Agreement in Italian SLI children: a comparison between Determiner-Noun, Subject-Verb and Object-Verb agreement

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Abstract:

In this paper, we present the results of a new forced-choice task designed to test SLI children's competence with three different agreement configurations: Determiner-Noun, Subject-Verb and Object-Verb agreement. Three populations of Italian-speaking children took part in the study and we compared the performance of a group of typically developing children with two groups of children diagnosed with phonological (P-SLI) or grammatical (G-SLI) Specific Language Impairment. Our study revealed that in this task the G-SLI group performed worse than the other two groups. We also found that the different agreement configurations under scrutiny introduced different degrees of complexity, with the Determiner-Noun condition being the easiest one. We discuss these results in relation to Clahsen's (1997) *Grammatical Agreement Deficit Hypothesis* and to a more recent proposal presented in Moscati and Rizzi (2014). Furthermore, we also compared plural and singular S-V agreement morphology. Results indicate that in our comprehension task no extra cost is associated with plural morphology in none of the experimental groups.

Keywords: Agreement, Morphology, Specific Language Impairment

1. *Introduction*[*]

Since their first breath, and even before that, children start their journey through the sounds of their caregivers' language. A journey that will lead them to achieve, within a few years, the adult grammatical competence. Before that, all children will pass through a sequence of developmental milestones

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[*] The paper is the result of the joint work of the authors. For the specific purposes of the Italian academic system, Vincenzo Moscati is responsible for Sections 2 and 3, while Ilenia Vottari for Sections 1 and 4.

that are typical for their age. But some children seem to proceed at a much slower pace, and their linguistic development falls outside the normal range of individual variation. Specific Language Impairment is a clinical condition that refers to this group of children, whose language abilities lag behind the ones of their peers in spite of a normal hearing, motor development and general non-verbal abilities. In recent years, much research has focused on the proper characterization of the linguistic deficits of SLI children, leading to a finer-grained classification into several clinical subgroups. Among them, many researchers have individuated a population of children whose primary problem is in their grammar (a.o. Friedmann and Novogrodsky 2008; van der Lely 1993; van der Lely and Stollwerck 1996). Although different terminologies have been proposed, throughout this paper we will refer to this group as Grammatical SLI (G-SLI), to distinguish it from a second group of children that shows instead a phonological form of impairment (P-SLI). An important goal of current research is to set up early and accurate diagnostic tools, and since no identified neurobiological signature for language difficulties exists today (Conti-Ramsden and Durkin 2012), a great importance is given to the discovery of reliable behavioural clinical markers. One of the problems in identifying such clinical markers is the fact that their validity is language-dependent. For example, although general tests like non-word repetition have been shown to be particularly challenging by SLI children, these difficulties extends far beyond the borders of SLI and are common also to children with Down Syndrome (Jarrold *et al.* 2000) or Autism (Kjelgaard and Tager-Flusberg 2001). For this reason, tests based on the specific properties of the target language might be more reliable in singling out SLI children from the broader class of children with more general learning disorders.

In Italian, many studies have shown that SLI children have difficulties with functional morphology. In particular, determiners, clitic pronouns and verbal inflection are among the linguistic categories that appear to be the most problematic. For what concerns determiners, in a spontaneous production study on a group of SLI children, Bottari *et al.* (1998: 296) reported frequent omissions of determiners. The omission rate in this group was so dramatic that Bottari *et al.* concluded that "an almost total absence of Det is the hallmark of a consistent subgroup of children with SLI". Turning to clitic omissions, its persistency seems to be another defining feature of Italian SLI children (a.o. Bortolini *et al.* 2006; Arosio *et al.* 2014). Finally, verbal morphology has also been repeatedly indicated as another weakness in the grammar of SLIs. Bortolini and Leonard (1998) reported frequent omissions of auxiliary verbs, a phenomenon that is more pronounced in contexts requiring plural forms (see also Leonard 2000). Moreover, problems with verbal morphology extends beyond auxiliaries and different studies (Leonard *et al.* 1992; Bortolini *et al.* 2006) have shown that also for lexical verbs the 3rd person plural forms are the most problematic ones. Given this bulk of results, it is

plausible to believe that some kind of grammatical deficit is the source of the many problems that SLI children encounter with functional morphology.

