturias (1), Basque Country (8), Castilla-La Mancha (2), Extremadura (2), and Madrid (7); some children also lived in bilingual communities: Asturias (Asturian and Spanish) and Basque Country (Basque and Spanish). However, errors were unexceptionally not explainable as replicas of constructions typical of the corresponding Spanish varieties or concurring languages. We consequently concluded that there was no contamination in our data due to geographical reasons.

The test confirmed that Spanish speaking children with SLI have problems of comprehension with relative clauses. Moreover, miscomprehensions were significantly higher in the case of object relatives: 158 errors were observed in this case (87.8%) out of 400 responses—20 children, 20 items each, in contrast with 22 errors in the case of subject relatives (12%). Figure 2 specifies the number of errors of each type, child by child; Figure 3 shows the number of total errors of each type, confronted with the performance of controls.

Number of errors in the comprehension of relative clauses
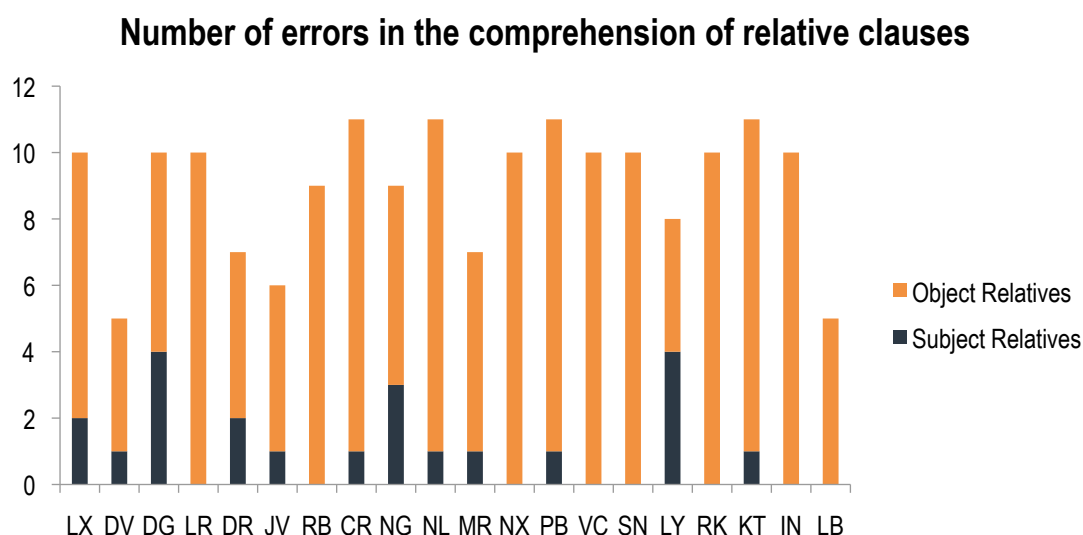
Chronological age of participants: LX = 6;8. DV = 7;4. DG = 8. LR = 8;9. DR = 9;2. JV = 9;9. RB = 9;11. CR = 10;2. NG = 10;3. NL = 10;8. MR = 10;10. NX = 11;0. PB = 11;2. VC = 12;6. SN = 13;7. LY = 14;0. RK = 14;3. KT = 14;3. NG = 14;11. LB = 15;0

