Locality and Intervention in the Acquisition of Greek Relative Clauses

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Abstract: According to the most recent formulation of Relativized Minimality, grammatical features are distinguished between those that are syntactically active and those that are not. Under this view, only the first play a role in the computation of locality. Furthermore, whether a certain feature is +/− syntactically active is determined by language-specific factors. Gender is one of the grammatical features that has been argued to have different values in Hebrew vs. Italian, and as a result, to play a role only in Hebrew-speaking children’s comprehension of relative clauses, in terms of intervention effects. Amidst this backdrop, this paper focuses on gender and case, and examines whether or not they have similar effects in the comprehension of relative clauses by Greek-speaking children. Greek differs from Hebrew in that gender does not qualify as a syntactically active feature, hence, the prediction is that it should behave like case, which does not qualify as syntactically active either. The paper presents results from a novel study showing that, indeed, neither gender nor case are responsible for intervention effects in the comprehension of relative clauses by Greek-speaking children, although both features are robustly expressed in Greek nominal morphology.

Keywords: case; gender; relativized minimality; relative clauses; acquisition

1. Introduction

This paper is concerned with how relative clauses, RCs, are comprehended by children, and, in particular, with how object relative clauses, OBJ RCs, compare with the corresponding subject relatives, SUBJ RCs, across various dimensions. A representative pair of RCs appears below from English and shows that the two types of RCs differ in that there is movement of the subject from the embedded subject position in the first, (1a), and movement of the object from the embedded object position in the second, (1b).

(1) a. This is the girl who <girl> pushed the boy. SUBJ RC
b. This is the boy who the girl pushed <boy>. OBJ RC

OBJ RCs are difficult for children, and this has long been noted in the relevant literature. It was reported in the 1970s already, for instance, that children make more errors in comprehending, or acting out, OBJ RCs (cf. Brown 1971; Cook 1975; Tavakolian 1978, i.a.).

The above asymmetry was captured in the recent syntactic literature by resorting to a fundamental property of language, locality. The principle of locality holds that a (local) relationship fails across an intervening element. This explains a number of ungrammatical outputs that are the result of movement and was formalized by Rizzi (1990), as Relativized Minimality (RM), simplified in (2a).

X and Y cannot be connected by movement (or other local relations) if Z intervenes between them, and Z is of the same structural type as X.

b. *When do you wonder who left __.
X Z Y
According to RM, a sentence such as (2b) is ungrammatical, because in order for it to be properly interpreted, the \textit{wh}-element \textit{when}, \((X)\), must be related to its trace, \((Y)\). This relation fails, however, because of the intervention of \textit{who}, \((Z)\), which is another element between \textit{when} and its trace, and it is of the same structural type as \textit{when}, as they are both \textit{wh}-elements.\(^1\)

In subsequent versions of RM, and in order to capture the observation in Starke (2001) that elements that are more richly specified, such as \textit{which problem}, can be extracted from the domain of elements that are less richly specified, such as \textit{how}, but not vice versa (cf. 3a–b), Relativized Minimality was restated, as in (4), to make reference to the features of the elements that are involved (Rizzi 2004, 2013, i.a.).

\textbf{(3)}
\begin{enumerate}
\item a. ?Which problem do you wonder [how to solve <which problem>]?  
\item b. *How do you wonder [which problem to solve <how>]?  
\end{enumerate}

\textbf{(4) Relativized Minimality (revised):}
\begin{quote}
in the configuration \(X \ldots Z \ldots Y \ldots\)  
A local relation (e.g., movement) cannot hold between \((X)\) and \((Y)\) if \((Z)\) intervenes  
and \((Z)\) fully matches the specification of \((X)\) in the relevant morphosyntactic features.  
\end{quote}
(Rizzi 2013, p. 34)

This development in syntactic theory obviously carries over to RCs, as they too involve movement. As we will see in what follows, the featural approach to locality and the ensuing intervention effects are actually in a position to offer an understanding of the trouble children have with RCs in a much more detailed manner than earlier accounts.

In a pioneering article, Friedmann et al. (2009) investigated the RCs of Hebrew-speaking children and discovered different performance even within the same type of RCs. In particular, they found that RCs as in (5a) are harder than those in (5b), although they are both OBJ RCs.

\textbf{(5) a. Show me the monkey that the boy is hugging <the monkey>.}  
\begin{flushright}
\begin{tabular}{c}
\text{[+R]} \\
\text{[+NP]} \\
\text{[+NP]} \\
\end{tabular}
\end{flushright}

\textbf{b. Show me who the boy is hugging <who>.}  
\begin{flushright}
\begin{tabular}{c}
\text{[+R]} \\
\text{[+NP]} \\
\end{tabular}
\end{flushright}

The authors consider the difficulties with (5a) to be the consequence of intervention effects, which RCs as in (5b) are able to escape. Specifically, they hold that the relativized constituents are specified as \textit{+R} (relativized) and, depending on whether they are lexically restricted as well, namely, on whether the relativized DPs contain an NP (restriction), they might further be specified as \textit{+/− NP}. Hence, the relativized object, \textit{monkey}, is specified as both \textit{+[R]} and \textit{[NP]} in (5a), but the relativized object who in (5b), which is known to form a free relative, is only specified as \textit{+[R]}. The intervention effects in (5a) follow from the (partial) structural similarity between the relativized DP and the subject, both of which are specified as \textit{+[NP]}. On the other hand, \textit{who} and \textit{the boy} in (5b) are not specified for some common feature, hence, no intervention effects arise and fewer difficulties ensue for children as a result of this.\(^2\)

