The comprehension and production of clitics in Italian adults with Down Syndrome: a pilot study

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This study reports on findings from an experimental investigation into the knowledge of Binding and the production of object clitic pronouns in a group of Italian adolescents with Down syndrome (DS), compared to a group of typically developing (TD) children aged 3:4-5:3, matched to the participants with DS on receptive grammar abilities. Previous studies on English adults with DS found a specific difficulty in comprehending reflexives, but not pronouns (Perovic 2006, Ring & Clahsen 2005).
With a comprehension study testing the interpretation of reflexive clitics and object clitic pronouns, we observe that both Italian participants with DS and TD children, comprehend the two types of clitics equally well. Moreover, no dissociation is found between reflexive and object clitics in any of the conditions in analysis in the two groups.
This results support the hypothesis that reflexive clitics, which are comprehended by Italian adults with DS, are different in nature than reflexive full pronouns, which are impaired in the English population (Kayne 2000, among others).
With a task testing the production of pronominal clitics, we observe that object clitic pronouns are particularly challenging for 3 of the 4 subjects with DS. Overall, the group performance of participants with DS is marginally lower than that of the TD controls. We interpret the difficult that (some) of the DS and TD participants experience with the production of object clitics as the result of the their syntactic complexity, as suggested by Hamman & Belletti (2006).

1. Introduction

In section 1.1 we describe the general language abilities of people with DS and in section 1.2 we discuss previous studies on syntax in DS, in particular on Binding Principles.

In Section 2 we focus on pronominal and reflexive clitics in Italian, presenting studies on TD children and sketching out the theoretical framework adopted in the present paper.

1.1 Language abilities in DS

The language of both children and adults with DS has generally been described as relatively more impaired than other cognitive functions, with production abilities

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laying behind comprehension (Cardoso-Martin et al. 1985, Miller 1992, Rondal 1993).

Moreover, despite a high individual variability (Fabbretti et al. 1997 among others), some components of language seem to be more affected than others. In particular, individuals with DS show morphosyntactic and phonological impairment with relatively spared lexical and pragmatic abilities (Fabbretti et al. 1997, Miller 1992, Fowler 1990).

Some studies describe language abilities in DS as delayed, mirroring the pattern in typical language development, with no obvious signs of deficiency (Fowler 1990, Miller, 1988, Vicari et al. 2000).

More recent studies show that a selective impairment affects some language components of syntax in DS. In this perspective, a new account has been proposed suggesting that the linguistic development of people with DS is not simply delayed and raising the issue of a 'deviant' linguistic development (Perovic 2003, 2006, Ring & Clahsen 2005).

In the next section we present some previous findings on syntax in adults with DS, in particular on their mastery of Binding principles (Perovic 2003, 2006, Ring & Clahsen 2005).

1.2 Binding in syntactic theory and DS

Binding Theory (Chomsky 1981) regulates the possible binding relationships between nominal and pronominal expressions within clauses by means of three principles. While Principle A claims that a reflexive pronoun must be bound by a local antecedent, Principle B states that a non-reflexive pronoun cannot be syntactically bound by a local antecedent. Finally, Principle C states that referential expressions must not be bound.

Previous research tested Principle A and B of Binding in monolingual adolescent with DS (Perovic 2003, 2006, Ring & Clahsen 2005, Stathopoulou 2009). An unusual pattern of performance was observed in this population.

In Perovic (2003, 2006) English and Serbo-Croatian individuals with DS tested with a picture matching comprehension task showed difficulties in interpreting reflexive full pronouns with either a referential (1) or a quantified antecedent (2).

(1) The bear$_i$ is drying himself$_i$

(2) Each bear$_i$ is drying himself$_i$

However, whereas Serbo-Croatian participants had problems interpreting conditions with the full reflexive pronoun *sebe* (3), they did not show the same difficulties with the Serbo-Croatian reflexive clitic *se* (4), when it was bound by either a referential or a quantified antecedent.

(3) Marija$_i$ sebe$_i$ vidi u ugledalu
Marija self-Acc sees in mirror
"Marija sees herself in the mirror"

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(4) Marko$_i$ se$_i$ brije
Marko se-Cl. shaves
"Marko shaves"

Ring & Clahsen (2005) obtained the same results with 8 English adolescents with DS.

A similar pattern of interpretation of reflexive pronouns has never been documented with TD children of any age. In some languages like English, instead, children display an opposite pattern, also called Delay of Principle B effect (cfr. Section 2.3).

As in the Serbo-Croatian study (Perovic 2003), recent results from Greek (Stathopoulou 2009) showed that participants with DS do not differ from mental age matched TD participants in the comprehension of the reflexive clitics, either when they are bound by a referential or a quantified antecedent[11].

In the next section we present the acquisition of Binding pronominal and reflexive clitics in TD across languages, with a particular focus on Italian.

2. Binding principles, pronominal and reflexive clitic in Italian typically developing children

In section 2.1 we present a review of the literature on the acquisition of Binding principles. In section 2.2 we focus on object clitics and reflexive clitic pronouns in Italian TD children, briefly describing the theoretical framework that we adopt in the present research.