Figure 2: Number of errors made by each child of the SLI group. Each correct answer counted one point; each incorrect answer counted zero. The chronological age of the participants is provided below.
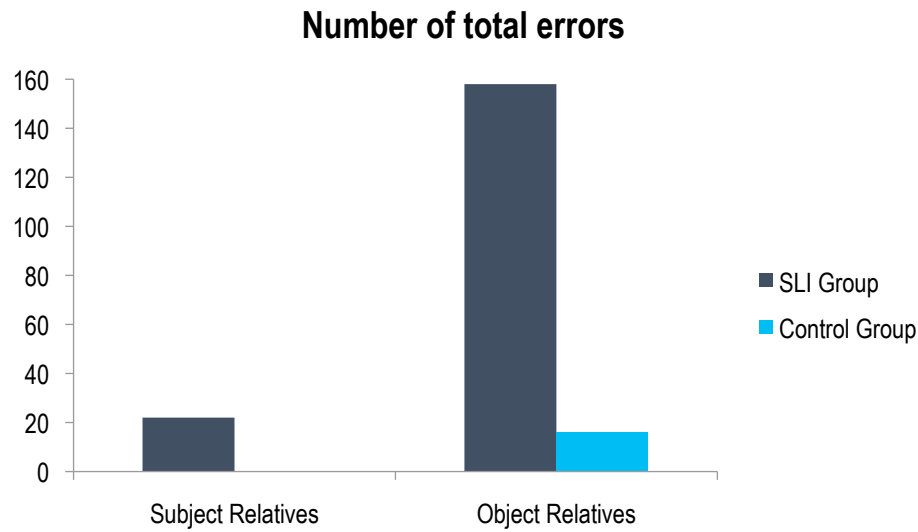
Number of total errors

Figure 3: Number of total errors of each type by SLI Group and Control Group.

2.3.   Analysis and Hypothesis

The test above was conducted to confirm the prediction that object relatives are more difficult to deal with than their subject counterparts for children with SLI, given previous observations that made us believe that they have problems with the Linearization algorithm that converts structural order into linear order—in production, and linear order into structural order—in comprehension (Lorenzo & Vares, submitted). From Kayne (1994) on, the idea is consensual that said algorithm translates asymmetric command relations into left-to-right order, as roughly represented in Figure 4.
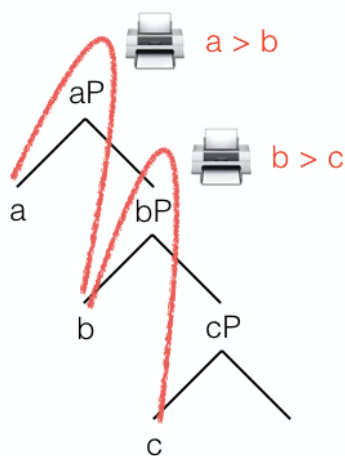

Figure 4: Linearization as based on asymmetric command—e.g. b *is a part of* aP*, but* a *is not a part of* bP*, so* a *precedes* b*. The printer icons refer to Berwick & Chomsky's (2011) metaphor for Externalization.*

In the case of relative clauses corresponding to the types illustrated in (1), Kayne's model has lead to sidestepping the traditional view according to which the antecedent of the relative (e.g., [NP *la chica*]) and the relative clause proper (e.g., [S *que viste al chico*]) are exocentrically connected (Baker 1978: 108–115), since in the absence of asymmetry, no linear order would then ensue. Kayne's (1994: 86–92) alternative suggestion is that a phrase like *la chica que viste al chico* is a nominal structure (DP), headed by a determiner (D) and complemented by a sentence (CP), the specifier of which is the landing site of the 'antecedent' NP that originates in the subject or object CP-internal positions (see also Vergnaud 1974); Kayne's analysis has been subject to minor corrections (Borsley 1997, Bianchi 2000), which are insubstantial to our concerns. Here, we accept the essentials of Kayne's analysis, but in addition we suggest the attribution of a slightly more complex structure to C, somehow along the lines of Watanabe's (1993) CP-shells. According to this suggestion, a lower C serves as the landing site for the verb—a common T-to-C effect that explains inversion phenomena typical of *wh-/th-*constructions, and an upper C where the relative pronoun is base-generated. The suggested resulting structure is offered in (2), an analysis of sentence (1a) along these lines—movement is captured as in the Copy Theory (Chomsky 1995), so traces are replaced by deleted copies:

(2)   [DP [D la [CP chica [C que [CP [C viste [TP ~~chica viste~~ al chico]]]]]]]