In this paper, we will explore a specific aspect of the grammar of Italian G-SLIs trying to closely compare different types of agreement morphology. We believe that the relations established through agreement could be particularly problematic for G-SLI children, since they have to rely on a fairly advanced linguistic ability. This intuition finds some support in the aforementioned studies, who revealed that Italian SLI children tend to omit categories that enter into agreement relations. Of course, we won't claim that omissions are a *direct* consequence of the complexities associated with agreement since many other factors could determine omissions. We will instead try to compare here the relative difficulty associated with different types of agreement, extending the research initiated in Moscati and Rizzi (2014) to SLI children. In that study, Moscati and Rizzi have shown that different agreement relations develop at a different pace, and that some configurations are still challenging even at the age of 5. On the basis of these results, we could expect that this kind of difficulty will be exacerbated in G-SLI children, and that not all agreement configurations are equally demanding for them. This view introduced important distinctions on the basis of the nature and the number of the derivational steps needed to satisfy the feature-checking operations. The important difference between this proposal and previous ones, as for example the *Grammatical Agreement Deficit Hypothesis* discussed in Clahsen (1997, 2008), is that it introduces a gradation of complexity that generates a new set of empirical predictions. We will discuss them in the next section. In Section 3, we will then present a new experiment designed to compare children's grammatical competence with three different types of agreement: Determiner-Noun (D-N), Subject-Verb (S-V) and Clitic-Past Participle (Cl-PPart).

2. *Grammatical Agreement in SLI children: a general or configuration-specific impairment?*

Recent developments in linguistic theory (Chomsky 1995, 2001) introduced a distinction between two natural classes of syntactic features. A first class encodes traits that have a semantic import and that can be read by the semantic component of language, whence the label *interpretable features.* A second class, referred to by the term *uninterpretable features,* designs instead features that lack semantic content and that must be eliminated during the course of the derivation. A typical example of this latter kind of features is given by gender and number on verbal morphology. Under the plausible assumption that these features belong to the semantics of nouns and contribute to their meanings, their correlates on verbal morphology are instead purely formal. Consider the following Italian example in (1):

(1)   le   ragazze   sono   venute
         the$_{f,p}$ girls$_{f,p}$ aux$_{3rd,p}$ came $_{f,p}$
         'the girls came.'

In the example above, the plural feminine noun that serves as the subject of an unaccusative verb enters into an agreement relation with the determiner, the auxiliary and the past participle. This relation is captured via syntactic operations that link a set of interpretable features with a set of uninterpretable features: agreement morphology is thus the visible reflex of such operations. Under this view, uninterpretable features trigger syntactic computations and, consequently, they impose a computational load on the system.

Capitalizing on this, Clahsen (1997) put forth the idea that (some of) the problems encountered by SLI children could be related to the linguistic complexity introduced by uninterpretable features. This idea, known as the *Grammatical Agreement Deficit Hypothesis,* can be implemented in different ways. Clahsen (2008) briefly discusses two possibilities that we will call here the *Lexical* and the *Procedural Grammatical Agreement Deficit Hypothesis*. This to express the fact that the primary source of difficulty could reside either in the lexical representations or in the grammatical operations needed to process agreement relations. In order to derive the predictions of the *Grammatical Agreement Deficit Hypothesis* for Italian, we will try to briefly develop the two views. According to the *Lexical Grammatical Agreement Deficit Hypothesis*, uninterpretable features are missing from the derivation altogether. For example, some forms of the verbal paradigm could be left underspecified, lacking values for uninterpretable features. Their distribution will then be less constrained and substitution errors could follow. The case discussed in Clahsen (2008) is the substitution of the correct 3rd person plural form with the 3rd person singular in Italian (Leonard 1998). The second way of implementing the hypothesis is the *Procedural Grammatical Agreement Deficit Hypothesis.* According to this second alternative, SLI children have problems with agreement not because they use lexical items deprived from their full feature specification, but because uninterpretable features involve grammatical operations that exceeded the limits of their computational system. For our purposes, a crucial point here is that also this second alternative does not distinguish between different types of agreement. Therefore, regardless of its implementation, the *Grammatical Agreement Deficit Hypothesis* predicts that all agreement relations will be equally problematic for SLI children. This worth saying that Italian SLI children will have generalized problems with agreement morphology, and that different configurations as Determiner-Noun, Subject-Verb and Clitic-Past Participle will pose the same level of difficulty.

Let's now consider a different proposal, the one presented in Moscati and Rizzi (2014). Although the proposal was originally formulated to account for a set of data coming from a population of typically developing children, it could be straightforwardly extended to children with a diagnosis of SLI. The main idea

is that different types of agreement pose different degrees of complexity from the point of view of the processing resources. From this, it follows that some configurations - the more demanding ones - could be selectively impaired. In order to rank the various types of agreement, Moscati and Rizzi drew a typology taking into account the nature of the syntactic relations that links the two terms that enters into an agreement relation. In particular, they considered the following types of agreement:

(2) le   ragazze   (Det-Noun)
    the$_{f,p}$ girls$_{f,p}$
    'the girls.'

(3) le   ragazze   mangiano   (Subject-Verb)
    [the girls]$_{f,p}$ eat$_{3rd, p}$
    'the girls eat.'

(4) la   ragazza le   ha mangiate   (Cl-Past Part)
    the girl   them$_{f,p}$ has eaten$_{f,p}$
    'the girl has eaten them.'

