Morphosyntactic Issues in the Development of Cypriot Greek Individuals with Down Syndrome: A Preliminary Analysis

***Christiana Christodoulou*[1,2,3] *and Kleanthes K. Grohmann*[1,2]**
University of Cyprus[1]*, Cyprus Acquisition Team*[2]*,*
Massachusetts Institute of Technology [3]

Abstract
This study examines the morphosyntactic development of Cypriot Greek-speaking children and adolescents diagnosed with Down Syndrome (CG_{DS}) aged 6;0–18;11, and compares it to children with typical language development (CG_{TLD}) aged 2;0–6;11, aiming to document the developmental trajectory for their linguistic development. Preliminary results show near-ceiling accuracy rates for person/number and slightly lower ones for tense/aspect. However, while it is evident that CG_{DS} and CG_{TLD} present different mastery of verbal inflectional features, a more detailed analysis shows that participants frequently make use of alternative strategies to accommodate their productions, such as use of narrative present in story-telling (instead of past tense) or the 'less-than-a-forceful-command' use of the subjunctive (instead of the imperative). These results, combined with findings from older CG_{DS} and CG_{TLD} (Christodoulou 2011), corroborate the claim that the linguistic development in Down Syndrome is to a great degree dissociated from cognitive development, and it is ongoing.

1. Introduction

Given that the language faculty is not solely dependent on cognition (Fodor 1983), the question pursued here is to what extent intellectual impairment makes it impossible to develop grammar. This study investigates the morphosyntactic development of 28 Cypriot Greek-speaking children and adolescents diagnosed with Down Syndrome (hereafter, CG_{DS}) aged 6;0–18;11, and compares it to 56 children with typical language development (henceforth, CG_{TLD}) aged 2;0–6;11, though only a small portion of the data is analyzed so far. We also examine a variety of complex syntactic structures: subjunctives, relative clauses, subject-to-object raising, *wh*-questions, nominal/adjectival predication, clefts, etc.

To date, very little is known about the linguistic development of individuals diagnosed with Down Syndrome (henceforth, DS). Previous work on Greek adolescents ($Greek_{DS}$) shows high accuracy scores with the comprehension of past perfective (Stathopoulou 2009, Stathopoulou and Clahsen 2010). Christodoulou (2011, to appear) finds that CG_{DS} adults perform accurately (95%–99%) on aspect, tense, person, number and case. In contrast, Stathopoulou (2009) reports poor performance in the comprehension of relative clauses and *wh*-questions, while Tsakiridou (2006) concludes that $Greek_{DS}$ present especially problematic production of *wh*-questions. Studies on English DS (Eng_{DS}) at younger ages suggest that the use of inflectional marking and several syntactic operations are impaired (Chapman *et al*. 1998, Eadie *et al*. 2002, Laws & Bishop 2003). However, there are a number of inconsistencies across these studies, especially regarding accuracy rates with regular past tense.

In this study we aim to uncover whether CG_{DS} children and adolescents exhibit the same linguistic capabilities as $Greek_{DS}$ adolescents and CG_{DS} adults,

and whether we can find similarities in the DS performance across different ages and languages. In addition, preliminary results from the current study contribute to the general question of whether linguistic development is indeed dissociated from cognitive development.

Preliminary results show that CG_{DS} and CG_{TLD} children present different mastery of all verbal inflectional features. The first thing to note, though, is that percentages of accuracy are quite high, ranging from 91%–99% for CG_{DS} children and adolescents (compared to 97%–99% for CG_{TLD} children). We do observe some problems with the use of past tense and imperative, but this is mainly due to the fact that participants prefer to use different, but equally grammatical ways, of expressing the targeted structures. Moreover, with regards to the comprehension and production of subjunctive clauses and *wh*-questions, we found that both groups present higher percentages of comprehension than production, with differences for CG_{DS} greater than for CG_{TLD}. The results are enlightening on how early CG_{DS} as well as CG_{TLD} fully acquire the verbal inflectional system suggesting that all functional projections are in place. In addition, comprehension of two complex syntactic phenomena (subjunctives and *wh*-questions) is also close to ceiling, though production of both phenomena appears challenging for the two groups, but especially for CG_{DS}.

In the following sections, we present a general overview of what is known so far on the linguistic abilities of DS (section 2) and discuss the methodology employed for this experimental study (section 3). We then provide preliminary results that are currently available after analyzing a very small fraction of the collected data (section 4) for which we subsequently offer a short discussion, including some of the implications these might have on the research of the DS linguistic as well as cognitive abilities (section 5). Finally, we briefly conclude (section 6).

