

Children Don't Like Restrictions: Evidence from the Acquisition of Object A'-dependencies in French¹

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Children's difficulties with headed object A'-dependencies have been attributed, on the one hand, to the intervention of a structurally similar element (the subject) in the interpretive chain formed by the moved object with the gap, and on the other, to the incremental processing of these constructions. This study brings new evidence to show that structural similarity as a source of difficulty is overridden by semantic properties such as set-restriction and animacy, and that the processing of these properties relates to working memory capacities. 119 French-speaking children were tested on the comprehension of object relative clauses and wh-questions by using a character-selection task. Working memory was assessed through digit-span tasks. Results show significantly better performance for –Set-restricted object A'-dependencies than for +Set-restricted ones across all age groups. The mismatch in animacy also modulates comprehension, but its effect becomes relevant only for the older children and in cases where the object is +Set-restricted. We argue that an analysis purely in terms of syntactic similarity cannot capture these effects. Moreover, the weaker effect of working memory on the accuracy of –Set-restriction structures shows that the soliciting of working memory resources depends on the nature of the disambiguating information.

1. Introduction

Relative clauses and wh-questions have been extensively investigated in language acquisition and processing because of their structural complexity, which requires interpreting constituents in a position (the gap) different from the one in which they are pronounced (the filler). This is illustrated in (1) and (2) below which show the filler in italics and the gap as “___”:

(1a) *The elephant* that ___ is chasing the lion.

(1b) *Which elephant* ___ is chasing the lion?

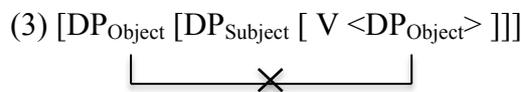
(2a) *The elephant* that the lion is chasing ___.

(2b) *Which elephant* is the lion chasing ___?

For instance, the DPs ‘the elephant’ in the relative clause and ‘which elephant’ in the wh-question are pronounced sentence initially in (1) and (2), but they are interpreted as the subject of the verb ‘chase’ in (1) and as the object in (2). A common cross-linguistic finding is that subject dependencies like those illustrated in (1a) and (1b) are easier to produce and comprehend than object dependencies as in (2a) and (2b). This has been reported in a variety of studies with typically developing (Brown 1972, Goodluck & Tavakolian 1982, Labelle 1990, Arnon 2005, 2010) or hearing-impaired children (Volpato & Adani 2009), healthy adults (Frauenfelder et al. 1980, Frazier and Clifton 1983, Crain and Fodor 1985) and aphasic patients (Avrutin 2000, Garraffa & Grillo 2007, Grillo 2008).

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Various accounts have tried to explain how children fine-tune their abilities to compute such complex dependencies (see Guasti 2002 for a review). A more recent proposal focuses on the structural processes that affect the way children deploy this knowledge (Friedmann, Belletti & Rizzi 2009; Belletti, Friedmann, Brunato & Rizzi 2012). The structural account put forth in Friedmann et al. (2009) claims that children's selective difficulties with certain types of object relative clauses and *wh*-questions stem from the presence of an embedded subject DP ('the lion' in (2)) in the interpretive chain formed by the moved object with the gap. This element intervenes between the fronted object DP ('the elephant') and its position of origin and is a potential competitor in establishing the relevant filler-gap relation because the two share a similar structure: both are full DPs (lexically-restricted or [+NP], to use Friedmann's et al. terminology). As such, the subject DP hinders the realization of the correct grammatical dependency between the moved constituent and its original position, as shown in (3):



On the other hand, Goodluck (2010) challenges this approach and suggests that children's difficulties result from the pressure that certain computations place on their limited processing abilities and this pressure is not necessarily grounded in structural sources. She claims that the structural approach has theoretical and empirical drawbacks. On a theoretical level, Friedman et al.'s proposal implies that child grammar does not contain an A and A-bar distinction. Indeed the structures in (1) and (2) are grammatical in adult grammar because the intervening DP does not occupy an A'-position and is thus not 'similar' to the fronted object in this respect. An analysis where children would not take this into account appears to violate the continuity approach to language acquisition (Pinker 1984; Crain 1991). However the evidence to date suggests that despite some differences between child and adult grammar in terms of question formation and relativization, child performance reveals a clear awareness of functional projections including CP and hence of A/A-bar distinctions (Thornton 1995; Goodluck et al. 2006). The structural analysis is also questioned on an empirical level in light of preliminary evidence provided by Goodluck (2005). The latter study assessed children's performance with *who* and *which* questions, including *wh*-phrases with different semantic information, such as the presence or absence of set-restriction, i.e. *which zebra* (+set-restricted) vs *which animal* (-set-restricted). Set-restricted *which*-questions were found to be more problematic, which Goodluck (2009) argues cannot be accounted for in terms of Friedman et al.'s analysis. Goodluck opts instead for an approach in terms of increased processing load brought about by properties that are not structural, such as set-restriction, and which also show an impact in the more subtle form of slower reading-times in adults (Donkers et al. 2013).