2.1 Acquisition of Binding

Typically developing children are known to have an adult-like interpretation of reflexive pronouns from the age 3, but they have difficulties in comprehending non-reflexive pronouns. Up to the age of 4 they allow pronouns to be locally bound to c-commanding antecedents, accepting ungrammatical sentences such as (5) as grammatical (Chien & Wexler 1990, Guasti 2002, Thornton & Wexler 1999). However, their interpretation is adult-like in contexts where the pronoun is bound with a quantified antecedent, as in (6):

(5) *John$_i$ washes him$_i$

(6) Every man$_i$ washes him$_j$

This phenomenon, known as Delay of Principle B effect (DPBE), has been attested in a variety of languages, such as English (Chien & Wexler 1990, Guasti 2002), Russian (Avrutin & Wexler 1992), Dutch (Philip & Coopmans 1996) and Icelandic (Sigurjónsdóttir & Hyams 1990). Instead, it is absent in Romance languages such as Italian (McKee 1992), Spanish (Baauw, Escobar & Philip 1997) and French (Hamann & Philip 1996).

[11] With a picture matching task, Stathopoulou (2009) did not observe any dissociation between clitic pronouns and reflexive clitics in the DS participants. Rather, the Greek DS group showed a general less accurate performance in all conditions, especially those displaying a mismatch.

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For Italian, McKee (1992) shows that TD children aged 3:7 to 5:5 have a good mastery of both pronominal and anaphoric binding. Furthermore, the author suggests that the absence of the DPBE is related to the fact that weak pronouns like Italian *lo* are clitics, as the example in (7), unlike English pronouns such as *him* (8).

(7) Gianni$_i$ lo$_j$ lava
John him-masc-CL washes

(8) *John$_i$ washes him$_i$.

Even though the interpretation of sentences with pronominal clitics is adult-like from the early stages of language development, the production of pronominal clitics in Italian TD children is known to be more problematic.

In the next section we are addressing the issue of production of pronominal clitics in Italian children, in particular accusative clitics in comparison to reflexives.

2.2 Acquisition of Object and Reflexive Clitic Pronouns and theoretical accounts

Studies on the acquisition of object clitics in Italian have shown that in the early stages of language development the number of clitics produced is low and their adult-like use is delayed (Guasti 1993/1994). Moreover, even though children tend to place pronominal clitics correctly, optional omission emerge in both elicitation (Shaeffer 2000) and spontaneous speech contexts (Cipriani et al. 1993, Guasti 1993/1994).

The delayed production of pronominal object clitics in TD children sharply contrasts with that of other clitic elements, such as reflexives, which are known to be adult-like from the early stages of development (Shaeffer 2000).

To account for the delayed emergence of object clitic pronouns in the children's speech, we adopt a theoretical approach based on the accusative clitics' structural properties.

Object clitic pronouns in Romance languages have been extensively discussed and several proposals have been made to explain their nature and their behaviour.

We adopt a movement analysis of cliticization, assuming that pronominal clitics are V-related determiners that have their features checked by a verbal head[12]. Moreover, we adopt Belletti (1999)'s account on the syntactic clitic derivation as it provides a uniform analysis of the properties of Romance clitic system.

The theoretical basis of Belletti's account is constituted by the interaction of Case checking with the checking of verbal inflectional morphology, which determines the movement of the clitic in either proclitic or enclitic position.

To check the accusative Case, the clitic and the DP it heads move from its base position to the Specifier of AgrO[13]. After checking its Case under a Spec/head configuration (Kayne 1989), the clitic can cliticize via head movement to the next

[12] This hypothesis (Rizzi 2000 among others) presumes that a feature checking system could be extended to the internal structure of the nominal system. While in the N-related determiner system N move to D to check its features, the V-related determiners (e.g. clitics) do not take a NP complement and move to find a checker as they cannot have their features checked DP-internally.

[13] Following Chomsky (1993) account for functional head, AgrO is the inflectional head that has the function of checking Accusative Case features of DP's moving to their specifiers.

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higher head. The clitic, firstly moved as an XP, in the last part of its movement is incorporated to the verbal head (I´, its final landing site) as a X´.

Further evidence for this derivation of clitics is given by Belletti (1999) with examples of past participle agreement in Italian. As shown in (9) and (10), in Italian sentences involving cliticization with a complex verb form Aux+Past participle the past participle agrees in gender and number with the clitic:

(9) Lo ha visto
him-cl-masc-sing has seen-masc-sing
"(He/she) saw him"

(10) Le ha viste
them-cl-fem-plu has seen-fem-plu
"(He/she) saw them"

In Belletti's account, the behaviour of past participle in (9) and (10) is a clear manifestation that the clitic moved as a DP through the Specifier of the AgrPstPrt[14].

As in Belletti & Hamann (2006), we assume that syntactic complexity is a crucial factor for the late emergence of object clitics in the production in TD children.

Concerning reflexive clitics, we briefly describe the main approaches proposed to account for their derivation: the base-generation hypothesis (Kayne 1975, 2000), the unaccusatives analysis of reflexive verbs (Grimshaw 1990, Kayne 1988, Marantz 1984, Pesetsky 1995, Sportiche 1998) and the lexicalist approach (Chierchia 1989, Reinhart 1996, Wherli 1986,).

First of all, Kayne (1975, 2000) shows that the movement analysis assumed for pronominal clitics cannot be implemented for reflexive clitics. He therefore concludes that reflexive clitics must be base-generated in their overt position.

It has been further observed that reflexive clitic constructions share certain properties of passives and unaccusatives cross-linguistically. This fact has been taken to indicate that reflexive clitics are generated as external arguments, with the internal argument raising to subject position, as in a passive (Kayne 1988, Marantz 1984).