2. Background

Down Syndrome is a neurodevelopmental disorder, considered to be one of the most common causes of mental disability with one in six to seven hundred births. It is most commonly caused by trisomy 21, the presence of an extra copy of chromosome 21 due to an atypical meiosis of the maternal egg cell (Epstein 2006, Nelson and Gibbs 2004, Olson et al. 2004). Individuals diagnosed with DS present some distinct physiological symptoms in addition to some health challenges. Apraxia of speech is a commonly sided symptom (Dodd, 1976, Kumin 2006). Mild to moderate hearing loss (Nittrouer 1996, Roberts 1997, Stoel-Gammon 2001) as well as challenges with verbal short-term memory (Buckley 2008, Conners et al. 2001, Vicari et al. 2001) are believed to have a critical effect on language development. The degree of mental impairment in DS has been argued to vary. Rondal and Comblain, (1996) suggest that DS with mean chronological age of 30 have the mental age of approximately 5 years. However, Fowler et al. (1994) and Chapman et al. (1998), among others, argue

that their linguistic abilities are much lower than those of their suggested mental age, with children aged 5–8 years old at an equivalent of the linguistic abilities of 2-year-old TLD, and with only slight improvement for older children and adults, reaching the linguistic capabilities of 3-year-old TLD.

Most studies on the inflectional marking of DS have been conducted with Eng_{DS}. Though quite informative, restrictions imposed by the nature of language (i.e. limited use of overt inflectional marking) cause the overall picture of DS linguistic abilities to appear confusing and unrepresentative when considering results from studies on DS in other languages. Problematic use of 3rd person singular *–s* (S/V agreement), less problematic the use of *–ing*, regular plural as well as the use of determiners, but a relatively strong performance for irregular past, modals, and 3rd person irregular present tense forms (*does* and *has*) have been reported (Eadie et al. 2002, Laws and Bishop 2003). These two studies, however, present contradicting results with regular past tense. While on the one hand Laws and Bishop's (2003) results provide evidence that their participants did well with past tense *–ed*, results from the Eadie et al. (2002) study show participants to perform considerably lower with past tense *–ed*. In an earlier study (Chapman et al. 1998), Eng_{DS} children and adolescents omit words receiving inflectional marking as well as function words regularly. In addition, they recorded inconsistent use of plural *–s*, possessive *–s*, 3rd person singular, contractible auxiliaries and copulas, present progressive *–ing*, and regular past tense *–ed*, and problematic use of copulas, auxiliaries, prepositions, modals, articles, pronouns, adverbial adjuncts, conjunctions, and infinitival *to*.

In a study on German DS (Ger_{DS}), Schaner-Wolles (2004) found high accuracy with the use of finite verbs in verb second clauses for both Ger_{DS} adults and 2-year-old Ger_{TLD} (98.4% and 99.6% accuracy, respectively). She also notes a tendency with Ger_{DS} to use non-finite marking at higher rates than their age-matched controls (7.8% vs. 1%). Finally, she observed that both groups avoid the use of verbs in clause-final position (finite and non-finite alike).

There are only a handful of studies on Greek and Cypriot Greek DS. $Greek_{DS}$ adolescents achieve high scores with the comprehension of past perfective (Stathopoulou 2009, Stathopoulou and Clahsen 2009), by performing equally well with their age-matched controls on (i) verbs where aspect is marked with an *–s–* suffix), and (ii) verbs where aspect is encoded in the verbal root. A significant difference between the two categories was evident for both groups, such that their comprehension accuracy was significantly better with verbs that include *–s–* than with verbs that do not. A study on the inflectional system of CG_{DS} adults revealed accuracy rates close to ceiling for both nominal (case, number, gender, person) and verbal (aspect, tense, person, number) inflectional marking, with percentages of accuracy ranging from 95%–99% (Christodoulou 2011, to appear). Some of the most important conclusions of this research portray an entirely different picture of the linguistic abilities of individuals diagnosed with DS. First, Christodoulou observed that CG_{DS} (as well as CG_{TLD} children) tend to use the default feature value for each feature when not using the targeted feature values. Second, even though rates of copula omission are

high (26.6%), omission of verbs and nominals is at much lower rates: 3.8% and 7.2%, respectively. However, further analysis showed that omission rates for non-inflectional words were actually slightly higher than those for words that receive inflection (verbs, copulas, determiners, nouns, adjectives, pronouns, etc.): 7.9% vs. 7.5%, correspondingly. Third, a tendency for syntactic re-organization with certain environments, resulting in grammatical alternatives for the targeted structures, suggests high competence with the relevant syntactic structures and their grammatical alternatives. Use of grammatical alternatives shows that participants do not only have knowledge of the targeted structure, but also of what constitutes a grammatical alternative for each. Last but certainly not least, Christodoulou (2011) reports an interesting finding related to how certain productions that do not match the target and have been argued or are initially perceived to be syntactic in nature. These are, in fact, shown to be caused by articulatory (i.e. physiological) and phonological restrictions. This is particularly significant because it shows that the large number of studies which have not controlled for external factors like methodology in data collection and phonetic/phonological effects but argue for severe linguistic impairment, unintentionally misrepresent the linguistic abilities in DS.