From this structural input, Linearization can read off the expression and flatten it as (3):

(3)   # la > chica > que > viste > al chico #

According to current minimalist assumptions, EXT related operations, including Linearization, do not occur at once; rather, in the process of material-ization internal expressions are chunked and served to EXT in a piecemeal basis. The resulting units are referred to as 'phases', which are nowadays one of the basic units of analysis of minimalist syntax (Chomsky 2001, 2008; cf. Citko 2014, for an introduction). Within this framework, it is consensual that *v*P and CP are phases, but VP and TP are not; likewise, VP is the assumed locus of complemen-tation, while *v*P is an agency-/transitivity-related projection and CP a full propo-sition which completes the bare temporal/aspectual contribution of TP. (4) details (2) along these lines:

(4)   [DP [D la [CP chica [C que [CP [C viste [TP ~~chica~~ [T ~~viste~~
                                    [*v*P ~~chica~~ [*v* ~~viste~~ [VP ~~viste~~ al chico]]]]]]]]]]]

According to Phase Theory, such an internal expression is constructed in a phase-by-phase basis, and each phase independently subserved to EXT, as in (5):

(5)   a.   [*v*P chica [*v* viste [VP ~~viste~~ al chico]]] ⇒ EXT
        b.   [CP chica [C que [CP [C viste [TP ~~chica~~ [T ~~viste~~ [*v*P ~~chica~~ [*v* ~~viste~~]]]]]]]] ⇒ EXT

Implicit in these analyses is the further consensual assumption that once a phase is subserved to EXT, its 'edge' (i.e. its upper head and Spec) continues to be active and accessible to the subsequent phase, while its 'domain' (i.e. the remaining material) is not accessible anymore.

Putting all these analytical pieces together, a relevant consequence regarding our examples is that in the case of an internal expression like (4), the subject and the object end up located at different phases. Consequently, they do not have to linearize relatively of each other, which is not the case with object relatives (see below). It is our contention that it is this particular detail that makes subject relatives more easily processable for children with SLI than object relatives. Let's dwell on this.

In the case of an object relative like (1b), the object has now to rise to an extra Spec$v$P position, where it becomes accessible to the second phase. There, the object ends up in the upper SpecCP position; in its turn, the subject raises as usual to SpecTP, which is its canonical surface position. (6) captures this set of operations from the viewpoint of Phase Theory:

(6)   a.   [$_{v}$P al chico [$_{v}$P la chica [$_{v}$ peina [$_{VP}$ ~~peina al chico~~]]]] $\Rightarrow$ EXT

        b.   [$_{CP}$ chico [$_{C}$ al [$_{CP}$ que [$_{CP}$ [$_{C}$ peina [$_{TP}$ la chica [$_{T}$ ~~peina~~ [$_{v}$P ~~al chico~~

                                          [$_{v}$ ~~peina~~]]]]]]]]] $\Rightarrow$ EXT

This analysis entails that the 'PREP/DET' *al* ('to the') and the NP *chico* ('boy') move independently of each other, the former compounding and extra C-layer, and the latter ending up, as suggested, in the SpecCP position. This technical detail is not particularly relevant to our approach. What is really substantial is that the object (in SpecCP) and the subject (in SpecTP) are now to be linearized relatively to each other at the same (upper) phase, which was not the case of (5).

From a mechanism point of view, it is to be expected that children with SLI are going to have more problems in dealing with object relatives than when dealing with subject relatives, given their independently established limitations of working memory resources (Clahsen et al. 1997, Gathercole & Baddeley 1990, Marshall et al. 2002; cf. Booth et al. 2000 and Frizelle et al. 2017 for observations on relative clauses). Plausibly, working memory limitations affect the lapse of retention of a single phase, and thus the execution of the operations that are needed in relatively more complex ones. Our hypothesis is thus that children with SLI, when confronted with utterances of a relatively complex kind, have problems arriving at the target meaning because they lack the resources for reconstructing the right system of hierarchical relations from the flat incoming stimuli they receive.