Capitalizing on the assumption that agreement and movement are closely connected computational operations, Moscati and Rizzi differentiate the three agreement configurations in (2-4) on the basis of the number and the properties of the movement operations involved. The simplest case is (2), with D - N agreement being the most local form of agreement. It may not involve any movement at all and in any case, it will be phase-internal (in the sense of Chomsky 2001). The second type of agreement, S-V in (3), involves instead movement of the subject from its vP internal position to the Spec position of a functional head in the clausal structure. This can be the final movement step and no further movement is required:

(5).... [$_{AgrS}$ ___ Subj .... [$_{vP}$ DP ....]

The third case is Clitic - Past Participle Agreement in (4). In this configuration, agreement is checked "in passing" (Kayne 1989; Belletti 2006). The clitic moves from object position, triggers agreement on the past participle and then proceeds to its final destination, the clitic position in the functional structure of the clause.

(6).... ___ Cl .... [$_{AgrO}$ ___   ... [$_{vP}$ V DP   ....]]

The crucial difference between (5) and (6) is that while the Subject -Verb configuration is stable at the end of the derivation and the two elements can be hosted under the same functional head, in the case of Clitic-Past Participle this configuration is obligatorily disrupted by a successive derivational step.

Building on these considerations, Moscati and Rizzi proposed a gradient of complexity that enables the following ranking, from the simplest to the more complex agreement configuration:

(7)   I.   D - N
       II. S - V
       III. Cl - PPart

From this ranking it follows the developmental hypothesis that more local configurations will be fully mastered earlier than less local ones. Thus, D-N will be mastered earlier than S-V agreement and Cl-PPart agreement. This idea found support on a population of TD children and it can be naturally extended to SLI children, whose difficulties with the more costly configurations in (7) might be exacerbated. The prediction for G-SLI children is then similar to the one about TD children, namely that the processing costs associated with agreement is variable and it is modulated in function of the number and the kind of the required syntactic operations. This proposal shares with the *Procedural Grammatical Agreement Deficit Hypothesis* the fundamental idea that the feature-checking operations could be impaired in SLI children but introduces the important difference that not all agreement configurations are equally costly. In order to evaluate the two aforementioned proposals, we designed a new experiment that we will describe next.

3. *Comparing agreement configurations in two populations of SLI children*

We already pointed out that, to account for the diversified array of language impairments, different clinical subgroups have been identified. In particular, we will refer to children whose language problems are mostly confined to the phonological/articulatory component as 'Phonological SLI' (P-SLI) and to children with a deeper grammatical impairment as 'Grammatical SLI' (G-SLI). Given this distinction, we expect that only G-SLIs, but not P-SLIs, will show a significant delay with respect to the typically developing population in terms of their competence with agreement morphology. In addition, given the different predictions of the two theories previously discussed, we also want to compare children's competence with the different configurations presented in (7).

In order to overcome the articulatory difficulties of P-SLI children, we adopted a task that does not rely on production. We used the Forced Choice of Grammatical Form Task (FCGFT) reported in Moscati and Rizzi (2014), a procedure that was originally designed to test very young TD children

and could be extended, with minimal modifications, also to G-SLIs and P-SLIs. Since it consists in a binary decision task that could be carried out also non-verbally i.e. by choosing on video the character associated with the grammatical alternative, P-SLI won't face any extra difficulty related to the nature of the behavioural response. This task involves a series of forced choices between minimal pairs, in which a grammatical alternative is contrasted with an ungrammatical one. To test the configurations in (7), we insert feature mismatches of different kinds, as in the pairs below:

(8) Determiner - Noun
     a. (la torta) la bambina la ha mangiata   b. *(la torta) **le** bambina la ha mangiata
        the cake the$_{sing}$ girl$_{sing}$ it has eaten   the cake the$_{plur}$ girl$_{sing}$ it has eaten

(9) Subject - Verb
     a. (la torta) la bambina la ha mangiata   b. *(la torta) la bambina la **hanno** mangiata
        the cake the girl$_{sing}$ it has$_{sing}$ eaten   the cake the girl$_{sing}$ it has$_{plur}$ eaten

(10) Clitic -Past Participle
     a. (la torta) la bambina la   ha   mangiata   b. *(la torta) la bambina la ha mangiat**e**
        the cake the girl   it$_{sing}$ has eaten$_{sing}$ the cake the girl   it$_{sing}$ has eaten$_{plur}$

Each pair is formed by a grammatical (8a, 9a, 10a) and an ungrammatical sentence (8b, 9b, 10b) that minimally differ only with respect of a single morpheme. Crucially, the (b) sentences introduce different types of agreement violations, one for each of the configurations in (7). Participants were presented with minimal pairs similar to 8-10, and their task was to select the grammatical alternative over the ungrammatical one. If all the different agreement configurations impose the same degree of difficulty, no difference should exists between the proportion of correct choices in (8), (9) and (10), in line with the predictions of the *Grammatical Agreement Deficit Hypothesis.* Conversely, in a theory that assumes a graded scale of complexity, we expect that children difficulties will be more pronounced with the configurations in (9) and (10) with respect to (8).