Our study taps into this debate by investigating (a) the effect of the non-structural properties set-restriction coupled with animacy on the comprehension of A'-dependencies and (b) how this links to working memory (WM) capacities. This is the

first study that looks into how French typically developing children comprehend object relative clauses and wh-questions which vary in the amount of semantic information conveyed by the object DP (i.e. whether the object DP is more or less restrictive in the set of potential referents it presupposes). The study also examines whether children are sensitive to the animacy feature of the object DP and whether they draw on the mismatch in animacy between the object and the subject when processing these structures. Whereas the manipulation of semantic properties is not expected to modulate comprehension under the structural intervention account (which focuses on the presence or absence of a +NP feature on the subject and the object), it should facilitate comprehension from a processing perspective, since it offers children additional cues as to how to interpret the structure, therefore decreasing processing costs.

Given the complexity of A'-dependencies, we also investigate the relation between children's processing abilities and working memory resources, while aiming to determine whether accessing different types of referents solicits children's working memory capacities to the same degree. If the computation of such dependencies and of the featural relations between their constituents builds not only upon grammatical abilities, but also on other cognitive capacities such as working memory, then we should observe a link in our study between successful processing of these relations and increased working memory resources.

These issues are of particular interest given recent findings that certain semantic features hinder or enhance the processing of object filler-gap dependencies, both in adults and children. Based on a self-paced reading experiment with English adults, Gordon et al. 2004 report that weaker set-restriction facilitates processing of object relative clauses. Similarly, Donkers et al. (2013) argue that Dutch adults display faster reading times for object questions introduced by *who* and *which person* than for *which N* questions (where N represents a noun that has a more specific reference than *person*). They take this as evidence for a higher processing cost associated with *which N* questions, as their interpretation requires access to a more restrictive set than *who* or the generic *which person*. Such an effect has also been reported for children. As previously noted, Goodluck (2005) shows that English speaking children aged 4 to 6, when tested on an act-out task, comprehend object questions introduced by a less specific referent such as *which animal* better than when the wh-phrase was more specific (e.g. *which lion*).

Another factor that modulates comprehension of object A'-dependencies is the animacy of the subject and object constituents. An animacy mismatch between the subject and the head of the object relative modulates performance in 9-year-old Italian children (Arosio et al. 2010). Object relative clauses with an inanimate head are easier for Italian children to parse than object relative clauses headed by an animate noun. This has also been shown for sentence processing with adult speakers of Dutch (Mak et al., 2002) and French (Baudiffier et al., 2011). However to date, no research has determined if the animacy feature impacts different relative clauses and wh-questions to the same extent or whether there is a developmental effect across age groups, so as to pinpoint when

children become sensitive to animacy as a relevant feature for filler-gap dependencies. It is also worth noting that animacy is not morpho-syntactically realized on the verb in French. In the framework put forth by Belletti et al. (2012), the featural specifications which play a role in the computation of similarity between the moved object DP and the intervening subject are those features that belong to the phi-feature complex of the verbal inflection, and as such determine movement to the subject position. According to this view, one would not expect a mismatch in animacy to modulate comprehension of object A'-dependencies in French-speaking children.

Given the complex structure of filler-gap dependencies, their successful processing requires a fine computation not only of the structural relationships between the various constituents, but also of the referential properties of the nominal expressions that enter into such dependencies. Parsing of A'-dependencies thus involves maintaining and manipulating information in memory. This suggests that limited memory resources might translate into limitations of interpretation processes in immature cognitive systems. Some empirical evidence exists in favor of this view: a study by Arosio, Guasti & Stucchi (2010) investigated processing and offline comprehension of relative clauses in Italian children (mean age 9;3) through a self-paced listening task followed by a final comprehension question. Alongside this task, the authors also investigated the role of memory on sentence comprehension with both a forward digit-span task (d-span), and a listening span test (w-span). Their results show that the d-span task modulates comprehension of object RCs, but no effect of w-span was found: children with higher phonological short-term storage resources, as measured by digit-span tasks, succeed better in the processing of A'-dependencies. An effect of forward digit span on the online comprehension of subject and object relative clauses is also reported in Booth, MacWhinney and Harasaki for typically-developing 8- to 12-year-old English children.