This might certainly be read, as aptly observed by a reviewer, as pointing to a non-linguistic interpretation of the problem, which would be just due to working memory limitations. For the time being, however, we only have reasons to support the idea that memory resources run out in the case of children with SLI in relation to the task of converting order-into-hierarchy—or the other way around, in the linguistic area. Admittedly, the issue demands future work in other to verify similar effects with other, non-linguistic motor and cognitive skills, in which similar conversion processes are at stake. Results like the ones

reviewed in Rechetnikov & Maitra (2009), which refer to cases of comorbidity between motor and language impairments, suggest that it might certainly be the case.

The idea might be further implemented along the lines of Richards' (2010) 'distinctness' framework, considering that in the case of object relatives what children with SLI may find difficult to linearize are two not sufficiently distinct nominal constituents within the same phase. For speakers with unimpaired grammars, these kinds of sentences are not particularly defying, given that the subject and the object are distinctly marked by means of gender/number features, as well as by a preposition in the case of the latter. But in the case of children with SLI, it is a well-known characteristic that they have problems in perceiving 'small' functional words, like prepositions (Leonard 2014), and that their grammars operate on the basis of defective bundles of features (Vares 2017). At this stage of our research, however, we don't have sufficiently strong reasons for supporting this distinctiveness based alternative. In any event, we see it as a particular, more nuanced instantiation of the one presently offered, generically based on working memory limitations (see Lorenzo & Vares, in progress).

It might also be argued that the allegedly generalized feature-composition defectiveness of representations in cases of SLI could explain, alone, the kinds of effects that have been assessed in this section—see Grillo (2009) for an analysis along these lines in the case of aphasic agrammatism. Leaving aside the question of the explanatory depth of feature-based models—raised, for example, by Boeckx (2015)—we believe that such an idea cannot however attain the kind of empirical coverage that we presently adduce in the sections to follow in favor of the linearization-based approach.

2.4. *Alternative Hypothesis and Discussion*

An influential family of explanations regarding the observed asymmetry in relative clauses comprehension by children with SLI is based on the fact that object relatives entail a pattern of crossing links which is absent in the case of subject relatives. In a subject relative (cf. (4)–(5)), the subject moves from Spec$v$P to SpecTP (the canonical position for subjects), and ultimately it lands in the higher SpecCP; the object, according to the analysis suggested here, remains VP-internal. In contrast, in an object relative (cf. (6)), the object raises from the inner VP to Spec$v$P (the phase edge), just to escape from there and landing in SpecCP. So, in this latter case, the object needs to cross the subject twice—first across Spec$v$P and then across SpecTP; no equivalent crossings are needed in the case of subject relatives. (7) captures the corresponding patterns:

(7)   a.   *Subject relatives*

   $[_{CP}$ X $[_{TP}$ X $[_{v\text{P}}$ X $[_{VP}$ Y $]]]]$

   b.   *Object relatives*

   $[_{CP}$ Y $[_{TP}$ X $[_{v\text{P}}$ Y $[_{v\text{P}}$ X $[_{VP}$ Y $]]]]]$

Crossings like the ones in (7b) have been pinpointed as critical for comprehension in cases of both aphasia (Grodzinsky 1990, 2000) and SLI (van der Lely 1996), under the assumption that they interfere with the correct assignment of theta roles to constituents. Such a tenet appears to be reinforced by the fact that the affected populations show a tendency to interpret the 'antecedents' of object relatives (canonical θ role = patient) as if they were a subject (canonical θ role = agent).

According to our interpretation, these kinds of explanations are not wrong, but they are not however deep enough, in the sense that they do not fully explain why children with SLI appear to be unable to correctly assign theta roles. Note that theta-role assignment is not based on linear order considerations. However, the above explanations seem to entail this, for they rely on the idea that (in SVO languages) an 'agent-first' rule applies, yet being a rule that can be sidestepped in constructions with O/S crossings. Children with SLI, according to this explanation, fail to change the default rule in such structural contexts.