3.1 *Participants*

Fifty children took part in the experiment, divided into three groups: the first group was made of 12 children diagnosed with G-SLI, the second by 8 children diagnosed with P-SLI and the third group by 30 children with no known language-related condition. Children in the P-SLI and G-SLI groups were recruited from the following clinical centers: the *IRCCS Fondazione Stella Maris* in Calambrone (Pisa), the *Centro Dedalo* of Siena, the rehabilita-
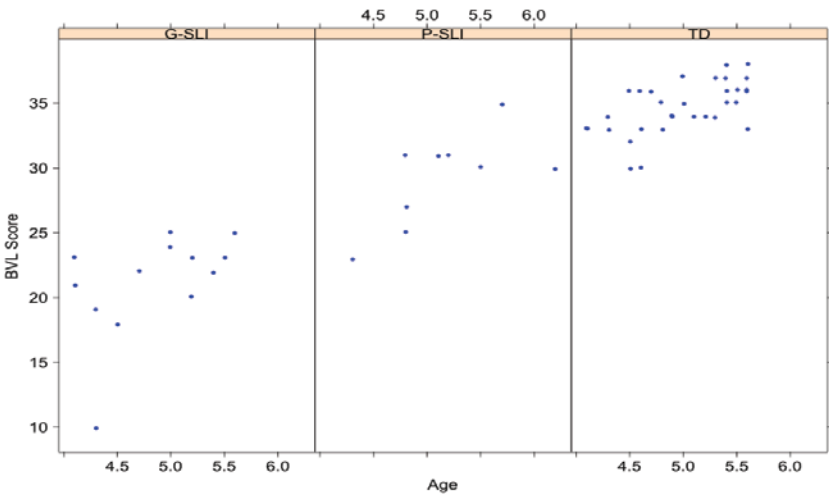
tive center *Giovanni XXIII* in Lessona (Biella), and a private speech-therapy studio in Biella. All the children of the control group were recruited from a kindergarten of the *Comprehensive Institute* of Candelo (Biella). All SLI children received individual language therapy, and they were all independently diagnosed by speech therapists/clinicians.

Before commencing the test, all participants underwent to an additional screening of their grammatical development. Their comprehension skills were measured using the 'comprehension of syntactic structure' section of the *Batteria di Valutazione del Linguaggio* 4-12 (Marini *et. al* 2014). All the children with a diagnosis of G-SLI performed below the standard score for their age, between 0 and -2 S.D. Children belonging to the other two groups, TD and P-SLI, scored instead above their age mean. All children in the G-SLI and in the P-SLI group also received a preliminary cognitive evaluation, either through the WPPSI-III or the Raven's Progressive Matrices Colored. These tests revealed no general cognitive deficits, with all children being within the normal range. A summary for the aggregated characteristics of the participants in each experimental group is provided in Table 1, while individual data are plotted in Figure 1.

Table 1. Summary: age, linguistic evaluation and number of participants for each experimental group

Group	Mean score BVL 4-12	Mean Age	N
TD	34,4	4;8	30
P-SLI	29,2	5;1	8
G-SLI	21,1	4;9	12

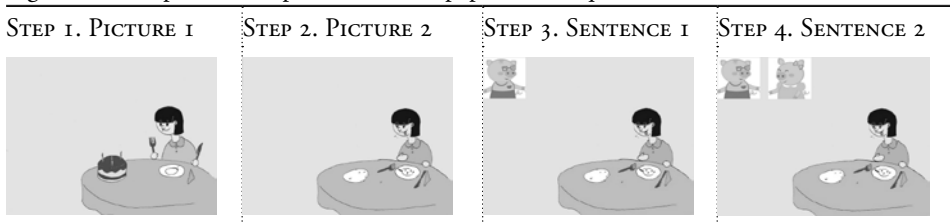Figure 1. Individual data: age and score in the BVL 4-12 for participants in each group

In Figure 1, we report on the x-axis the age in years and on the y-axis the score in the BVL 4-12. As the figure shows, children in the G-SLI group obtained a score lower than children in the other two experimental groups, confirming their language deficit in comprehension.