Varlokosta et al. (2015) confirm the subject/object asymmetries in the comprehension of Greek-speaking children’s RCs, and further show that both internal structure and specification of the moved constituent and the intervener affect children’s comprehension. The authors do so by focusing on free and restrictive RCs, as well as on \textit{wh}-questions, but only the \textit{+/− NP} specification is considered in their tasks. See also Nerantzini et al. (2014) and Varlokosta et al. (2014) for similar studies with atypical populations.

While up to this point the approach to locality had investigated in detail the effects of the \textit{+/− NP} feature specification on children’s \textit{wh}-questions and RCs, it was soon discovered that other features may give rise to intervention effects as well. Yet, not all morphosyntactic features may cause such effects, and this is of utmost importance for a theory of locality and intervention in early language. Belletti et al. (2012) studied children between 3;9 and 5;5, and found that Hebrew OBJ RCs pose additional difficulties if the object and the subject of the RC have the same value for gender, an effect that does not
carry over to SUBJ RCs obviously as no element intervenes between the relativized subject and its original position. Contrary to Hebrew, however, Italian children’s comprehension of OBJ RCs are not affected by the same gender features of the participating DPs in a similar manner, constituting the ideal minimal pair to investigate children’s behavior on OBJ RCs. The authors claim that the different behavior of children on the OBJ RCs of the two languages is due to the fact that gender is an active morphosyntactic feature only in Hebrew. This is because gender is overtly manifested on the verb in Hebrew, and, most importantly, it belongs to the features that function as attractors of movement of the subject to the specifier of Infl (Shlonsky 1997). This is not the case in Italian, on the other hand, where the verb does not inflect for gender, but only for number and person. Based on these findings, Belletti et al. argue for a version of RM in which locality (and intervention) in children’s grammar is computed in terms of the active morphosyntactic features of the participating DPs. It should be noted that similar effects had already been pointed out for the feature number in Italian (Adani et al. 2010), which is also an active morphosyntactic feature, as the verb agrees with the subject in number. Since number is an active feature in very many languages, however, no minimal pairs with respect to number have been investigated, to make the clear point Hebrew and Italian make with respect to gender. This is why we consider the Belletti et al. (2012) study important, and why it constituted the primary motivation for the study we are about to report.

The Objectives of This Study

In light of the view that only a subset of grammatical features, i.e., the active ones, matter for locality and are responsible for intervention effects in early language, this study investigates the role of gender and case in the comprehension of RCs by Greek-speaking children. Furthermore, it also investigates whether case mismatches between the head of the RC and its extraction site are an additional disturbing factor. In what follows, we set the stage by discussing the Greek data, and how we constructed the two versions of our experiment testing the role of gender and case in Greek-speaking children’s RCs (Section 2). Section 3 presents the results and Section 4 offers a discussion on these results. Section 5 concludes.

2. Intervention in Greek RCs

2.1. Setting the Stage: The Greek Data

Greek RCs of different types, restrictive or pseudo-relatives, and certain types of complement clauses, are introduced by the invariant item *pu* (see Roussou (2020) and Angelopoulos (2019) for recent descriptions and analyses of various properties of *pu*.

\[(6) a.\] O naftis pu akoluthi
ton nearo
the.NOM.MASC sailor.NOM.MASC that follow.3SG

‘The sailor that follow the young man...’ 

\[b.\] O naftis pu akoluthi
o nearos
the.NOM.MASC sailor.NOM.MASC that follow.3SG

‘The sailor that the young man follows...’

Greek verbs are inflected for person and number, though not for gender; therefore they resemble Italian verbs, and also crucially differ from Hebrew in this respect. On the other hand, both determiners and the associated nominal constituents are marked with gender (masculine, feminine, or neuter) and case morphology (nominative or accusative in subject and object positions, respectively) in Greek. This last difference initiated our interest in investigating the effects of case on the RCs of Greek-speaking children, as case has mostly been studied in Hebrew so far in this respect, where case marking takes place via a preposition-like marker that attaches to definite direct objects (Friedmann et al. 2017). 

Studying the effects of gender in Greek is undertaken in order to further evaluate the claim...
that gender is a feature resulting in intervention effects only when it is syntactically active, regardless of whether it is robustly manifested morphologically on the DP, as is the case in Greek.4

Turning to the position of DPs in the Greek RCs, similar considerations hold as for other types of A-bar movement. Concretely, in all kinds of A-bar movement that involve the object, the subject of the clause tends to occur post-verbally. This is also shown in the RC in (6b) where the subject, o nearos ‘young man’, surfaces after the verb. The consensus in previous works (see Kotzoglou 2006 for an overview) is that inverted subjects occupy a VP-internal or low VP-peripheral position. The postverbal order of the subject arises after V-to-T movement.5 We adopt and extend to RCs this consensus, assuming a VP-internal position for inverted subjects. The exact syntactic position we assume for the verb, the subject and the relativized phrase in object RCs, as the one in (6b), is illustrated below:

(7) \[ [DP o nearos.NOM[P4C naftis.NOM][TP akoluthi T[VP o nearos.NOM[V' akoluthi V' o naftis]]]].