Evidence for this hypothesis is given from French auxiliary selection, as exemplified in the past participle constructions in (11)-(13). In (11) a non-reflexive clitic is followed by the auxiliary *avoir* and the past participle of the transitive verb. In examples (12) and (13) a reflexive external argument (12) and a passive with a null external argument (13) take take the auxiliary *être* (cf. Kayne 1975).

(11) Jean *l'a/*l'est* frappé
Jean him-CL has/*is hit
"Jean hit him"

(12) Jean *s'est/*s'a* frappé
Jean himself-CL is/*has hit
"Jean hit himself"

[14] The Agr projection of the Past participle verb, placed lower than the Agr/O in Romance languages as argued by Friedemann & Siloni (1993).

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(13) Jeani *était/*avait* frappé ti.
Jean was/*had hit
"Jean was hit"

Further evidence that reflexive clitic constructions share certain properties of passives and unaccusatives is taken from French case. Examples of a transitive verb embedded under a causative are given in (14) and (15). In (14), the object clitic *le* is accusative, and the embedded subject *juge* is marked as a dative, whereas when the embedded clause has a reflexive clitic, as in (15), the reflexive clitic is the external argument, and DP *le juge* is the object, bearing accusative case. If *se* were the object, *le juge* would be the subject, and would have dative case as in (14).

(14) Jean *le* fait reveler *au/*le* juge
Jean him-CL made reveal to/*the judge
"Jean made the judge reveal it"

(15) Jean fait *se* reveler *le/*au* juge
Jean made himself-CL reveal the/*to judge
"Jean made the judge reveal himself"

Research supporting the analysis of reflexive verbs as unaccusatives and claiming that the internal argument of reflexives is the derived subject has been further developed. Some authors hypothesize that the external argument undergoes a lexical process of absorption (Grimshaw 1990, Marantz 1984), while other research propose that it is present in syntax in the shape of the reflexive clitic (Kayne 1988, Pesetsky 1995, Sportiche 1998). Finally, a lexicalist approach suggests that reflexive clitics, unlike full reflexive pronouns, are elements of the inflectional system to mark lexical reflexivity processes of reduction/absorption of the internal argument of the verb (Chierchia 1989, Reinhart 1996, Wherli 1986).

Regardless of the specific analysis that we take into account, the theories illustrated assume that the reflexive clitic is structurally different than the full pronominal counterpart (such as the English *himself*).

Furthermore, all the approaches mentioned predict an earlier acquisition of the reflexive clitic than the object clitic pronoun. While object clitic pronouns are first generated as XPs and than undergo a syntactic movement to a higher projection belonging to the extended projection of V (Belletti 1999), reflexive clitics involve a less complex syntactic derivation.

On the one hand, the lexicalist approach suggests a derivation of a structure lacking the thematic role absorbed in the lexicon, for which an easier computation than accusative clitics is required.

On the other hand, the inaccusative analysis of reflexive verb predicts that an easier chain is surfacing with reflexive rather than accusative clitics, as no crossing is involved in the former with respect to the latter. Crossing between the subject and the object chain is visible in the pronominal clitic construction in (16) while it is absent in the reflexive clitic construction in (17). This might suggest an explanation the earlier surfacing of reflexive clitics in typical language acquisition.

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(16) Gianni$_i$ lo$_j$ vede [t$_i$ V t$_j$]
Gianni him-cl sees
"Gianni is seeing him"

(17) Gianni$_i$ si$_j$ vede [t$_j$ V t$_i$]
Gianni himself-cl sees
"Gianni is seeing himself"

In the present study we will investigate the competence on reflexive clitics and object clitic pronouns in Italian adolescents with DS. Considering the syntactic status of the Italian reflexive clitic *si*, compared to the reflexive full English pronouns, we want to observe if a selective impairment in the interpretation of reflexives is present in Italian subjects with DS. Furthermore, we want to observe if and to which extent object clitic pronouns are mastered by this population, in comparison to Italian TD children.

In the next section we present the experimental study**.**

3. The study

The aim of the study is to test comprehension of pronominal and anaphoric clitics and production of object clitic pronouns in Italian adolescents with DS. Subjects with DS are compared to TD controls matched on receptive grammar.

We expect that, according to the results from Serbo-Croatian (Perovic 2003) and Greek (Stathopoulou 2009), participants with DS should not experience particular difficulty in interpreting pronominal and reflexive clitics, when the antecedent is either a referential or a quantified NP.

On the other hand, we don't have specific predictions for the production of object clitics, as this aspect has never been investigated in DS.

However, the general problems with language production and morphosyntax (Fabbretti et al. 1997, Fowler 1990, Miller 1992) and the delay in the acquisition of object clitic pronouns by TD children due to their syntactic complexity (see discussion in section 2.2) suggest that pronominal object clitics might be difficult to produce for subjects with DS.

In section 3.1 we present the group of participants with DS and the control groups. In Section 3.2 we illustrate the coding and in sections 3.3 and 3.4 we describe the comprehension and production tasks, respectively.

3.1 Subjects

Four Italian adolescents with DS aged 16:6 and 20:6 participated in the study.
They were recruited in a no-profit association in Perugia and Grosseto (Italy)[15]. Their clinical records confirmed that they are affected by standard Trisomy 21[16]

The participants' general language abilities were assessed with a standardized receptive grammar (TCGB) and receptive vocabulary test (PPVT-R). The results of the standard tests are illustrated in Table 1[17].