3.2 *Procedure and Materials*

Participants sat in front of a laptop computer and saw a sequence of pictures that illustrated simple events. The test session was preceded by a brief warm-up, in which participants had to look at some objects on screen and choose the correct object's name between two, pronounced by two different characters. Children had to indicate which one "said it right". This served to introduce the forced choice procedure and to be sure that they were paying sufficient attention to the task. After familiarization, the test session began. We illustrated it in Figure 2. In each trial, children saw a short sequence of two pictures describing an accomplished event (Step 1 and 2). The first picture set the stage and introduced all the entities involved, while the second showed the final outcome. At this point, two characters (a male or a female piglet) appeared on screen, each one uttering a sentence (Step 3 and 4), either the grammatical or the ungrammatical one. Again, the participants' task was to indicate which one "said it right", either repeating the correct sentence or pointing out the character on the screen.

Figure 2. Example of the experimental set up: pictures' sequence and final evaluation

STEP 1. PICTURE 1	STEP 2. PICTURE 2	STEP 3. SENTENCE 1	STEP 4. SENTENCE 2

We used 6 different picture sets and, for each of them, children heard a sentence pair with a different agreement violation. The same correct sentence was used to generate three minimal pairs, so to control for the lexical material. For each different agreement configuration, children heard 6 minimal pairs, for a total of 18 trials.

Table 2. Agreement conditions

Conditions	Examples
D-N	(la torta) la/*$\textbf{le}$ bambina la ha mangiata (the cake) the$_{sing}$/$_{*plur}$ little-girl it has eaten
S-V	(la torta) la bambina la ha/*$\textbf{hanno}$ mangiata (the cake) the little-girl it has$_{sing}$/$_{*plur}$ eaten
Cl-PPart	(la torta) la bambina la ha mangiata/*$\textbf{e}$ (the cake) the little-girl it has eaten$_{sing}$/$_{*plur}$

In addition, we also included an extra S-V agreement condition in which the correct choice was the 3rd person plural instead of the 3rd person singular. This to test whether plural forms are more complex than singular ones. To do so, we used here a slightly modified set of pictures, depicting actions carried out by plural subjects. Pictures were very similar to the ones previously described, but they varied in the number of agents: for example, instead of showing only one child eating the cake, they were showing two children. We included six more trials in the S-V plural condition:

(11) (la torta)   le bambine   la **ha**/hanno   mangiata   S-V$_{plural}$
      (the cake) the little-girl it *has/have   eaten

Interspersed between the experimental trials, we added 6 controls that introduced some word-order violations as in the pair below:

(12) *balena la   grande / la   grande balena
       nwhale the big   the big   whale

These controls served to be sure that children have no general problem in carrying out the forced-choice task. In total, each participant saw a total of 30 sentence pairs.

3.3 *Results*

Since this experimental paradigm was previously employed only with TD children, the first issue to consider is whether children in the two SLI groups had some general problem with the procedure. In particular, we needed to determine if P-SLI and G-SLI children correctly understood the task and were able to express their choice. In Figure 3, we report the proportion of correct answers to the controls, i.e. the minimal pairs with simple word-order violations. As the figure shows, performance was high in each group, with P-SLI at ceiling and TD and G-SLI making the correct choice in 96% and 92% of the cases. This shows that children correctly understood the task and they have no general problem with the experimental procedure. This is also confirmed if we look at the overall proportion of correct answers. In Figure 4, the proportion of correct choices for all the items is reported. The proportion of correct answers is high in each group and even children in the G-SLI group do not score below 82%. This overall good performance shows that SLI children have no general difficulty in understanding the Forced Choice of Grammatical Form Task.

Figure 3. Performance in the Word-Order controls. Proportion of correct acceptances in each group. Error bars = 2 S.E.
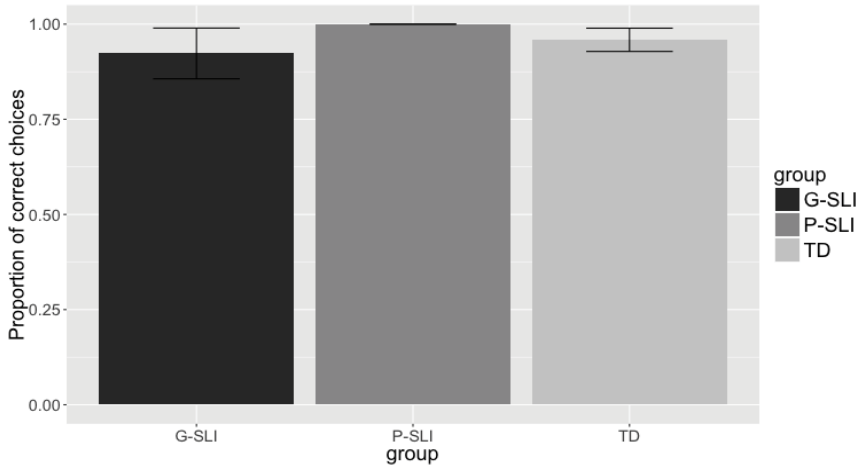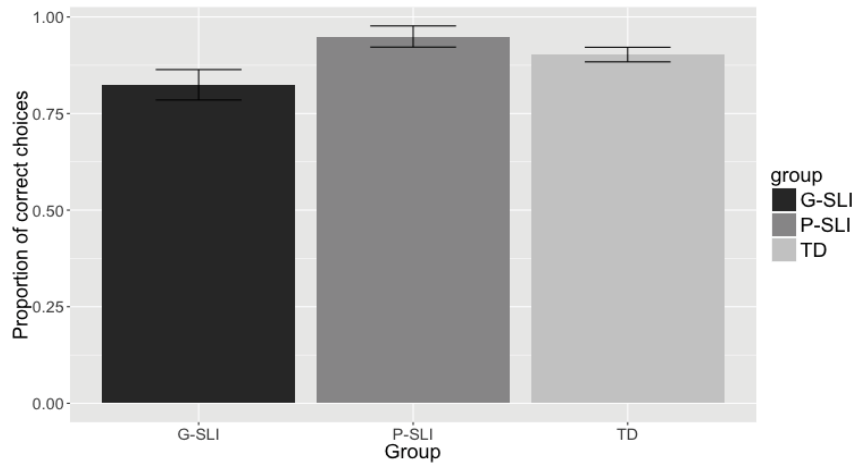