Example (7) is important for our purposes because it shows that subjects in Greek do count as interveners in computing locality in RM terms in the case of OBJ RCs.6

2.2. The Study

2.2.1. The Participants and Brief Overview of the Study

Thirty-two typically developing Greek-speaking children, aged 4;3 to 5;3 (mean age 4;9) took part in a picture matching comprehension task. All children were recruited from public kindergartens in Patras. The comprehension tasks they were administered comprised (i) SUBJ RCs and OBJ RCs and (ii) their corresponding transitive active and passive sentences. The active sentences were used as a baseline to ensure successful identification of the content of the picture. Our task was designed to come in two versions which minimally differed with respect to case marking (nominative or accusative) on the relativized constituent (subject or object).

2.2.2. Experiment Version 1: Nominative Marked Relativized DPs

Version 1 of the study investigated via a picture matching task the comprehension of SUBJ and OBJ RCs with a nominative case marked relativized DP. There were 24 RCs in each category, 12 SUBJ RCs and 12 OBJ RCs, half of which with DPs of the same gender value, either feminine (6RCs) or masculine (6RCs) (RC-Gmatch condition). The other half of RCs contained DPs of different gender value (RC-Gmismatch condition). The DPs referred to professions and kinship or other such relations with relatively direct correspondence between grammatical and physical gender. For instance, (8a) illustrates a SUBJ RC: the relativized subject carries the same gender with the object (Gmatch). On the other hand, the gender of the relativized subject is different from the gender specification of the object in (8b) (Gmismatch). Examples (9a) and (9b) illustrate OBJ RCs: the gender of the relativized object is either the same as that of the subject, (9a), or different, (9b).

(8) a. Edo ine o kirios pu fotografizi ton magira
here is the.NOM.MASC man.NOM.MASC that photograph.3SG the.ACC.MASC cook.ACC.MASC
‘Here is the man that photographs the cook.’ SUBJ RC-Gmatch

b. Edo ine o papus pu chirokroti ti nifi.
here is the.NOM.MASC grandpa.NOM.MASC that applaud.3SG the.ACC.FEM bride.ACC.FEM
‘Here is the grandpa that applauds the bride.’ SUBJ RC-Gmismatch
(9) a. Edo ine i vasilisa pu here is the.NOM.FEM queen.NOM.FEM that akoluthi i kiria. follow.3SG the.NOM.FEM lady.NOM.FEM 'Here is the queen that the lady follows.' OBJ RC-Gmatch

b. Edo ine i yiayia pu here is the.NOM.FEM grandma.NOM.FEM that fotografizi o gabros. photograph.3SG the.NOM.MASC groom.NOM.MASC 'Here is the grandma that the groom photographs.' OBJ RC-Gmismatch

The picture selection task was administered on a computer screen via a PowerPoint file. There were three pictures on each slide, one that corresponded to the target picture and two more. For SUB RCs, besides the target picture, there was a picture depicting the corresponding OBJ RC and a third one in which the subject of the target sentence performed the action of the verb to another individual, see Figures 1a and 2a, which contain the picture sets for the SUB RCs in (8a) and (8b), respectively. For OBJ RCs, besides the target picture, there was a picture of the counterpart SUB RC and a third one in which the object of the target sentence performed the action of the verb to another individual. See Figure 2a,b for the OBJ RCs in (9a) and (9b), respectively. Sentences were pseudo-randomized, so that:

- sentences with the same verb were not next to each other,
- no more than two sentences of the same condition were next to each other, and
- no more than two sentences with the target picture in the same position were next to each other.
- the position of the target picture was pseudo-randomized both within each condition and within the entire protocol.

(a) 
(b) 

Figure 1. (a): SUBJ RC, gender match (8a), (b): SUBJ RC, gender mismatch (8b).
Figure 1. (a): SUBJ RC, gender match (8a), (b): SUBJ RC, gender mismatch (8b).

Figure 2. (a): OBJ RC, gender match (9a), (b): OBJ RC, gender mismatch (9b).

The sentences were recorded by two female native speakers of Greek, so that all participants heard them in exactly the same manner and participants were instructed to choose the picture that corresponded to the sentence they heard. In the beginning they were presented with two slides that contained all characters of the task, and, subsequently, they were given four training sentences to match to the corresponding pictures.