2. Participants, Procedure and Materials

In our study we aimed to understand to what extent comprehension of object relative clauses and wh-questions is modulated in children by manipulating the semantic properties of the object DP (i.e. set-restriction and animacy) with respect to the intervening subject, which was always a set-restricted animate DP. Given recent claims in the literature that children's difficulties with these structures might stem from limitations in computational capacities, we also evaluated the impact that working memory resources have on the processing of such complex structures across four age groups.

119 typically developing French-speaking children took part in the study. There were twenty-eight 5-year-olds (mean age 5;2, ranging 4;8 to 5;11), thirty-two 7-year-olds (mean age 7;0, ranging 6;6 to 7;7), thirty-one 9-year-olds (mean age 9;2, ranging 8;7 to 10;0) and twenty-eight 11-year-olds (mean age 11;2, ranging 10;9 to 11;10). All children were recruited from two schools in the Geneva area, Switzerland. Children were tested individually in a quiet room at school, and each session lasted about twenty to thirty minutes. The experimental phase started with a warm-up part during which the experimenter explained the task and practiced precise pointing with the children. The

warm-up was followed by two practice sentences and then by the actual experimental trials. Children's responses were recorded on the response sheet by the experimenter.

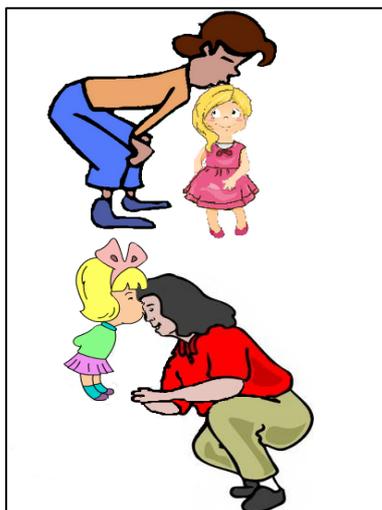
Character-selection task

The study was carried out using a character-selection task adapted to French from Friedmann et al.'s (2009) design for Hebrew. The experimental material consisted of 16 sets of pictures representing reversible transitive actions involving different pairs of human and animal characters, as well as objects. Each picture set depicted four characters that were performing the same action but with reversed Agent-Patient roles.

We used a 2 (set-restriction) x 2 (type of Abar-dependency) x 2 (object animacy) design. Set-restriction (+Set-restricted/ -Set-restricted) was a between-subject variable, whereas the type of A-bar-dependency (relative clause/ wh-question) and the animacy of the object (+Animate/ -Animate) were used as within-subject variables. All the nouns that designated the object of the action in the +set-restricted condition were replaced with only four nouns in the -Set-restricted condition (*personne* 'person', *animal* 'animal', *chose* 'thing', and *objet* 'object'). The nouns used were in the singular form and they were matched for gender (there were always two masculine or two feminine noun phrases). Since *personne* 'person' and *chose* 'thing' are feminine in French, they were paired with feminine subject nouns. *Animal* 'animal' and *objet* 'object', which are masculine, were used with masculine subject noun phrases. This was to ensure that children do not use gender mismatch as a cue for comprehension.

Figures 1 and 2 illustrate the sets of pictures for the animacy match and animacy mismatch conditions. The examples associated with each picture report the type of relative clauses and wh-questions used throughout the experiment: (4a,c) and (5a,c) exemplify the items for the +Set-restricted condition; (4b,d) and (5b,d) represent items in the -Set-restricted condition. The same pictures were used with both +Set-restricted and -Set-restricted nouns.