In contrast, current minimalist syntax accounts for 'patient' and 'agent' theta-role assignment on a 'first merge = patient, second merge = agent' basis (cf. Chomsky 2008): V first merges with the object, which is read off as 'patient'; afterwards, *v* merges with the subject, which is read off as 'agent'—see Figure 5. It is crucial to the idea that Merge is a pairwise set-forming operation, the outputs of which are *unordered* sets (Chomsky 2013). This entails (as early established by Tesnière 1959) that the resulting connections are alien to linear order—so the mirror image of Figure 5 would still represent the same.
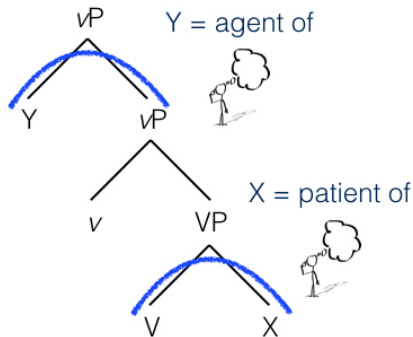

Figure 5: Theta-roles as based on successive Merge instantiations.

Thus according to our view, what may be problematic for children with SLI regarding theta roles is the reconstruction, from a flat stimulus, of the target hierarchical ordering of merge operations from which assignment ensues. Note that this entails that the mechanism that they rely on for assignment proper is the run-of-the-mill one described in the previous paragraph. The observation that children with SLI heuristically interpret antecedents as 'agents' is, certainly enough, a valuable finding; more so, considering that it is a well-known interpretive strategy in language comprehension at large (Adani & Fritzche 2015, Ferreira

2003, Gattei et al. 2015, Hirsh-Pasek & Golinkoff 1996, Pappert & Pechmann 2014; cf. Brandt et al. 2016, 2017 for the specific case of relatives), which appears to be grounded on deeper principles of general cognition (Bruner 1983: 34–35). But what ultimately makes interesting the identification of a heuristic is the reason for which the heuristic is needed, to begin with. If our interpretation is on track, then the 'agent-first' heuristic is, in the context of SLI, a patch with which children try to conceal their limitations when trying to recover structural ordering—the true realm of theta-role assignment—from linear ordering.

The alternative hypothesis that children with SLI, lacking the resources for reconstructing the recursive structure of a DP containing a relative clause, are doomed to treat the relative clause as conjoined to the antecedent (Sheldon 1974, Tavakolian 1981), deserves a similar response. According to this hypothesis, for example, (1a) would be interpreted like '*chica & viste al chico*' (lit. 'girl & she dresses the boy'), which is close enough to the target meaning; but in the case of (1b) it would be interpreted like '*chica & peina el chico*' (lit. 'girl & the boy combs'), which is an unclear meaning in Spanish. As pointed out before, prepositional marking of the object is not of much help for children with SLI. But, again, while we think that this family of explanations is certainly insightful, we also believe that it fails to clarify why children with SLI are, to begin with, unable to attribute a recursive structure to DPs.

We are aware that in order to strengthen our case, data should be provided that independently support that children with SLI have difficulties with the linearization algorithm, not solvable in terms of crossing/theta roles or conjoined interpretations. In this respect, a promissory source of information are interrogative sentences, which have actually been a frequent focus of attention in SLI research (Friedmann & Novogrodsky 2011, van der Lely & Battel 2003; cf. for the particular case of Spanish Vares 2017: 293–353). Note that, to begin with, lacking an antecedent, interpretations based on the compulsion to conjoin lack motivation in the case of interrogatives.