2.2.3. Experiment Version 2: Accusative Marked Relativized DPs

Version 2 of the experiment differs from Version 1 on the introductory instructions. In this version the head of the RC surfaces with accusative case. This was the consequence of embedding the RCs in the imperative form of the verb dikse (mu) ‘show (me)’.

\[(10)\]
\[
a. \text{Dikse } \text{mu} \text{ ton kirio pu} \text{ fotografizi ton magira.} \\
\text{show me the.ACC.MASC man.ACC.MASC that} \\
\text{photograph.3SG the.ACC.MASC cook.ACC.MASC} \\
\text{‘Show me the man that photographs the cook.’ SUBJ RC-Gmatch}
\]
\[
b. \text{Dikse } \text{mu} \text{ ton papu pu} \text{ chirokroti ti nifi.} \\
\text{show me the.ACC.MASC grandpa.ACC.MASC that} \\
\text{applaud.3SG the.ACC.FEM bride.ACC.FEM} \\
\text{‘Show me the grandpa that applauds the bride.’ SUBJ RC-Gmismatch}
\]

\[(11)\]
\[
a. \text{Dikse } \text{mu} \text{ ti vasilisa pu} \text{ akoluthi i kiria.} \\
\text{show me the.ACC.FEM queen.ACC.FEM that} \\
\text{follow.3SG the.NOM.FEM lady.NOM.FEM} \\
\text{‘Show me the queen that the lady follows.’ OBJ RC-Gmatch}
\]
\[
b. \text{Dikse } \text{mu} \text{ ti yiayia pu} \text{ fotografizi o gabros.} \\
\text{show me the.ACC.FEM grandma.ACC.MASC that} \\
\text{photograph.3SG the.NOM.MASC groom.NOM.MASC} \\
\text{‘Show me the grandma that the groom photographs.’ OBJ RC-Gmismatch}
\]

Note that the head of the SUBJ RC has now accusative case, (10a)–(10b), which is different from the (nominative) case assigned in its extraction subject position. Likewise, the head of the OBJ RC, (11), has accusative, which now is the same case it has in its extraction (object) position. The two DPs that participate in the OBJ RC are not specified for the same case feature in this version of the experiment. Hence, they differ in this respect from the corresponding sentences of Version 1, where both DPs carried nominative, and raised concerns as to whether same case specification could cause intervention effects.
3. Results
3.1. Version 1

The data in Table 1 summarize the error rates of 27 out of the 32 children we assessed in Version 1 of the experiment. Five children were excluded because they had more than 2 errors in the 24 active sentences. The first line presents raw scores, and the second presents the percentage of errors across conditions.

Table 1. Errors on Version 1 of the experiment.

<table>
<thead>
<tr>
<th></th>
<th>SUBJ RCs</th>
<th>OBJ RCs</th>
<th>OBJ RCs</th>
<th>OBJ RCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Errors total</td>
<td>59/648</td>
<td>131/648</td>
<td>75/324</td>
<td>56/324</td>
</tr>
<tr>
<td>Error rate</td>
<td>9.10%</td>
<td>20.22%</td>
<td>23.15%</td>
<td>17.28%</td>
</tr>
</tbody>
</table>

3.2. Version 2

The data presented in Table 2 below summarize the responses of the 27 children on Version 2 of the experiment.

Table 2. Errors on Version 2 of the experiment.

<table>
<thead>
<tr>
<th></th>
<th>SUBJ RCs</th>
<th>OBJ RCs</th>
<th>OBJ RCs</th>
<th>OBJ RCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Errors total</td>
<td>86/648</td>
<td>152/648</td>
<td>79/324</td>
<td>73/324</td>
</tr>
<tr>
<td>Error rate</td>
<td>13.27%</td>
<td>23.46%</td>
<td>24.38%</td>
<td>22.53%</td>
</tr>
</tbody>
</table>

In order to investigate differences in performance among conditions, a 2 (task Version 1, Version 2) by 2 (SUBJ RCs, OBJ RCs) by 2 (gender match, mismatch) repeated measures ANOVA with Bonferroni adjustment for multiple comparisons was performed.

With regard to the task Version being administered, the results did not show a significant main effect of Task $F_{(1,26)} = 2.96, p = 0.097, \eta^2 = 0.102$. There was not a significant difference in performance accuracy when Version 1 or Version 2 of the task was administered.

With regard to the type of RCs, i.e., SUBJ RCs or OBJ RCs, results showed a significant main effect of RCs $F_{(1,26)} = 18.89, p < 0.001, \eta^2 = 0.421$. In order to investigate the nature of the RC type main effect follow-up paired-samples t-tests were performed between performance accuracy on SUBJ RCs and OBJ RCs for both versions of the task, for gender match and mismatch conditions. Analysis showed a significant difference in performance accuracy in favor of SUBJ RCs across conditions, i.e., SUBJ RCs vs. OBJ RCs Version 1, gender match $t_{(26)} = 2.84, p = 0.009$; SUBJ RCs vs. OBJ RCs Version 1, gender mismatch $t_{(26)} = 2.49, p = 0.020$; SUBJ RCs vs. OBJ RCs Version 2, gender match $t_{(26)} = 2.45, p = 0.021$; SUBJ RCs vs. OBJ RCs Version 2, gender mismatch $t_{(26)} = 3.12, p = 0.004$. In order to sum up the effects of sentence type regardless of gender, performance accuracy on the total of SUBJ RCs (SUBJ RCs gender match plus SUBJ RCs gender mismatch) vs. OBJ RCs (OBJ RCs gender match plus OBJ RCs gender mismatch) for both versions was compared. A paired-samples t-test of SUBJ RCs total vs. OBJ RCs total for Version 1 showed a highly significant difference in performance $t(26) = 3.09, p = 0.005$; comparison of SUBJ RCs total vs. OBJ RCs total for Version 2 also showed a highly significant difference $t(26) = 3.23, p = 0.003$, i.e., children comprehend SUBJ RCs significantly better than OBJ RCs in both versions of the experiment.