Figure 1. Picture and items for the animacy match condition



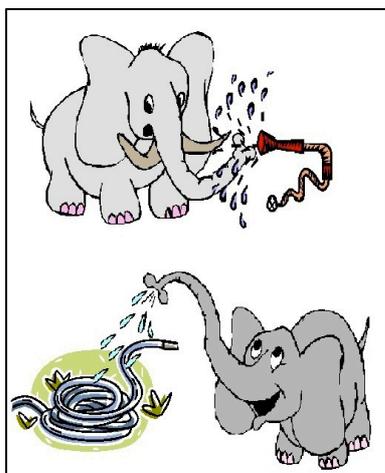
Relative Clauses

- (4a) Montre-moi *la dame* que la fille embrasse.
show-me the lady that the girl kisses
- (4b) Montre-moi *la personne* que la fille embrasse.
show-me the person that the girl kisses

Wh-questions

- (4c) *Quelle dame* est-ce que la fille embrasse?
which lady ESK the girl kisses
- (4d) *Quelle personne* est-ce que la fille embrasse?
which person ESK the girl kisses

Figure 2. Picture and items for the animacy mismatch condition



Relative Clauses

- (5a) Montre-moi *le tuyau* que l'éléphant arrose.
show-me the hose that the elephant splashes
- (5b) Montre-moi *l'objet* que l'éléphant arrose.
show-me the object that the elephant splashes

Wh-questions

- (5c) *Quel tuyau* est-ce que l'éléphant arrose?
which hose ESK the elephant splashes
- (5d) *Quel objet* est-ce que l'éléphant arrose?
which object ESK the elephant splashes

Each child was presented with 16 test sentences in a randomized order. Filler items were used to ensure that participants did not develop answer strategies and to control for their level of attention throughout the task. Every sentence was associated with a different picture.

Digit-span task

A standardized digit span task taken from the Wechsler Intelligence Scale for Children (WISC IV, Wechsler 2005) was administered to children in order to measure their verbal short-term memory. In the forward digit task, children listen to a sequence of numbers and immediately repeat them aloud in the same order. In the backward digit task, children have to repeat the series of digits in the reverse order of presentation. The length of each sequence of numbers increases from 2 to 9 as the child responds correctly. The number series are presented in blocks of two and the task is stopped when children miss 2 out of the 2 trials within one block.

3. Results

The graphs below show the participants' accuracy in the comprehension of object relative clauses (Figure 3) and object wh-questions (Figure 4). We measured children's accuracy by calculating the mean number of responses they gave by pointing to the correct character within the image that contained the same agent-patient mapping as expressed in the test sentence. The bars in each graph represent the standard errors.

Figure 3. Mean of Correct Responses for Relative Clauses

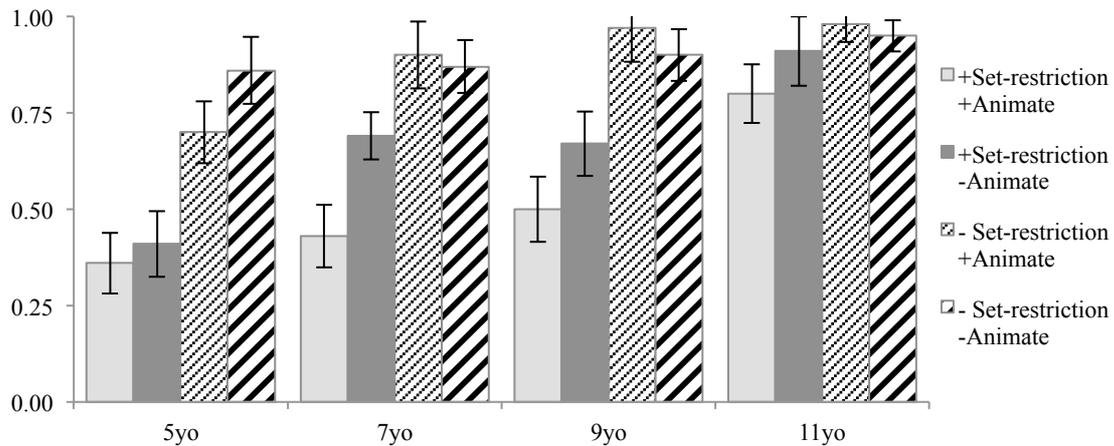
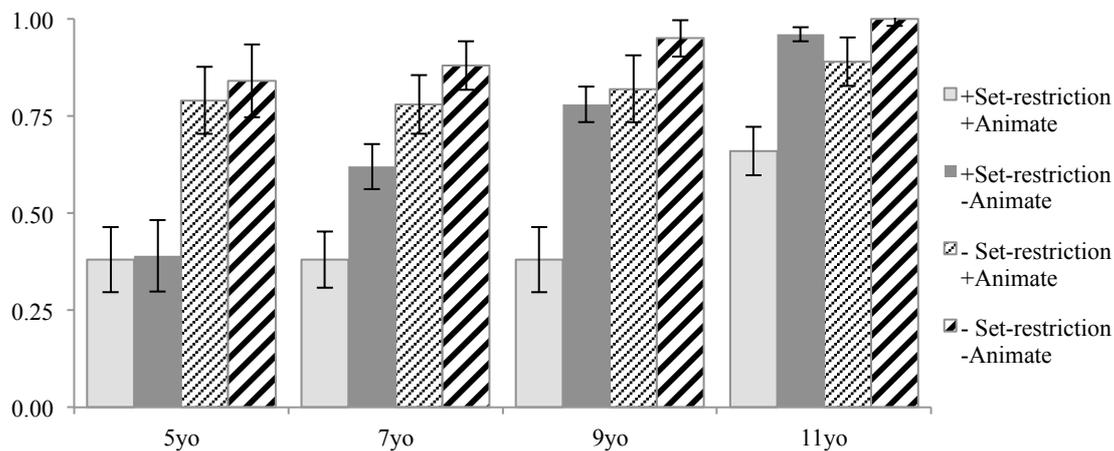