An important finding in this area is that, as in the case of relatives, a subject–object asymmetry also holds in the case of interrogatives, namely, object *wh*-words are frequently interpreted as subjects by children with SLI. Van der Lely & Battel (2003) consequently defend that these children have problems with the corresponding sentences because they depart from the canonical correlation between word order and theta role assignment. However, an extra non-trivial observation regarding the performance of children with SLI with interrogatives is that they rank better when the *wh*-phrase merely comprises a *wh*-word (e.g., *(a) quién* '(to) who') than when the *wh*-phrase also comprises a pied-piped noun (e.g., *(a) qué niño* '(to) what boy'). This contrast is illustrated in (8):

(8)   *Spanish*
      a.   ¿A quién está empujando la   chica?
              to who   is   pushing   the girl
            'Who is the girl pushing?'
      b.   ¿A qué   chico está fotografiando   la   chica?
              to what boy   is   taking-a-picture   the girl
            'Which boy is the girl taking a picture of?'

In order to confirm this trend, we conducted a series of tests, the details of which are summarized in Table 1.

Participants. 22 children with SLI (age: 5;1 to 15;0; mean: 10;4); 22 unimpaired children (matched for age). The demographic details of the participants almost correspond to the ones of the main experiment described in section 2.2. For concreteness, only one participant in the first experiment did not participate in this one (LX=6;8), while three extra participants, with almost identical profiles, partook in it (CR=5;2, VC=5;7, and SN=6;2).

Task. Children were presented two quasi-identical pictures (the only difference was the reversal of the role of the participants in the represented event) and asked to select the one that was coincident with the meaning of a sentence being read by the examiner. The task consisted of 20 items, 10 of which were subject questions and the other 10 were object questions. In each case, 5 questions contained a *wh*-phrase of the type *qué-N* 'which-N', and 5 a *wh*-phrase of the type *quién* 'who'.

Results. Percentages corresponding to errors of the total of answers:

	SLI Group	Control Group
Subject questions		
who	6.4%	0.9%
which-N	8.2%	0%
Object questions		
who	34.5%	1.8%
which-N	60.9%	8.2%

Table 1: Procedure and results of a series of tests conducted to evaluate the comprehension of interrogative sentences.

As Table 1 shows, the comprehension of questions decreases when the *wh*-phrase is the object. According to our suggestions, both the object and the subject land, in this case, in the same upper phase, namely, the object in SpecCP and the subject in SpecTP. Consequently, they have to be linearized relative to each other, creating difficulties to children with SLI. This particular aspect of the trend could arguably still be explained in terms of crossing/theta roles difficulties. But Table 1 also shows that miscomprehension of object interrogatives increases when the *wh*-phrase incorporates a NP—a fact that in contrast is not amenable to explanation resorting to crossing/theta role considerations. However, our hypothesis predicts it because in this case the linearization procedure needs to apply not just to solve the object/subject relative ordering, but also the relative order of constituents within the *wh*-phrase, roughly like represented in (9)—see also Figure 6.

(9)   [$_{CP}$ [$_{WhP}$ Wh [$_{NP}$ N]] [$_C$ V [$_{TP}$ DP$_{subject}$ [$_T$ T …
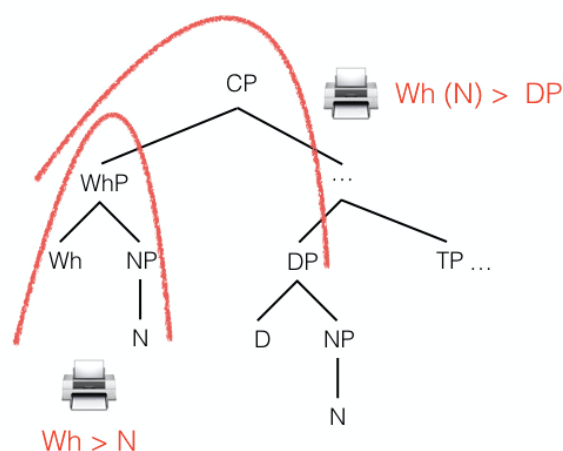

Figure 6: Detail of the linearization of the upper phase of an object wh-*NP interrogative.*

We thus conclude that the results reflected in Table 1 are fully expected from the point of view of our linearization-based hypothesis, while alternative frames would need to resort to *ad hoc* explanations (Friedmann & Novogrodsky 2011).