With regard to the role of gender match/mismatch manipulation, analysis showed a significant main effect of gender $F_{(1,26)} = 6.41, p = 0.018, \eta^2 = 0.198$. Overall, children scored higher on gender mismatch compared to gender match condition. In order to investigate why such a main effect arose, follow-up paired-samples t-tests were performed between performance accuracy on gender match and mismatch for both versions of the task for
SUBJ RCs and OBJ RCs. Analysis did not show a significant difference in performance accuracy in any of the conditions, i.e., Version 1 SUBJ RCs gender match vs. SUBJ RCs gender mismatch $t_{(26)} = 1.64, p = 0.119$, Version 1 OBJ RCs gender match vs. OBJ RCs gender mismatch $t_{(26)} = 1.44, p = 0.162$, Version 2 SUBJ RCs gender match vs. SUBJ RCs gender mismatch $t_{(26)} = 1.69, p = 0.103$, Version 2 OBJ RCs gender match vs. OBJ RCs gender mismatch $t_{(26)} = 0.64, p = 0.528$. As paired-samples t-tests reveal no statistically significant difference for SUBJ RCs or OBJ RCs in any version of the task, the current data do not provide evidence of the effect of gender on children’s performance. Performance accuracy on SUBJ and OBJ RCs on gender match and gender mismatch conditions can be seen in Figure 3a for Task 1 and Figure 3b for Task 2.

![Figure 3a](image1.png) ![Figure 3b](image2.png)

**Figure 3.** (a): Task 1 performance on SUBJ and OBJ RC, gender match and mismatch condition, (b): Task 2 performance on SUBJ and OBJ RC, gender match and mismatch condition.

In order to investigate the role of case manipulation in performance accuracy among conditions a 2 (case match, mismatch) by 2 (gender match, mismatch) by 2 (SUBJ RCs, OBJ RCs) repeated measures ANOVA with Bonferroni adjustment for multiple comparisons was performed. Analysis did not yield a main effect of case manipulation on performance accuracy $F_{(1,26)} = 0.40, p = 0.844, \eta^2 = 0.002$. Moreover, analysis did not yield an interaction between case, gender and sentence type $F_{(1,26)} = 0.27, p = 0.610, \eta^2 = 0.010$. Performance accuracy on case match and case mismatch conditions with regard to gender manipulation both for SUBJ and OBJ RCs can be seen in Figure 4a,b, respectively.
Figure 4. (a): performance accuracy on SUBJ RC, case match and mismatch condition, (b): performance accuracy on OBJ RC, case match and mismatch condition.

Finally, in order to investigate potential difficulties arising for relativized DPs that ended up with a different case feature than the one they had in their extraction site, performance accuracy on the total of SUBJ RCs (SUBJ RCs gender match plus SUBJ RCs gender mismatch) of Version 1 vs. Version 2, and total of OBJ RCs (OBJ RCs gender match plus OBJ RCs gender mismatch) of Version 1 vs. Version 2 was compared. Paired-samples t-test of SUBJ RCs Version 1 total vs. SUBJ RCs Version 2 total showed a difference in performance that just reached significance \( t(26) = 2.15, p = 0.041 \), i.e., children scored slightly higher in Version 1. On the other hand, paired-samples t-test of OBJ RCs Version 1 total vs. OBJ RCs Version 2 total did not show a significant difference in performance \( t(26) = 0.803, p = 0.430 \).

4. Discussion

A comparison of performance on SUBJ and OBJ RCs in Task 1 showed a highly significant difference \( p = 0.005 \); that is, children made more errors on OBJ RCs than on SUBJ RCs, as expected. The errors on OBJ RCs were further investigated with regard to gender feature. A comparison between OBJ RCs gender match and OBJ RCs gender mismatch does not show a significant difference \( p = 0.162 \); namely, children did not benefit on OBJ RCs when the two DPs had a different gender feature.

The first conclusions to draw are that: (a) OBJ RCs indeed create a significantly bigger problem than SUBJ RCs for the Greek-speaking children, confirming previous findings for Greek (Varlokosta et al. (2015)), (b) the same value for the feature gender does not constitute an additional source of difficulty for the comprehension of OBJ RCs in children’s grammar.

It should be noted that Version 1 did not control for potential effects of the case of the head noun. Recall that the RCs in Version 1 are introduced by the instruction ‘here is...’, with the consequence that the DP that follows has nominative case. Both the relativized subjects, (8), and the relativized objects, (9), carry nominative case morphology, which is distinct and overt in Greek. Hence, in OBJ RCs, (9), nominative case, NOM, may be involved in the computation of similarity between the moved object and the intervening subject, and induce intervention effects which would render OBJ RCs even more difficult. Moreover, the relativized object of OBJ RCs has nominative case, and this may be another source of additional difficulty, besides intervention effects. We will return to these issues after we discuss the results from Version 2 of the experiment.