Figure 4. Mean of Correct Responses for Wh-questions



The results show that children’s comprehension of object A’-dependencies sharply increases when the moved A’-object is –Set-restricted. The configurations that pose the most difficulties to children are those in which both the intervening subject and the A’-object are +Set-restricted +Animate. Younger children’s accuracy with these structures is as low as 36%, for relative clauses, and 38% for wh-questions. This difficulty persists beyond the age of 9, remaining clearly observable even in the 11-year-old children who are otherwise at ceiling for the other conditions that we tested. The presence of an inanimate object also boosts children’s performance, as illustrated by higher accuracy scores in the +Set-restricted –Animate conditions. Interestingly, the mismatch in animacy does not help the 5-year-olds, for whom +Set-restricted + Animate and +Set-restricted- Animate conditions are equally hard.

As for the working memory task, most of children’s forward digit span scores (Figure 5) range from 3 to 6, while the majority of the backward digit span scores (Figure 6) are between 0 and 4. The 5 year-olds’ digit-span scores are overall lower than those of the other age groups. The results are illustrated in Figures 5 and 6 below.

Figure 5. Forward d-span scores per Age Group

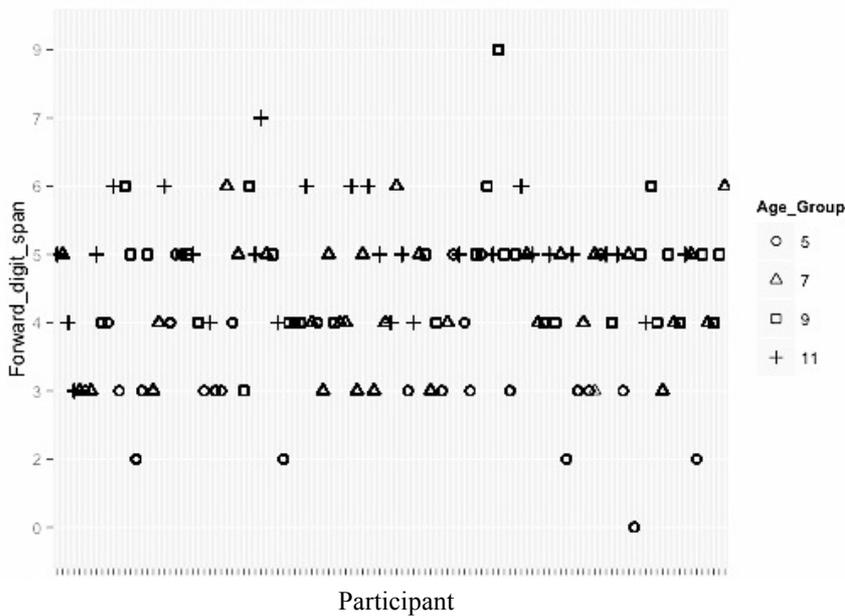
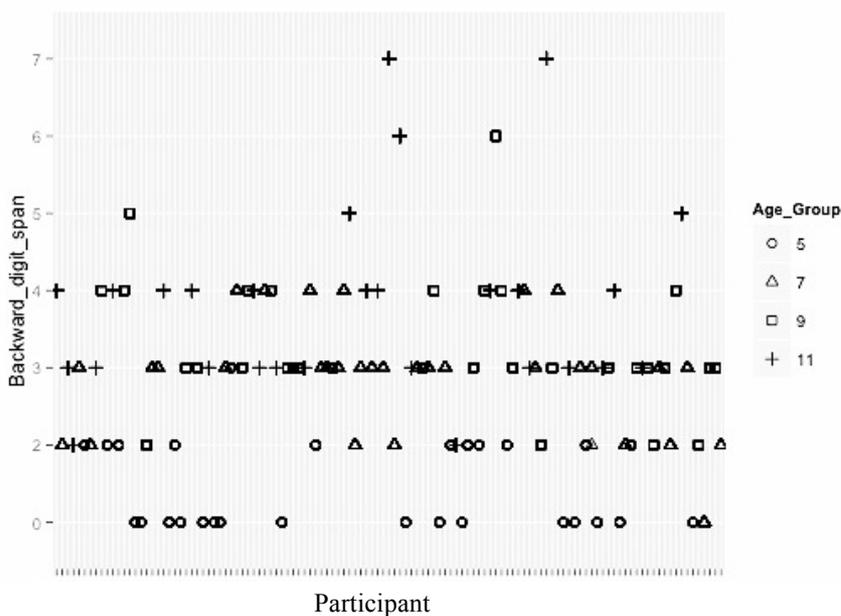