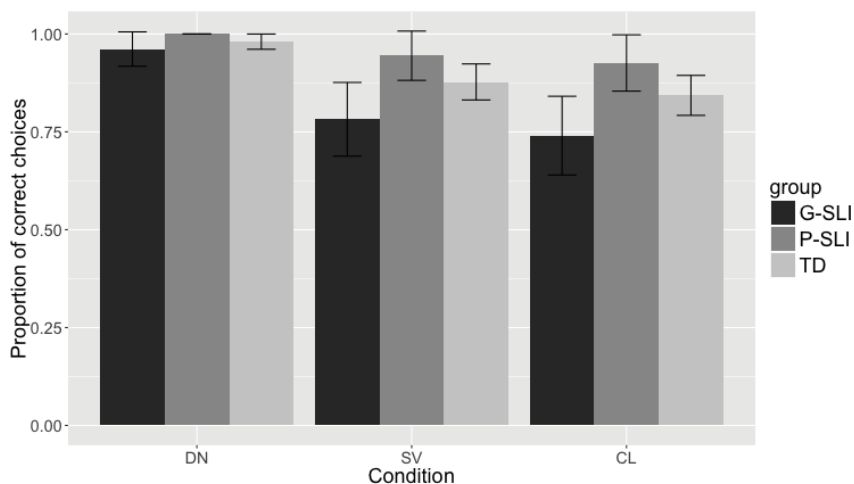Figure 4. Overall performance. Proportion of correct acceptances in each group. Error bars = 2 S.E.

A point worth to be discussed is the fact that P-SLI children performed even better than TD children. Although this difference is not significant (see Table 3), we could speculate about potential explanation for this trend. One explanation could reside in the fact that the average age of the P-SLI group is slightly higher, being

it about 3 months above the average age of the TD group. An alternative could be that SLI children are more used than TD children in carrying out language-related task. Therefore, if the task taps in abilities that are not impaired, as in the case of grammatical abilities in P-SLI, these children could perform even better than children randomly recruited in kindergartens.

We now turn to our research question, trying to assess whether children difficulties with morphological agreement are modulated in function of the different agreement configurations. In Figure 5, we report the proportion of correct choices for each of the three agreement configurations under scrutiny. Let's discuss them in turn, starting from the D-N Condition. As the figure shows, there is only a small difference between groups in the DN agreement condition, with the G-SLI children being at the lower end with 96.1% of correct choices, followed by TD children at 98% and P-SLI children producing no error. This high performance, observable across groups, indicates that D-N agreement does not pose any particular challenge for children, regardless to the experimental group they belonged to. The picture changes when we turn to SV agreement. Here the difference between groups becomes more evident, with G-SLI children providing the correct answers at 78.2%. This proportion is lower than the ones of TD children and P-SLI children, who provided the right answer at 87.7% and 94.4% respectively. This is very similar to what happens in the Cl-PPart condition. In this latter condition, G-SLIs provide an even lower proportion of correct answers, making the correct choice only in 74% of the cases. Again, a proportion lower than P-SLIs and TDs, who made the correct choice 92% and 84.3% of the times. In sum, Figure 5 shows that all children found the DN condition easier than the other two and that this difference is more pronounced in the group of G-SLI children.

Figure 5. Proportion of correct choices for each agreement configuration. Results for each group. Error bars = 2 S.E.