3.   Core Computations: Are They Impaired or Spared?

3.1.   In Search of Specific Externalization Impairments

In the previous section we offered support for the idea that Linearization is an extra source of difficulties to children with SLI, which add to previously reported problems with Morphology and Phonology. So we conclude that it may be legitimate to claim that a natural class of specific impairments exists, which extends along the whole EXT component. This new section is devoted to complete this idea by trying to show that children with the same diagnostic profile do not contrarily manifest problems attributable to core computations. If the idea is on the right track, then the further claim could be made that the observed affectations are specific to the EXT component, paving the way for defending that there exists a family of Specific EXT Impairments (SEXTI).

The data that we shall offer here in support of the thesis is taken from some other parallel projects of us. So we shall introduce them more expediently than in the previous section and refer readers to the relevant sources. They relate to two different areas of affectation of SLI, namely, object clitic agreement and pied-piping effects in interrogatives. Together, they offer support to the idea that core computations are subject to the kinds of 'third factor' effects that Chomsky (2005, and subsequent works) pinpoints as the distinctive seal of core, thought-related internal computations. We argue that 'third factor' governed computations func-

tion equally the same in children with and without SLI, save for the fact that in the case of the former they run 'wildly', so to speak, for they escape the vigilance of UG conditions, which we suggest are exercised from the EXT component.

3.2. Subject Agreement in Object Clitics

In conducting a series of tests aimed at documenting the performance of children with SLI with object clitics in Spanish, we found the very salient pattern that object clitics tend to agree with the subject in number and gender features. For example, when children were asked to substitute a NP with a pronoun chosen among two possibilities (one pronoun with features that matched the subject, and another pronoun with features that matched the object), subject agreement was the preferred option in 54.1% of the answers (Lorenzo & Vares, submitted, Vares 2017). (10) offers an example, introduced by the expected correct answer (target):

(10)   *Spanish*
    a.   Los   chicos   la   ven.   (target)
          the-PL boy-MASC-PL CL-FEM-SG see-3-PL
          'The boys see her.'
    b.   Los   chicos   los   ven.
          the-PL boy-MASC-PL CL-MASC-PL see-3-PL
          lit. 'The boys see them.'

According to our analysis and interpretation of this observation, a transitive *v*P-structure containing an object clitic may be thought to be articulated like in (11):

(11)   [$_{vP}$ CL [$_{vP}$ NP-NOM [$_{vP}$ *v* [$_{VP}$ V pro-ACC]]]]

From this point of departure, the clitic, containing unvalued agreement features, behaves as a probe in search of the nearest goal apt to value such features. In normal circumstances (the ones captured in (11)), NOM, a non-interpretable case feature, signals that the NP, despite being the closest to the probe, is of a different kind and must be skipped. So the clitic extends the search until the unit marked with the ACC-feature and gets correctly valued. In the case of SLI grammars, however, bundles of features are commonly defective (Vares 2017), so it is reasonable to interpret cases like (10b) above as the effect of the subject and object not being abstractly case marked. As a consequence, the probe, now acting on a bare minimal basis, chooses the nearest candidate as its goal. Note that, if the suggestion is on the right track, these kinds of examples would be illustrative of a grammatical regime in radical agreement with the Strong Minimalist Thesis (Chomsky 2000); in other words, illustrative not of an imperfect grammar, but of a grammar free of imperfections (Lorenzo & Vares, submitted).