Figure 6. Backward d-span scores per Age Group



To investigate differences between the two +Set-restricted and -Set-restricted groups, and the effect that an animacy match or mismatch has on the comprehension of both object relative clauses and wh-questions, we ran a logistic mixed effects model. The data were analyzed using the lme4 software package in R (Bates, 2007). The fixed predictors were (i) Set-restriction, (ii) Abar-dependency, (iii) Animacy, (iv) Forward digit span, (v) Backward digit span and (vi) Age. Age was included as a between-subjects variable in order to compare performance across the four age groups tested. Participants and items were modeled as simultaneous random effects on both intercept and slope to ensure that

the effects observed for the fixed-effects predictor variables reflected the slopes for these effects and not between-participant and between-item variance (Baayen et al., 2008). A series of models were run and compared using the *anova* function in *R*. Only the significant results of the model that best fit the data are given in Table 1 below.

Table 1. Fixed effect estimates for GLMER of correct answers (Correct_Character ~ Set-restriction * Dependency_Type * Animacy * Forward d-span + Backward d-span + Age Group + (1 + Group + Forward d-span + Backward_d-span | Participant) + (1 | Item), N = 1904, log-likelihood = -879.18)

Fixed effect	Coefficient	SE	Wald Z	p
(Intercept)	-2.53	0.915	2.76	< .001
Set-restriction = + <i>Set-restricted</i>	-1.86	0.643	-2.89	< .001
Animacy = <i>Inanimate</i>	3.01	1.266	2.38	< .01
Forward d-span	0.58	0.234	2.48	< .01
Age Group	0.31	0.062	5.08	< .0001
Animacy:Forward_d-span	-0.71	0.300	-2.37	< .01
Set-restriction:Animacy:Forward d-span	0.76	0.349	2.20	< .01

Table 2. Summary of random subject and item effects in the mixed logit model

Random effect	s^2
Subject Intercept	0.132
Set-restriction = + <i>Set-restricted</i>	0.012
Forward d-span	0.057
Backward d-span	0.0002
Item Intercept	0.137

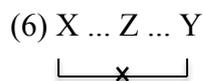
The analysis revealed several main effects. First, children performed significantly worse with structures in which the object was +Set-restricted than when it was –Set-restricted (coefficient = -1.86, $z = -2.89$, $p < .001$). Three factors enhance children’s comprehension of object A’-dependencies: the inanimate character of the object (coefficient = 3.01, $z = 2.38$, $p < .01$), higher working memory scores (coefficient = 0.58, $z = 2.48$, $p < .01$), and age (coefficient = 0.31, $z = 5.08$, $p < .0001$). Finally, the interaction between forward digit-span scores, object animacy and set-restriction reflects the fact that higher forward digit-span scores are associated with better performance in the most difficult structures, namely those in which the Abar-object is +Set-restricted +Animate. Crucially, there was no significant effect of backward digit-span ($p > 0.5$).