[15] AIPD Onlus- Associazione Italiana Persone Down, sez. Perugia and Grosseto.

[16] Trisomy 21, which is the most common etiological subtype of DS, was diagnosed to the subject by neurpsychologists.

[17] IQs were not available for all the participants with DS. Only the medical record of participant 3 (19;6) and participant 4 (19;8) provided this information:

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Table 1. Individual results on standard language tests: participants with DS

DS	S	CA	TCGB -ES	EA	PPVT-R RS
Participant 1	F	16;6	30.5	3;6-4	67
Participant 2	F	20;6	21	4-4:6	103
Participant 3	F	19;6	23	4-4:6	98
Participant 4	M	19;8	17.5	4:6-5	64

Note: TCGB = Test di Comprensione Grammaticale per Bambini; PPVT-R = Peabody Picture Vocabulary Test-Revised; SS = standard score; RS = Raw Score; EA = equivalent age; ES = error score; C.A. = chronological age in years; S=sex; M=male; F=female

Table 1 shows that the participants with DS have a very poor performance on receptive grammar. Their scores are comparable to those of TD children aged 3;6 - 5.

We matched our group with DS with two control groups.

The first control group is composed by five adult students (2 young man and 3 young woman) with typical language abilities, aged matched to the DS subjects (17:9-25:8).

Their performance was at ceiling on both production and comprehension tasks, confirming their validity.

The second control group is composed by 6 TD children aged 3:4-5:3, matched to the participants with DS on the base of their receptive grammar scores[18]. TD children were randomly selected in a public school in Siena (Italy). The aim of recruiting a second control group is to provide a control for grammatical abilities.

Table 2 shows the individual scores on standard tests of the TD group. The equivalent age (EA) and standard deviation scores (SD), confirm that children's receptive abilities are within the normal range for both grammar and lexicon[19].

Participant 3 (19:6): **verbal IQ = 45; performance IQ= 64;**

Participant 4 (19;8): **verbal IQ = 54; performance IQ=71;**

The other two participants (participant 2 and participant 1) who have not been tested for IQ score, were nevertheless described by the neuropsychologists as “high functioning” subjects with DS, with a moderate/medium cognitive deficit.

[18] As the aim of the study is to examine a specific syntactic ability in DS, we decided to select a group of TD children that matched the group with DS on the base of their general receptive grammatical abilities. Therefore, we took into account the normative age-range corresponding to the DS's performances on TCGB (3:6-5).

[19] We considered 2 SD below the mean for age as a cut-off for including TD children in the control group.

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Table 2. Individual results on standard language tests: control group

TD children	S	CA	TCGB ES	ES-EA	PPVT-R RS	PPVT-R SD
A	F	3:4	27	4:0	57	-0.1
S	F	4:1	12.5	5:0	90	+1.3
L	M	4:1	30.5	4:0	56	-0.1
P	M	4:8	26	4:0-4:6	54	-0.9
M	M	5:3	23.5	4:6	82	-0.3
G	F	5:0	23	5:0	66	-1.2

Note: TCGB = Test di Comprensione Grammaticale per Bambini; PPVT-R = Peabody Picture Vocabulary Test-Revised; SS = standard score; RS = Raw Score; EA = equivalent age; ES = error score; SD= Standard Deviation; C.A. = chronological age in years; S=sex; M=male; F=female

Table 3 shows the mean scores on receptive grammar (TCGB) and the mean raw score on receptive vocabulary (PPVT-R, RS) of both DS and TD groups.

It is interesting to notice that the two groups have a comparable mean score on receptive grammar (TCGB), while participants with DS are more accurate on receptive lexicon than TD controls.

This result is in line with the widely reported dissociation between grammar and vocabulary in DS's language (Fabbretti et al. 1997, Miller 1992, Fowler 1990).

Table 3. Groups mean results on receptive grammar and vocabulary

	Mean CA	Mean scores TCGB	PPVT-R RS
Participants with DS	19	23.75	83
TD controls	4:4	23	67.5

3.2 Coding

The group with DS and the control groups were asked to perform a set of tasks involving comprehension of object and reflexive clitics and production of object clitic pronouns. Participants with DS were tested individually in a quite room in their home. The tests were similarly administered to the TD children in individual sessions in a separate, quiet room in their school.

All the participants' responses were recorded and transcribed after each session. Unintelligible utterances were discarded.

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3.3 The tasks: Comprehension

The comprehension task, whose aim is to tests Principle A and B of Binding, involves the elicitation of yes-no answer accompanying picture stimuli. The subject is asked to judge whether a vocal sentence matches or not with a picture.

32 experimental sentences were included: 16 items test the comprehension of a referential or quantified antecedent and a reflexive clitic *si* (N-ReflCl; QP-ReflCl); 16 items test the comprehension of a referential or quantified antecedent and an object clitic pronoun (N-ObjCl; QP-ObjCl).

The quantified antecedent conditions are included because in languages where DPBE surfaces, TD children correctly interpret the full pronoun when the antecedent is a quantified NP (see section 3.1).

Half of the items displays a match (M) and half a mismatch (MX) between the picture and the vocal sentence in order to check for yes-bias.

Examples of each of the four conditions are listed in (11)- (14).

15 filler items in mismatch condition are included. Experimental and filler sentences are presented in a random order.