We evaluate these observations by analysing our data using a Generalized Linear Mixed Effects Model (Bates 2007) implemented in R (R Development Core Team, 2010). We used Group and Agreement Configuration as fixed effects and Subject and Item as random effects (see Baayen *et al.* 2008; Jaeger 2008). In order to compare different conditions, we run the same analysis twice, setting first the reference level for condition as 'CL-PPart' and then 'S-V'. Significant main effects are reported in the table below:

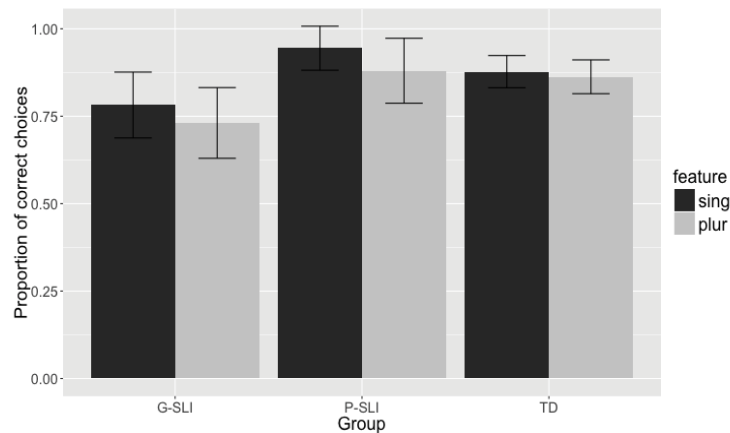Table 3. GLMM with Condition and Group as fixed effects

Condition		Estimate	Std. Error	z value	Pr(>|z|)
Clitic	(Intercept)	1.17036	0.36106	3.241	0.001189 **
	Cl vs DN	2.28892	0.69463	3.295	0.000984 ***
	G-SLI vs P-SLI	1.64067	0.66478	2.468	0.013587 *
	G- SLI vs TD	0.68902	0.39525	1.743	0.081291 .
S-V	(intercept)	1.41661	0.36795	3.850	0.000118 ***
	S-V vs DN	2.04247	0.71718	2.848	0.004401 **
	G-SLI vs P-SLI	1.74030	0.73975	2.353	0.018645 *
	G- SLI vs TD	0.77107	0.41212	1.871	0.061344 .

glmer(correct~group*condition+(1|item)+(1 | subject), family=binomial
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The model revealed a significant effect of Group, with the probability of choosing the correct alternative in the G-SLI group being lower than in the P-SLI and in the TD group (whereas the difference between G-SLIs and TDs only reaches a marginal level of significance). A main effect of Condition was also found, with the probability of making the correct choice in the DN condition higher than in both the Cl-Part and the S-V conditions. The model revealed no significant difference between SV and Cl-Past Part. This model confirmed that not all agreement configurations present the same difficulty, with the DN configuration being the easiest one. It also confirmed that G-SLIs had more troubles than both TD and P-SLI children in making the correct choice.

Having compared the three different configurations, we look now to the two types of SV agreement, the one in which the correct verbal form was plural and the one in which it was singular. Figure 6 shows that the proportion of correct choices in general was lower in the G-SLI group and slightly higher for the 3rd person singular condition in the each group.

Figure 6. Subject-Verb agreement: comparison between 3rd singular and 3rd plural verbal morphology

Again, we analysed the data using a Generalized Linear Mixed Model with Group and Condition (3rd singular, 3rd plural) set as fixed effects and Subject and Item as random effects. The model (Table 4) revealed no significant interaction between Group and Condition and only a main effect of Group, with G-SLI being more likely to select the ungrammatical alternative with respect to the other two groups.

Table 4. GLMM with Condition and Group as fixed effects

Fixed Effect		Estimate	Std. Error	z value	Pr(>|z|)
	(Intercept)	1.3631	0.3559	3.830	0.000128 ***
Group	G-SLI vs P-SLI	1.6684	0.6847	2.437	0.014820 *
	G- SLI vs TD	0.7520	0.3824	1.967	0.049231 *
Condition	Sing vs Plural	-0.586	0.4589	-0.652	0.514405

glmer(correct~group*condition+(1|item)+(1 | subject), family=binomial
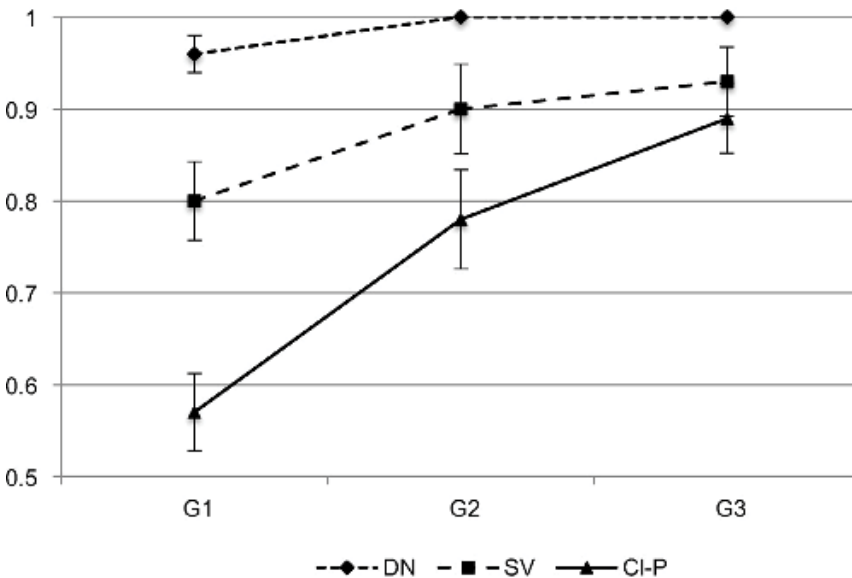Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