The subject/object asymmetry holds in Version 2 as well, with the difference between SUBJ and OBJ RCs being highly significant again \( p = 0.003 \). Moreover, comparison
between OBJ RCs gender match and OBJ RCs gender mismatch does not show a significant difference either ($p = 0.528$). This means that children did not benefit on OBJ RCs in Version 2 of the experiment either when the participating DPs had a different gender feature. Recall that in this version of the experiment OBJ RCs did not face the additional issues raised in Version 1 of the experiment, since a) the relativized DP had the same case as in its extraction site (accusative), and b) the two DPs of the sentence did not have the same case. It seems safe to conclude, therefore, that gender is not involved in intervention effects in early Greek. This is expected on the basis of the claim that only active morphosyntactic features trigger such effects in early language, and we have no reason to believe that gender is an active morphosyntactic feature in Greek in the relevant sense.  

At this point we are also in a position to understand whether morphological case is a feature that may induce locality effects in early Greek. This is because the two DPs of OBJ RCs are specified for the same morphological case (nominative-nominative) in Version 1 of the experiment, but for different case (accusative-nominative) in Version 2. Results extracted from the respective Tables constitute Table 3 below:

Table 3. Case and intervention effects.

<table>
<thead>
<tr>
<th>OBJ RCs</th>
<th>OBJ RCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 1</td>
<td>Case Match</td>
</tr>
<tr>
<td>Errors total</td>
<td>131/648</td>
</tr>
<tr>
<td>Error rate</td>
<td>20.22%</td>
</tr>
</tbody>
</table>

If case induced intervention effects, hence, case match posed additional difficulties on children’s grammar, we would expect the OBJ RCs of Version 1 of the experiment to be more difficult than those of Version 2, as they contain two DPs with the same (nominative) case. This is not so, however, and we see that there were actually fewer errors on the first set of OBJ RCs, while the difference between the two OBJ RCs is not statistically significant ($p = 0.430$). We conclude, therefore, that case, which is overtly and distinctively marked on feminine and masculine DPs in Greek, both on the determiner and the noun, does not induce intervention effects in child language.

Case of the Relativized DP and Its Extraction Site

A final issue that concerns this work is whether it matters if the case of the relativized DP is different from the case it has in its extraction site. Recall that in Version 1 of the experiment the relativized object of OBJ RCs has nominative case, rather than the accusative it receives in its extraction site, (9a), repeated below.

(9a) Edo ine i vasilisa pu akoluthi
    here Is the.NOM.FEM queen.NOM.FEM that follow.3SG
    i kiria.
    the.NOM.FEM lady.NOM.FEM
    ‘Here is the queen that the lady follows.’

On the other, in Version 2 of the experiment, the relativized subject of SUBJ RCs has accusative case, rather than the nominative it has in its extraction (subject) position, see (10a), repeated below:

(10a) Dikse mu ton kirio pu
    show me the.ACC.MASC man.ACC.MASC that
    fotografiizi ton magira.
    photograph.3SG the.ACC.MASC cook.ACC.MASC
    ‘Show me the man that photographs the cook.’

Does it matter for children if an extracted object appears with nominative case, or an extracted subject appears with accusative? Given the omnipresence of Greek case morphology, an answer to this question is important for the validity of the various experiments that are administered to children, whose results may otherwise be contaminated. The
relevant data are in Table 4 below. Notice that the data we compare for OBJ RCs are the same as those investigating the possible intervention effects of case. This time, however, the comparison extends to SUBJ RCs as well.

Table 4. Case and the extraction site of the relativized DP.

<table>
<thead>
<tr>
<th></th>
<th>OBJ RCs</th>
<th>OBJ RCs</th>
<th>SUBJ RCs</th>
<th>SUBJ RCs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Version 1</td>
<td>Version 2</td>
<td>Version 1</td>
<td>Version 2</td>
</tr>
<tr>
<td>Errors total</td>
<td>131/648</td>
<td>152/648</td>
<td>59/648</td>
<td>86/648</td>
</tr>
<tr>
<td>Error rate</td>
<td>20.22%</td>
<td>23.46%</td>
<td>9.10%</td>
<td>13.27%</td>
</tr>
</tbody>
</table>

If we compare the two versions of OBJ RCs, which differ in that in Version 1 the relativized object has nominative case, but in Version 2 it has accusative, we see that the difference (20.22% vs. 23.46% error rate, respectively) is not a significant one \( (p = 0.430) \). If we compare the two versions of SUBJ RCs, that is when the relativized subject has nominative case with when it has accusative, \( (9.10\% \text{ vs. } 13.27\% \text{ error rate, respectively}) \), the difference just reached significance \( (p = 0.41) \). We see in other words that it does not seem to matter whether an object/internal argument is marked for nominative case, but it may matter when a subject/external argument has accusative. A possible explanation might have to do with the fact that whereas internal arguments with nominative case are encountered in more than one other syntactic environments, e.g., in passives, unaccusatives, and middles, nominative arguments with accusative case are found in much fewer environments, e.g., ECM constructions.