(11) Referential antecedent and pronominal clitic (N-ObjCl; M-MX):
Vedi il bambino, il papà *lo* pettina
look at the boy, the dad *him-CL* combs
"Look at the boy, the dad is combing him"

(12) Quantified antecedent and pronominal clitic (QP-ObjCl-; M-MX):
Vedi i bambini, ogni papà *li* pettina[20]
look at the boys, every dad *them-CL* comb
"Look at the boys, every dad is combing them"

(13) Referential antecedent and reflexive clitic (N-ReflCl; M-MX):
Il papà *si* pettina
the dad *himself-CL* combs
"The dad is combing himself"

(14) Quantified antecedent and reflexive clitic (QP-ReflCl;M-MX):
Ogni papà *si* pettina
every dad *himself-CL* combs
"Every dad is combing himself"

3.4 The tasks: Production

A task adapted from Belletti e Leonini (2004)[21] tests the production of direct object clitic pronouns in elicitation context.

The test consists of 19 short video scenes with questions. After watching the scenes the participant is asked to answer to questions whose aim is to elicit direct object clitics and fillers questions. An example of a question eliciting a direct object clitic is given in (15), and the correspondent target answers are given in (16):

[20] In this case quantified NP *ogni papà* (masculine singular) differ in terms of number features from the clitic pronoun *li* (masculine plural). Because of the mismatch in number, *ogni papà* is not a good antecedent candidate for the clitic pronoun.

[21] The original test was designed to test a group of adult German speakers with Italian as L2

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The scenario shows a woman sitting in chair, reading a book. The woman suddenly closes the book she is holding.

(15) Question:
Che cosa ha fatto la donna con il libro?
What has done the-fem woman with the-masc book
"What did the woman do with the book?"

(16) Target answer:
Lo ha chiuso / Lo chiude
it-CL-masc-sing has closed-masc / it-CL-masc-sing closes
"She closed it"

After the scenarios, the participants listen to a question in which the verb is inflected to the past tense (15), with an auxiliary (*have*) followed by a past participle.

The expected answer "*Lo ha chiuso"* in (16) also contains a past tense form, with the cliticization taking place on the auxiliary verb. However, as often observed in the elicited productions, the question may also elicit a present tense form preceded by a clitic pronoun (*Lo chiude*). Both answers have been counted as correct.

Moreover, when a sentence containing a past tense form is elicited (as in: *Lo ha chiuso*), the past participle must agree in gender and number with the clitic. In 9/19 cases the past participle expected is masculine singular, in 6/19 feminine singular, in 3 cases masculine plural and in one case feminine plural.

The participants with DS sometimes answer with sentences containing a past participle that does not agree in gender/number with the clitic pronoun, as in the production in (17).

If a clitic pronoun is nevertheless present, the sentence is counted as correct. Further analysis of clitic/past participle agreement in the elicited productions is provided in section 4.2.

(15) Question:
Che cosa ha fatto la donna con il libro?
What has done the-fem woman with the-masc book
"What did the woman do with the book?"

(17) Sentence produced**:**
*Li ha portato via
them-cl-masc-plu has brought-masc-sing away
(She) brought them-CL away (Group with DS: Participant 3)

4. Results

In section 4.1 we present results of comprehension task. Individual and groups results of participants with DS and TD children are compared.

In section 4.2 we show individual and group's results on the elicited production task, both at a quantitative and qualitative level.

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4.1 Comprehension

Table 4 illustrates the individual results of participants with DS on each of the four experimental conditions.

Table 4. Individual percentages of correct responses: participants with DS

	Participant 1 (16;6)	Participant 2 (20;6)	Participant 3 (19;6)	Participant 4 (19;8)
Name-Object clitic				
Match N-Ocl-M	100	100	75	100
Mismatch N-Ocl-MX	100	100	100	100
Name-anaphoric clitic				
Match N-Acl-M	100	100	100	75
Mismatch N-Acl-MX	75	75	75	100
QP-Object clitic				
Match QP-Ocl-M	100	100	100	100
Mismatch QP-Ocl-MX	100	75	75	100
QP-anaphoric clitic				
Match QP-Acl-M	100	100	100	75
Mismatch QP-Acl-MX	100	100	50	75

Participants with DS perform at ceiling in most of the conditions, scoring 100% correct responses. In some cases, their performance drops at 75%. Using a binomial distribution, we determined that 75% of correct sentences is significantly above chance level[22].

In one of the conditions (quantifier-object clitic condition, MX) Participant 3 (19:6) performs at chance, scoring 50% of correct responses.

[22] Participant 1, 2, 3 4: p=0.99. The p values are obtained using a binomial distribution, on the assumption that participants were guessing in a random, unbiased way.

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We now compare the DS group performance on comprehension of object clitic vs. anaphoric clitic by means of a *Two way Fisher's Exact Test*[23].

Comparing the group's scores on object vs anaphoric clitics, the difference is not statistically significant when the antecedent is either a referential or a quantified NP.

We now take into account the comprehension of mismatch vs match conditions[24]. No significant difference emerges between match and mismatch conditions in either reflexive or object clitic pronouns when the antecedent is a referential or a quantified NP.

Table 5 shows the control group performance on each of the experimental conditions.