4. *Discussion and conclusions*

With respect to the predictions of the *Grammatical Agreement Deficit Hypothesis* and the theory of locality discussed in Moscati and Rizzi (2014), the main result of our experiment is the contrast between D-N agreement and the two other configurations, i.e. S-V and Cl-PPart agreement. Remem-

ber that, according to the *Grammatical Agreement Deficit Hypothesis,* G-SLI children's problem with agreement morphology should be generalized to all the agreement configurations. In contrast, our study revealed that choosing the grammatical alternative in a pair is harder in the case of S-V and Cl-PPart with respect too. DN. This result is consistent across groups and the difficulties posed by these two configurations are exacerbated in the G-SLI group. We take this to indicate that the challenges posed by different agreement configurations are variable and that we need the appropriate set of theoretical tools to characterize the relative complexity of each configuration.

A proposal in this direction came in the work of Moscati and Rizzi (2014), who proposed a ranked typology in function of the derivational steps needed to check uninterpretable features. On this scale, previously reported in (7), the D-N agreement constitutes the most local and easier configuration. Therefore, the relative easiness of D-N agreement and the contrast with the other two configurations is expected. What deserves instead a closer look is the absence of any significant difference between S-V and Cl-PPart in our experiment. This is most likely due to the age of our participants. In fact, such a difference was visible in the TD population only in children at age 3 (G1) and 4 (G2), as the figure taken from Moscati and Rizzi shows:

Figure 7. Results from Moscati and Rizzi (2014). Proportion of correct choices for each agreement configuration in three different age-groups of TD children: G1= 3y.o., G2= 4y.o., G3 = 5y.o.

The figure shows that, also in the original study, by the age of five no significant difference was found between S-V and Cl-Past participle agreement. In the older group (G3), the proportion of correct answers was at around 90%: roughly the same proportion of correct answers that we found in our TD and P-SLI groups. Given that the age of our participants was similar to the age of G3, there is a substantial coherence between the results of the two studies. For what concerns the performance of G-SLI children, we know that by definition this group is characterised by a slower developmental curve. Therefore, we could have expected that the problems that TD children have at three or four will persist until later in G-SLI. Our study instead revealed that at age 5 G-SLIs did not find the CL-PPart condition more problematic than the S-V condition. It is certainly possible that, also in G-SLIs, the difference between Cl-PPart and SV is simply not visible in this time-window and that it could be instead detected at earlier or later developmental stages. In this respect, data from a longitudinal follow-up with G-SLI of different ages would be relevant.

Another result worth to be discussed is the similarity between the S-V$_{plur}$ and the S-V$_{sing}$ conditions. We found that the proportion of correct choices in the minimal pairs in which the correct alternative was the 3rd person plural was not more difficult than in the pairs in which the correct alterative was the 3rd person singular. This result is relevant in light of previous studies that suggested an asymmetry between plural and singular verbal morphology (Leonard *et al.* 1992; Bortolini *et al.* 2006). A possible explanation for the difference between our and previous studies could reside in the different methodologies employed. In fact, while previous studied looked at children's production, here we adopted a forced-choice decision task. The difference is that children did not have to produce the sentence themselves and also that they heard the correct sentence before answering. What we observed is that, with this kind of aids, the difficulties related to 3rd person plural forms disappeared. This indicates that previous results are best interpreted as a kind of performance error, perhaps related to the phonological properties of the plural paradigm (see Bortolini and Leonard 1996).

We wish to conclude with a final observation that concerns the task itself. Our study showed that the overall performance in all groups was quite high, including children in the G-SLI group. In particular, no children had problems in understanding the nature of the task and all of them find the experimental session enjoyable. We believe that this task could be successfully employed to investigate grammatical structures that are not testable with more traditional comprehension tasks. Take for example the picture selection tasks often used to look at SLI children's grammar. With picture selection, only grammatical distinctions that introduce graphically salient semantic variations could be observable. This constraint does not apply with the Forced Choice of Grammatical Form that could be extended to investigate a series of grammatical violations that have no obvious semantic correlate.

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