Before concluding, we should mention a study that has been brought to our attention several times in the context of the current work, because it appears at first glance to contribute, in a slightly different manner, to the issue that concerns this last section. Guasti et al. (2012) investigated the effects of morphological case in the comprehension of subject and object RCs in Greek and Italian, via comprehension experiments with 27 Italian-speaking children (Range: 4.5–6.5) and 43 Greek-speaking children (Range: 4.5–6.5). Their experiments comprised pairs of sentences which differ in the way the grammatical function of the DPs, that is, subject/object, is distinguished in the RC. For instance, the RCs in (12a) and (12b) feature two DPs formed with the articles to and ta (neutral SG and PL, respectively). To and ta are ambiguous between the nominative and accusative case so in principle, the DPs in examples such as (12) could be used as subjects or objects of the verb. The only way in which the grammatical function of neutral DPs can be distinguished in RCs is via subject agreement on the verb. Concretely, the RC in (12a) is a SUBJ RC because the verb agrees in number with the relativized DP, to alogo ‘the horse’. On the other hand, the RC in (12b) is an OBJ RC because the verb displays 3PL agreement, which is the number specification of the post-verbal subject.

(12) a. Dikse mu to alogo show me the.ACC.NEUT.SG horse.ACC.NEUT.SG pu kiniga ta liontaria. that chase.3SG the.ACC.NEUT.PL lions.ACC.NEUT.PL ‘Show me the horse that chases the lions.’

b. Dikse mu to alogo show me the.ACC.NEUT.SG horse.ACC.NEUT.SG pu kinigung ta liontaria. that chase.3PL the.NOM.NEUT.PL lions.NOM.NEUT.PL ‘Show me the horse that the lions chase.’

In (13), the verb carries 3SG agreement in both cases. Nonetheless, the gender of the DPs is feminine and the article combining with feminine DPs is different in nominative and accusative case, \( i \) and \( tin \), respectively. With DPs, as those formed with \( i \) or \( tin \), that are unambiguously marked with case, OBJ RCs are distinguished from SUBJ RCs by their case marking. For instance, (13a) features a SUBJ RC: the post-verbal DP carries accusative case and thus, functions as the object of the verb of the RC. The relativized DP can only
function as the SUBJ of the verb of the RC, but is assigned accusative case in its surface position from the matrix verb. In (13b), the postverbal DP carries nominative case and thus it is interpreted as the subject of the verb. The relativized DP is the object of the verb of the RC and is marked with accusative case, as expected.

(13) a. Dikse mu ti maimu show me the.NOM.FEM.SG monkey.NOM.FEM.SG pu pleni tin arkuda. that wash.3SG the.ACC.FEM.SG bear.ACC.FEM.SG 'Show me the monkey that washes the bear.'

b. Dikse mu ti maimu show me the.ACC.FEM.SG monkey.ACC.FEM.SG pu pleni i arkuda. that wash.3SG the.NOM.FEM.SG bear.NOM.FEM.SG 'Show me the monkey that the bear washes.'

As far as the more general phenomenon goes, Guasti et al. (2012) observe an SUBJ/OBJ asymmetry in the comprehension of RCs showing, as expected, that SUBJ RCs are easier to comprehend. The authors also present a formal explanation of this asymmetry using machinery that has been introduced in previous work by Villata et al. (2016). Setting this asymmetry aside, the novel, and more interesting, finding in Guasti et al. (2012) is that Greek-speaking children comprehend better the kind of OBJ RCs in (13b), where the function of the DPs is disambiguated by morphological case marking than those of (12b) where it is disambiguated by number marking. This is the finding that led Guasti et al. (2012) to the conclusion that morphological case matters for the comprehension of RCs. We do agree with their conclusion that case does matter, and is probably what explains a different fact we have not commented on, namely, that by contrast to Italian where case is not marked at all, Greek speaking children perform better in the overall in object relative clauses. It is important to note, however, that their work does not extend to a central question of ours, namely, whether case matters in the computation of locality, in the same way that gender and other formal features have been argued to do (cf. Belletti et al. 2012, i.a.). In regard to locality, we saw that case does not play any role and in fact, it is not expected to play any different role in the computation of locality in (12b) and (13b) because in both examples, the relativized object has accusative case which is different from the nominative case carried by the subject. The only factor that is different between (12b) and (13b) is the morphological exponence of nominative case: in the first, it is syncretic with the accusative whereas in the latter, it is not. This difference is not predicted to play a role in the computation of locality in any obvious manner, however.

5. Conclusions

The paper presented results from a new study examining the role of gender and case in the comprehension of SUBJ and OBJ RCs by typically developing Greek-speaking children. The results of the study showed (i) that neither gender nor case induce intervention effects in the comprehension of OBJ RCs by the 27 typically developing children we assessed, and (ii) that OBJ RCs are systematically more difficult than SUBJ RCs, just as has been shown in several previous studies. In regard to (i), Greek behaves like Italian where gender match does not impose additional difficulties in the comprehension of RCs. Importantly, a common property of both languages is that in neither of them gender qualifies as a syntactically active feature. In Greek as well as in Italian, this can be witnessed by the fact that, in contrast to, e.g., Hebrew, gender is not morphologically realized on the verb. Similarly, case is not syntactically active in Greek either. As discussed, the fact that gender match does not impose additional difficulties as well as the fact that case and gender pattern alike in regard to comprehension of RCs finds an immediate explanation in the most recent version of RM; this version is advocated in a growing body of literature, and contends that only syntactically active features are relevant in the computation of locality.
Author Contributions: Conceptualization, N.A., E.G. and A.T.; methodology, N.A., E.G. and A.T.; formal analysis, E.G.; data curation, A.T.; writing—original draft preparation, N.A., E.G. and A.T.; writing—review and editing, N.A., E.G. and A.T.; visualization, E.G.; supervision, A.T. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki. The study protocol was reviewed by the departmental committee at the Department of Speech and Language Therapy (former TEI of Western Greece currently University of Patras), 698/07-08-2020. Parental written consent was obtained.