Table 5. Individual percentages of correct responses: control participants

	A (3;4)	S (4;1)	L (4;1)	P (4;8)	G (5;0)	M (5;3)
Name-Object clitic						
Match N-Ocl-M	50	100	100	100	75	100
Mismatch N-Ocl-MX	100	100	100	100	100	100
Name-anaphoric clitic						
Match N-Acl-M	100	100	75	100	100	100
Mismatch N-Acl-MX	100	100	75	100	100	100
QP-Object clitic						
Match QP-Ocl-M	100	100	100	100	100	100
Mismatch QP-Ocl-MX	50	100	75	100	100	100
QP-anaphoric clitic						
Match QP-Acl-M	100	100	100	100	100	100
Mismatch QP-Acl-MX	100	100	75	100	100	100

[23] Unless explicitly stated, the statistical analysis is performed by means of a *Two way Fisher's Exact Test.*

[24] The comparison between match and mismatch items is useful to detect the presence of *yes bias*

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As Table 5 shows, TD children perform at ceiling in most of the cases. In some conditions, they score 75% of correct responses, but their performance is still above chance level[25]. In 2 of the conditions (N-Ocl-M and QP-Ocl-MX), the participant A (3:4) performs at chance.

We now compare the control group performance on the different conditions.

Taking into account the comprehension of object and anaphoric clitics, no significant difference emerges between the comprehension of the two kinds of pronouns, when the antecedent is either referential or quantified.

Furthermore, the performance of the control group does not differ significantly in the match and mismatch with either reflexive or object clitic pronouns when the antecedent is a referential or a quantified NP.

Table 6 sums up the groups' performances and percentages of the experimental and control participants.

Table 6. Groups' total amount of correct responses in each of the Match (M) and Mismatch (MX) conditions

	DS participants %	Control participants (3;4-5;3) %
Name-Object clitic		
Match N-Ocl-M	93.7	87.5
Mismatch N-Ocl-MX	100	100
Name-anaphoric clitic		
Match N-Acl-M	93.7	95.8
Mismatch N-Acl-MX	81.2	95.8
QP-Object clitic		
Match QP-Ocl-M	100	100
Mismatch QP-Ocl-MX	87.5	87.5
QP-anaphoric clitic		
Match QP-Acl-M	93.7	100
Mismatch QP-Acl-MX	81.2	95.8

[25] L (4;1), G (5;0) p=0.99. The p values are obtained using a binomial distribution, on the assumption that participants were guessing in a random, unbiased way.

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We now compare the scores of the two groups.

Collapsing the total amount of correct responses given by TD and DS participants, the two groups are comparably accurate in all conditions.

Considering the performance on anaphoric and Object clitics, no significant difference emerges between the two groups when the antecedent is either an NP or a QP.

In the next section we present the results of the elicitation task.

4.2 Production

In table 7, we present the individual results of the group with DS in the elicitation task. Their productions are classified with respect to the number of direct object clitics produced and the other productions attested when a direct object clitic is expected (e.g. omission, full DP, Other clitic, Other production), examples of which are given in (18)-(22).

Table 7. Production task: Individual percentages of DS group

	Participant 1 (16;6)	Participant 2 (20;6)	Participant 3 (19;6)	Participant 4 (19;8)
Direct object clitic pronoun	60.4	63.1	57.8	94.7
Full DP	15.7	10.5		5.2
Omission	26.3	26.3	36.8	-
Other clitic	-	-	5.2	-
Other production	10.5	-	-	-

Question: “Che cosa ha fatto la donna all'uomo?”
What has done the-fem woman to the-masc man
Target answer: “Lo ha spinto/lo spinge”
him-cl has pushed-masc/ him-cl pushes
“(She) is pushing him/ (she) pushed him”

(18) **Object clitic :** L’ha spinto
him-cl has pushed-masc
“(She) pushed him” (Group with DS: participant 4)

(19) **Omission:** Ha spinto
has pushed-masc
“(She) pushed” (Group with DS: participant 3)

(20) **Full DP: “** Ha spinto l’uomo”
has pushed-masc the-masc man
“(She) pushed the man” (Group with DS: participant 1)

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(21) **Other clitic:** "Gli ha dato una spinta"
him-Indirect Object-CL has given a push
"He pushed" (TD Group: M.(5:3))

(22) **Other production:** Ha fatto una mossa
(he) has done a move
"He moved" (TD Group: G.(3:4))

Data in Table 7 clearly shows that the performance of DS subject is not homogeneous within the group. Considering the number of direct object clitics produced, three of the subjects give a correct answer in about 60% of the contexts (Participant 1, Participant 2, Participant 3) and only one participant scores at ceiling level (Participant 4).

In table 8, individual data of the TD children are presented.

Table 8. Percentages of responses in the production task: TD group

	A (3;4)	S (4;1)	L (4;1)	P (4;8)	G (5;0)	M (5;3)
Direct object clitics	57.8	84.2	78.9	89.4	94.7	94.7
Full DP	10.5	-	-	-	-	-
Omission	26.3	10.5	10.5	10.5	-	-
Other clitic	-	-	-	-	5.2	5.2
Other production	5.2	5.2	10.5	-	-	-

Table 8 shows a clear development in the production of Object clitics in the TD children. While the youngest child (A, 3:4) scores the lowest number of object clitics, the 4 years old children produce a higher amount of clitics and the 5 years old reach over 90% of correct responses.

Table 9 sums up the groups' results on elicited production.