3.3. Anti Pied-Piping Effects

Another unexpected pattern that we found in tests aimed at documenting the

performance of children with SLI in the domain of interrogative sentences, is one that we interpret as an 'anti pied-piping' effect (Lorenzo & Vares, submitted, Vares 2017). According to our tests, most of the productions of children with SLI contain different kinds of errors in this area, a quarter of which (26.5%) are grammatical errors—i.e. not semantic or pragmatic ones. We unexpectedly found that 34.6% of this portion of grammatical errors could be described as cases in which something akin to a restrictor element was left behind instead of pied-piping with the interrogative operator. An illustrative example is offer in (12), where the restrictor-like element appears in bold type:

(12)   *Spanish*
       Ese niño, ¿qué va   a   escoger **de camiseta**?
       this boy   what is-going to choose   of t-shirt
       lit. 'This boy, what is he going to choose of t-shirt?'
       (target: 'What t-shirt will the boy choose?')

Taking this example as representative of the phenomenon (see Lorenzo & Vares, submitted, and Vares 2017, for a more nuanced approach regarding this and other less clear examples), we interpret that children with SLI start the derivation with a constituent in the VP-complement position that contains a full-fledged 'operator/restrictor' structure—'*wh* (x)|t-shirt (x).' In normal circumstances, movement of this constituent to SpecCP is driven by a non-interpretable EPP feature in C. This feature acts as a probe in search of a goal containing, in this case, a '*wh*' feature. 'Minimal Search' in the sense of Chomsky (2013) forces the chosen constituent to be the closest from C that contains the feature, thus the whole constituent comprising both the operator and the restrictor. But again, SLI grammars commonly work on the basis of defective bundles of features, so the EPP feature is sometimes absent. In these cases, 'Minimal Search' is not operative as in the normal situation, and an alternative principle of optimization operates in its place, namely, one that forces the operation to move the minimal amount of structure possible (Watanabe 1993: 61), in order to attain a logical form corresponding to a demand of information: Thus, in this particular case, the operator part of the constituent moves, leaving behind the restrictor. Note that, again, it is not that the grammar of children with SLI is imperfect: It rather is that, freed of a non-interpretable feature, it approximates to the minimalist ideal of perfection more than spared grammars.

4.   Conclusions

This paper points to the conclusion that a substantial part of the linguistic affectations of children with SLI may be due to problems focused on the EXT component of language—as independently argued by Corver et al. (2012) and Leivada (2015), and more specifically on the Linearization procedure that translates hierarchical order into linear order (in production), and linear order into hierarchical order (in comprehension). If, as also concluded here, core, thought-related computations are in its turn spared in the population under

consideration—as witnessed by the fact that they appear to still obey to principles of optimal design, then the important result follows that Chomsky's 'thought/externalization' divide gets independent support from Clinical Linguistics. Such a result may also serve to vindicate the role of this field of expertise in the context of biolinguistic explorations.

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★ FORUM ★

Notice

As another year comes to a close, so does the 11th volume of *Biolinguistics* in 2017 —which, in terms of workload and organization, centered around a very special *special issue* on the 50th anniversary of the publication of Eric H. Lenneberg's *Biological Foundations of Language* (New York: Wiley, 1967). The idea was initiated by Patrick C. Trettenbrein, who then acted as guest editor for it. This *Biolinguistics* 11.SI is (almost) completed. It is now also available from the journal website just as the regular volume is. And I would like to use this opportunity to welcome any potential guest editor to come up with a fitting suggestion for a special issue in any of our upcoming volumes; if you are interested, please get in touch.

I am particularly grateful to all the reviewers that have served *Biolinguistics* throughout 2017. They are listed below by name for both the regular volume and the special issue (in alphabetical order). A particularly warm thank you is due to Patrick C. Trettenbrein, who undertook a tremendous task with the special issue —from conception to organization and administration, all the way to being fully in charge throughout the year communicating with contributors and reviewers, but also editing, formatting, and putting it all together. For everything else, I thank all supporters as well as the members of the *Biolinguistics* Advisory Board, the Editorial Board, and the Task Team that are not specifically mentioned by name for active participation and constructive feedback all the way through.

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