4. Summary and discussion

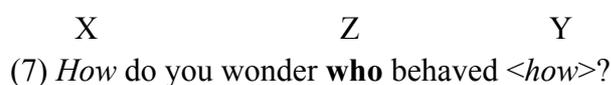
The goals of our study were to investigate whether different semantic features, such as set-restriction and animacy, affect the comprehension of A’-dependencies and whether individual memory differences modulate the comprehension of these structures. Our results show that the comprehension of object filler-gap dependencies is enhanced in

French-speaking children when the semantic properties of the object DPs are manipulated. This means that children perform more accurately when the object DP denotes a nominal referring to a less restrictive set (e.g. *The animal that the lion is chasing*), rather than when both the intervening subject and the A'-moved object belong to a more restrictive class of referents (e.g. *The elephant that the lion is chasing*). This effect surfaces to the same degree in both relative clauses and wh-questions. When tested on the comprehension of +Set-restricted object A'-dependencies with an animacy mismatch, French-speaking 7, 9 and 11-year-olds perform more accurately when the moved object is inanimate (e.g. *The hose that the elephant is splashing*) than when it is animate (e.g. *The elephant that the lion is chasing*). However, this effect is absent in the 5-year-olds, as well as in all the age groups when the A'-moved object is -Set-restricted. Whereas the lack of an animacy effect in the -Set-restricted condition is due to the fact that children perform almost at ceiling with these structures, its absence in the 5-year-olds suggests that children at this age cannot draw on the animacy mismatch cue to assign the correct interpretation to the object A-bar-dependencies. At least for off-line comprehension measures, animacy dissimilarities *per se* do not improve young children's performance with object relative clauses and wh-questions. These results are in line with those reported by Adani (2010) who also found that 5-year-old German children struggle with all object relative clauses, irrespective of the animate or inanimate nature of the head noun.

Children's overall enhanced performance with A-bar-dependencies introduced by -Set-restricted and inanimate objects does not follow straightforwardly from the structural intervention account. To recall, this account identifies the presence of a similar [+NP] element (the subject) in the interpretive chain formed by the moved object with the gap as the source of children's difficulties. More specifically, Friedmann et al. (2009) interpret this difficulty as stemming from the creation an intervention configuration reminiscent of the general locality principle of Relativized Minimality (RM), which also exerts pervasive effects in adult grammar and imposes constraints on the syntactic relations that can hold between a displaced element and the position where it originates in the sentence. The main idea behind RM is that a local relation between X and Y in the configuration (6) cannot be established if there is an intervener Z that is a potential candidate for the same local relation.



In its original formulation, the concept of RM (Rizzi 1990, 2004) was devised to account for the impossibility to extract some wh-elements from islands. For example, in (7), the wh-element *how* cannot be linked to its copy due to intervention of another wh-element *who*, which qualifies as a closer candidate for the same relation.



Put differently, the A'-dependency created by *how* fails because the terms to be connected in this dependency are separated by an intervener potentially involved in the A'-relation, i.e. the A'-element *who*. Building on Starke (2001), Friedmann et al. (2009) adopt a featural interpretation of the RM approach to account for the intervention effects that appear in object relative clauses and wh-questions in children, which do not involve an intervening A'-element but nevertheless trigger difficulties in comprehension. They thus assume that children are only able to compute configurations in which the target X (the moved object DP) and the intervener Z (the embedded subject DP) have *disjoint* featural specifications. This is why children cannot parse configurations in which the [+NP] (lexical restriction) feature on the potential intervener is *included* in the set of features of the target. Such structures are ruled out as minimality violations in the child system, although they are accessible to analysis for adults. The stricter requirement present in child grammar stems from children's inability to compute subset relations between the features on the target and those on the intervener. This is schematically represented in (8) for object relative clauses and in (9) for object wh-questions: the feature shared by the two lexically-restricted elements is [+NP], and the features which act as attractors for the object DP are [+R], in the case of the relative clause, and [+WH], in the case of the interrogative.

+R +D +NP +D +NP <+R +D +NP>
 (8) The elephant [that the lion is chasing <the elephant>].

+WH +D +NP +D +NP <+WH +D +NP>
 (9) Which elephant [is the lion chasing <which elephant>]?