Table 9. Total Percentages of DS subjects and TD children on elicited production

	DS	%	TD children	%
Direct object clitics	54/76	71	95/114	83.3
Full DP	6/76	7.8	2/114	1.7
Omission	13/76	17.1	11/114	9.6
Other clitic	1/76	1.3	2/114	1.7
Other production	2/76	2.6	4/114	3.5

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We now compare the results of the two groups.

Considering the number of object clitic pronouns produced in the expected context, the difference between participants with DS and TD children is approaching significance ($p<.049$).

We now focus on the qualitative analysis of the productions.

When a target sentence is not produced, participants with DS and TD children either produce a full DP or omit the clitic.

When the clitic is omitted, the production might either be a present tense form, as in (23), a verbal form aux+past participle, as in (19) repeated here as (24), or the sole past participle, as in (25). The latter case, with omission of the clitic and the auxiliary verb is attested in both groups (DS: 6 cases; TD: 3 cases).

Question: "Che cosa ha fatto la donna all'uomo?"
What has done the-fem woman to the-masc man
Target answer: "Lo ha spinto/lo spinge"
him-cl has pushed-masc/ him-cl pushes
"(She) is pushing him/ (she) pushed him"

(23) **Omission of clitic (present tense form):**
Spinge
pushes-3-per-sing
"(She) is pushing" (TD Group: A.(3:4))

(24) **Omission of clitic (aux+past participle):**
Ha spinto
has pushed-masc
"He pushed" (Group with DS: Participant 3)

Question: Che cosa ha fatto l'uomo con la carta?
What has done the-masc man with the-fem paper
"What did the man do with the paper?"

Target answer: La ha buttata/La butta
it-cl-fem-sing has thrown-fem-sing/ it-CL throws
"(He) thrown it away/(He) is throwing it away

(25) **Omission of clitic and auxiliary verb (aux+past participle):**
Buttata nel cestino
thrown-fem-sing in the-masc bin-masc
"(He) thrown in the bin" (Group with DS: Participant 2)

Moreover, in the DS corpus a case of omission with non-target gender agreement is attested. In the sentence produced by Participant 3, the past participle produced is masculine singular instead of feminine singular, as shown in (26):

Question: "Che cosa ha fatto la donna con la finestra?"
What has done the-fem woman with the-fem window-fem

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Target answer: "La ha aperta"
it-cl-fem-sing has opened-fem-sing

(26) **Omission and non target agreement:**
Aperto
opened-masc-sing (Group with DS: Participant 3)

When object clitics are produced in the elicitation task, both participants with DS and control children use them correctly and no placement errors are found.

In Table 10 we show the amount of Object clitics produced with a present tense or a past tense form (auxiliary and past participle).

Table 10. Percentages of Object clitics with a present tense or a past tense over the total amount of clitics produced in the elicitation task

	Participants with DS	TD controls
Present tense	7.5	14.7
Past tense (Aux+past participle)	92.5	85.3

We now take into account the agreement on the past participle verb.

In 9/54 cases (compared to 7/81 in the TD's productions) the participants with DS do not produce the required gender/number agreement on the past participle. In the production in (27), for instance, a masculine singular past participle is produced instead of a feminine singular.

Question: "Che cosa ha fatto la donna con la finestra?"
What has done the-fem woman with the-fem window-fem
Target answer: "La ha aperta"
it-cl-fem-sing has opened-fem-sing

(27) Answer**:** "**l**'ha aperto"
them-cl has opened-fem-sing (Group with DS: Participant 2)

In sentences with non-target agreement on the past participle it is not possible to verify if the clitic agrees with the past participle, due to vowel's elision.

The only exception is a sentence where a masculine plural Object clitic in its full form reveals a mismatch in number agreement with the past participle. The sentence, presented in (17), is repeated here as (28).

(28) Sentence produced**:**
*L**i** ha portat**o** via
them-cl-masc-plu has brought-masc-sing away
(She) brought them-CL away (Group with DS: Participant 3)

To sum up the production's results, the difference between the amount of clitics produced by DS and TD participants approaches significance. When the clitic is not

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produced, DS and control subjects either omit the clitic pronoun or produce a full DP. Notice that in both groups omission is higher than full DPs.

Taking into consideration the qualitative analysis of the correct responses, in some cases both groups use a non-target form in their answer as in (24), which is likely to be a default unmarked past participle form (the masculine singular). Moreover, in cases of omission of the clitic, the auxiliary verb can also be omitted at a similar rate in both groups.

To conclude, the quantitative/qualitative analysis of the responses shows a similar pattern of production in individuals with DS and TD children matched on receptive grammar abilities.

5. Discussion

5.1 Comprehension

In the comprehension task, the performance of TD participants confirm previous data on Acquisition of Binding in Italian (McKee 1992), as no DPBE is found. Children comprehend conditions with pronominal and reflexive clitics equally well, both when the antecedent is referential or quantified.

The individual performance is always above chance, except for the youngest control participant (A. 3:4) who performs at chance in two of the conditions with a pronominal clitic (match with referential antecedent and mismatch with quantified antecedent). However, this might not be due to particular problems interpreting the object clitic pronoun, as the same TD participant scores at ceiling in the other two conditions involving pronominal clitic (mismatch with referential and match with quantified antecedent).

Similarly, the group with DS comprehend pronominal and reflexive clitic to a comparable extent both when the antecedent is a referential or a quantified NP, and their performance is always above chance level. Only in the quantifier-object clitic condition (MX) participant 3 (19:6) performs at chance. We interpret this as a result of the mismatch condition, rather than a difficulty in interpreting the pronoun *per se*.