Data Availability Statement: Data available from A.T. upon request.

Conflicts of Interest: The authors declare no conflict of interest.

Notes

1 This, among other A’ asymmetries, as they are manifested by adults, have also been investigated extensively in the processing psycholinguistics literature (see Frazier and Clifton (1989) for the Active Filler Hypothesis, along with a detailed review of related studies).

2 Friedmann et al. (2009) describe three possible relations between the features of the moved element and the intervener: (a) identity of features, (b) disjunction, that is, no features in common between the two, and (c) inclusion, that is, partial overlap of features, in the sense that the intervener has a subset of the features of the moved element. See also Villata et al. (2016) for evidence from degrees of deviance, and Durrleman and Bentea (2021) on the effects of gender and animacy in RCs lacking the N-feature in French.

3 Hence, what we actually end up having in Hebrew is either sentences with: (i) two DPs without case marking, or (ii) one DP without case marking and the other with the Prepositional element et.

(i) Eize pil ha-arte martiv?

which elephant the lion wets?

(ii) Et eize pil ha-arte martiv?

ACC which elephant the lion wets

(Friedmann et al. 2017, p. 3)

It seems to us therefore, that what we see in (i) are not two DPs (elephant, lion) that are specified for the same case feature, but two DPs that are not specified for case. Therefore, there is need to include sentences that contain DPs specified for case (either the same or different), which the current study contributes.

4 Related to our interest in investigating potential effects of the feature gender in child Greek, although there is no reason to believe that gender is a syntactically active feature in the language, is the fact that it has been found that same gender of the two DPs of OBJ RCs render them significantly more difficult for Broca’s aphasics to understand (Terzi and Nanousi 2018). For the beginning of the work on minimality effects in the language of agrammatics, see Garraffa and Grillo (2008) and Grillo (2009). See also Varlokosta et al. (2014) and Nerantzini et al. (2014) for minimality effects and lexical restriction in the language of Greek agrammatics.

5 See Alexiadou and Anagnostopoulou (1998) among others for the idea that the verb in Greek is in T.

6 The following example shows that a subject surfaces before a manner adverb (pista ‘obediently’). Manner adverbs are standardly taken to occupy the vP. So, the fact that a subject can precede this adverb, suggests that it occupies a vP-internal position, just as shown in (7).

(i) O naftis pu akoluthi o nearos

the sailor.MASC.NOM that follow.3SG the young man.MASC.NOM

pista . . .

obediently . . .

‘The sailor that the young man follows obediently...’

Note that it is important that the subject does not form a phonological unit separated from the rest of the sentence. In our examples, which were recorded so that participants hear them in the same manner, this factor was controlled for.

7 In an earlier version of the paper, we singled out five younger children (mean age: 4;6) who had a lower performance on the task in the overall. Even in this group, however, although the difference between SUB RCs and OBJ RCs was highly significant ($p = 0.000$), the difference between OBJ RCs gender match and OBJ RCs gender mismatch was not ($p = 0.709$).

<table>
<thead>
<tr>
<th>Errors</th>
<th>SUBJ RCs</th>
<th>OBJ RCs</th>
<th>OBJ RCs gender match</th>
<th>OBJ RCs gender mismatch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Errors total</td>
<td>8/120</td>
<td>48/120</td>
<td>25/60</td>
<td>23/60</td>
</tr>
<tr>
<td>Error rate</td>
<td>6.7%</td>
<td>40.0%</td>
<td>41.7%</td>
<td>38.3%</td>
</tr>
</tbody>
</table>
Although the sample was small, we believe it offers a good indication that the absence of difference between the two types of OBJ RCs of the study we report cannot be due to the overall high performance of the Greek-speaking children on OBJ RCs, when compared to other languages (see Belletti et al. (2012), for Italian, for instance, but also for Hebrew in the case of gender match OBJ RCs in the same article).

A reviewer comments that in order to consider the findings entirely convincing and exclude the possibility of lack of statistical power, one would have to investigate the effects of a feature that is expected to induce intervention effects. Such a feature is number, and such a study is the study of Adani et al. (2010), which has investigated both number and gender in Italian, demonstrating the effects of number mismatch, by contrast to gender, in facilitating comprehension of OBJ RCs. It is our aim to investigate number as well in Greek, in future research, although we do not expect Greek-speaking children to be any different from Italian-speaking on this. We should further note that the protocol employed in this research was previously administered to a different population, and gave very different results. Terzi and Nanousi (2018) investigated via the same protocol the RCs of Broca’s aphasics, and found that gender played a very significant role in the comprehension of RCs, facilitating their comprehension when the two DPs had different gender. Nevertheless, as the authors argue, this was not an intervention effect, as the facilitating effects of gender mismatch extended to SUB RCs as well. Terzi and Nanousi (2018) offer an account of the peculiar behavior of agrammatics, but the point here is that if there was some issue with the protocol of the current study, resulting in decreased power of the statistical analysis, we should expect to obtain null effects for aphasics as well.

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