More recently, Belletti et al. (2012) refined the definition of structural similarity between the moved object and the intervening subject. The authors show that Hebrew-speaking children, but not Italian-speaking children, comprehend object relative clauses better when the subject and object DPs have different gender values (e.g. *The clown that the girl is drawing*). They relate this effect to the specific morpho-syntactic properties of gender in Hebrew, since gender acts as a trigger of movement in this language and is overtly marked on inflected verbs. In their revised system, an intersection relation between features is introduced, showing that children can compute structures in which the intervener and the moved object filler differ in at least one relevant feature (i.e. gender in Hebrew) although they are both lexically restricted. To summarize, cases of identity and inclusion are problematic for children and they are only able to compute configurations in which there is an intersection or a disjunction relation between the featural specifications of the A'-moved object X and the embedded subject Z.

However, our study shows that the semantic manipulation of set-restriction and animacy clearly affect processing in children, an unexpected result according to the structural view. While children struggle with configurations in which both the moved object and the subject are +NP +Set-restricted, they perform significantly better when the wh-object is 'semantically light' (-Set-restricted), despite the presence of a [+NP] feature. This is

particularly interesting since the experimental setting links both the +Set-restricted and –Set-restricted nominal expressions to a context with a limited number of referents. Our study shows that children are capable of using information about the syntactic roles of the referents in the given context and that they have a target-like syntactic representation of the input. What seems to challenge children is thus the operation of set restriction and the difficulty of constructing the representation of the +set-restricted element. The processing approach claims that this operation is associated with an increased processing load: one can argue that the representation of all the features necessary to distinguish the moved object DP from the intervening subject in the case of the +set-restricted configurations has a processing cost that might simply be too high to pay for children which, in turn, will generate comprehension difficulties. This analysis appears to be on the right track given the effect of forward digit-span scores on response accuracy.

Regarding animacy, children as of age 7 years show improved scores once the moved object is marked [–Animate], although answers are significantly more accurate in the –Set-restricted condition which reduces this effect of animacy mismatch on performance. When necessary, i.e. when processing load is already high in the +Set-restricted condition, animacy seems to serve as a semantic cue facilitating theta-role assignment. Put differently, it is more likely that an inanimate entity be assigned the role of theme than that of agent. The detection of the mismatch gives a hint as to how the structure has to be interpreted: inanimate entities are typically objects, not subjects. Children aged 7 and older capitalize on this cue to map correctly between arguments and surface syntactic position. That 5 year olds could not exploit the mismatch in animacy may stem from their system being already too taxed by the operation of set-restriction. The extra burden of set-restrictiveness overloads the processing capacities of the youngest children and surfaces to a greater extent in the most difficult +Animate conditions for the older age groups tested. In sum, the overridingly crucial impact is yielded by set-restriction, while a more subtle effect is attested by animacy.

Working memory resources also affect processing of A'-dependencies. Our results thus confirm previous studies, which have shown a correlation between forward digit span and children's comprehension of subject and object relative clauses (Booth et al. (2000), Arosio et al (2009). Moreover, the interaction that we found between set-restriction, animacy and forward digit span shows that the soliciting of WM resources depends on the nature of the disambiguating information. The lack of an effect for backward digit-span scores on the comprehension of object A'-dependencies might be due to children's very low performance on this task, with very few exceptions in the case of the 9 and 11 year olds. In sum, the operation of set-restriction increases processing cost, yielding inaccurate interpretations in children. With age, improved processing capacities result in better performance with set-restriction. If these effects surface even in adulthood, this would militate in favor of a view where what is impacting performance is not an inability to apply adult grammar, but rather extra-grammatical, processing challenges. Indeed under appropriate experimental investigation, difficulties remain detectable in adults and are associated with longer reading times reported (Donkers et al., 2013).

5. Conclusion

The results of this study demonstrate that semantic properties such as set-restriction and animacy modulate children's comprehension of object A'-dependencies. An explanation purely in terms of complexity of syntactic structure is not sufficient to capture the effects observed. Inclusion of the NP feature on both the fronted object A'-element and the intervening subject does not necessarily entail difficulties for children, as would be expected under the structural approach. An account which draws on the processing cost associated with the parsing of such complex structures can better explain the improved performance with A'-objects that are –set-restricted and –animate, and the increased memory resources solicited by +set-restricted and +animate object dependencies. Although the current study points to the importance of set-restrictiveness, further studies are necessary to understand what it is about the operation of set-processing that makes it difficult for children and adults alike.

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