As clearly emerges from the results, participants with DS are more likely to commit an error in the mismatch conditions, compared to the correspondent match conditions. A similar result is observed in the comprehension task described in Stathopoulou (2009) with Greek adults with DS. We argue that the mismatch is more challenging and more prone to errors for our participants with DS, leading in one case to a chance level performance (participant 3, condition QP-Acl-MX).

Finally, participants with DS do not differ significantly from controls matched on receptive grammar.

Considering previous results on DS in English (Perovic 2006, Ring & Clahsen 2005) Serbo-Croatian (Perovic 2003) and Greek (Stathopoulou 2009), we did not expect a quantitative difference in the performance of Italian participants with DS compared to TD children. This prediction seems to be supported by our results.

Therefore, contrary to what has been previously observed in English, we can conclude that the interpretation of reflexives in our Italian participants with DS is not impaired.

Italian participants with DS behave similarly to Greek and Serbo-Croatian DS, and correctly interpret the reflexive clitic pronoun.

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Our results do not contradict Perovic (2006) and Ring & Clahsen (2005)'s observation of a poor performance for DS in this particular experimental condition. Rather, they confirm the different nature of full reflexives and reflexive clitics (Kayne 2000).

Another interesting observation emerging from our results with DS is the lack of the DPBE in clitic contexts with both referential and quantified antecedents. The participants with DS, similarly to TD controls, exhibited high correctness scores, indicating their knowledge of the binding requirements in these conditions.

To conclude, our results not only provide an insight into the grammatical knowledge of Binding principles in adults with DS, but also support a structural difference between reflexive clitics and full reflexive pronouns. While the latter are impaired in DS, the former do not raise particular interpretative problems in this population.

The accurate performance on comprehension sharply contrasts with the production performance on object clitic pronouns, in both control and DS participants.

In the next section we are discussing the main results on elicited production.

5.2 Production

Taking into account the TD children's performance, we can observe that, despite the small size of the sample, production data clearly show a development in the production of Object clitics, confirming previous findings on Italian (Guasti 1993/1994, Shaeffer 2000 among others).

The amount of clitic omission is higher in the younger TD child (A.: 26.3%), gradually decreases in the 4 years old (S, L, P: 10.5%) and finally disappears in the older children (G, M: 5:3: 0%), who perform at ceiling in the elicitation task[26].

In subjects with DS, we also expected to observe a difficulty with production of object clitics.

This is partly confirmed by the results, as participants with DS do not fully master the production of Object clitics in all the expected contexts[27].

A high range of individual variability emerges within the group, confirming similar observations on general language abilities in DS (Fowler 1990, among others).

Participant 4 of group with DS scores a ceiling level performance on production of object clitics (94.7%), while the other three subjects exhibit a poorer performance (participant 1: 60.4%; participant 2: 63.1%; participant 3: 57.8%).

Furthermore, we observed that when DS participants do not produce clitics, they tend to consistently omit them. (Participant 1: 26.3%; Participant 2: 26.3%; Participant 3: 36.8%). This pattern resembles that of other language impaired populations. For instance, direct object clitics are known to be particularly difficult for Italian-speaking children with Specific Language Impairment (SLI). Various studies

[26] Notice that, beside the ceiling level performance on Object clitic production, the other structures produced by G (5:0) and M (5:3) still involve clitics, but of a different type. They correctly use indirect object clitics changing the target verb required in the task.

[27] We remind that for participants with DS the number of Object clitics produced amounts to 71%. An aged matched control group scored 100% of correct responses in the expected contexts, confirming the validity of the task

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(Bortolini et al. 2002, 2006, among others) found evidence that Italian-speaking children with SLI use direct-object clitics to a lower extent than their MLU controls in obligatory contexts and omissions of the clitic represents the most frequent type of error.

In our subjects with DS object clitics are marginally lower than the control group matched on receptive grammar.

Even though the performances of the two groups do not differ to a high degree, object clitics seem to be quite challenging for 3 of the four subjects with DS.

We interpret the difficulty that 3 participants with DS and younger TD children experience with production of object clitics as a result of their syntactic complexity, as described in the approach of Belletti (1999) and Hamann & Belletti (2006).

6. Conclusions

Results on the comprehension task confirm the absence of DPBE in Italian TD children, as previously observed by McKee (1992).

Furthermore, Italian adolescents with DS who took part into the study show a comprehension of reflexive and object clitics comparable to that of TD children matched for receptive grammatical abilities.

Our results on DS do not contradict previous findings on a selective deficit with the interpretation of full reflexive pronouns in DS (Perovic 2006, Ring & Clahsen 2005) and hence support the hypothesis that reflexive clitics undergo a different syntactic derivation than Reflexive full pronouns (Kayne 2000, among others), which facilitates the Italian-speaking DS individuals' ability to interpret the reflexive construction.

Results on production show that participant with DS are marginally less accurate than the control group in producing object clitics. Besides, a high variability between the four subjects emerges. When an object clitic is not produced, participants with DS either omit the clitic pronoun of produce a full DP. The former error prevails over the latter, resembling the performance of TD controls.

Future research with a larger group of participants with DS is needed to confirm the observations obtained with our pilot study. Moreover, a further comparison with mental age matched controls could provide insight into the extent to which the mastery of this structure is impaired in Italian subjects with DS.

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