Studies on the DS linguistic abilities with complex syntactic structures are also available in a number of languages. French individuals diagnosed with DS exhibit poor performance with subordinate and relative clauses, negation, and passive constructions (Tager-Flusberg 1994). Dutch DS are reported to avoid using interrogatives, negation, and subject–predicate constructions (Bol and Kuiken 1990). Results on Eng_{DS} in narrative discourse show that they are as competent in using complex sentences as Eng_{TLD} controls matched for mean length of utterance (MLU) (Thordardottir et al. 2002).

In a study on the acquisition of (non-)referential *wh*-questions by $Greek_{DS}$, Tsakiridou (2006) reports that both subject and object *which*-NP and *who*-NP questions are problematic for $Greek_{DS}$, with object *who*-NP questions the most problematic. Based on the differences on the types of errors produced by $Greek_{DS}$, Tsakiridou argues that their performance presents a deviant pattern, compared to $Greek_{TLD}$. Using the same testing materials to investigate comprehension and production, Stathopoulou (2009) reports that her $Greek_{DS}$ participants performed fairly well, with accuracy percentages surpassing 72% and reaching up to 85% for comprehension but at chance level with 53% accuracy for production, performing better with subject, rather than object questions. Finally, she tested the comprehension and production of relative clauses with $Greek_{DS}$ and found poor performance, with mean percentage of accuracy at 43% (69/160 items) for comprehension and 18% (22/121) for production. In a comprehension task $Greek_{DS}$ performed fairly poorly in all conditions (subject head–subject gap, subject head–object gap, object head–subject gap, object head–object gap), with the subject head–object gap the worst for both production and comprehension. She concludes that, based on the results from her study as well as previous work on DS, the linguistic development of $Greek_{DS}$ is not only delayed but also deviant when compared to TLD.

3. Methodology

This research investigates the morphosyntactic profile of CG_{DS} and CG_{TLD} children. We aim to determine whether the differences between CG_{DS} and CG_{TLD} grammars are conditioned syntactically, morphologically, or phonetically and phonologically. The experimental tasks were designed to (i) explore the participants' inflectional system, (ii) test a number of simple and complex syntactic structures such as subjunctive, interrogative, and imperative clauses, and (iii) control for factors external to morphosyntax, which may have major or minor effects on the results such as articulation restrictions or choice of experimental methods as well as data analysis methodology. Finally, we pursue the documentation of the first developmental trajectory for DS in general as well as CG_{TLD} and address the question whether language is indeed as highly affected by cognitive limitations as has often been suggested in the literature.

3.1 Participants

Twenty-eight CG_{DS} children and adolescents aged 6;0 to 18;11 (13F, 14M), who had previously been diagnosed with DS and placed in special education classrooms and special education institutions all across Cyprus, participated in this study. All participants had undergone auditory screening. The second group consisted of fifty-six CG_{TLD} children aged 2;0 to 6;11 (28F, 28M). The two groups were compared based on IQ and MLU scores. All participants were bilectal speakers of the Cypriot Greek variety (cf. Rowe and Grohmann 2013).

3.2 Materials and Method

Through the five experiments (ten experimental tasks), we first target to examine the Cypriot Greek inflectional system of CG_{DS} and CG_{TLD} children: aspect, tense, person, and number for verbs as well as gender, case, number, and (for pronouns) person for nominal phrases. Second, we examine the production and comprehension of a variety of simple and complex syntactic environments such as subjunctives, *wh*-questions, relative clauses, clefts, commands, gerund constructions, and nominal/adjectival predication. In this paper, we will only touch upon these two goals though this study has a number of additional goals. Table 1 summarizes the experimental tasks used for data collection ranging from elicited productions with visual and audio stimuli to imitation production, story-telling, and others.

Experiment	Task (no. of items) and Target
Experiment 1 (visual stimuli)	***Task 1*** (13): **VERCS**: Video Elicitation of Relative Clauses and Subjunctives
	relative clauses and subjunctive clauses
	Task 2 (13): **MaWiC**: 'Magic Window' Clauses
Guided Production	relative clauses, verbal and nominal Inflection
	Task 3 (27): **PTEDS**: Past Tense Elicitation in Down Syndrome
	past tense and subject–verb agreement (S/V Agr)
Experiment 2 (audio stimuli)	***Task 1*** (47): 'Say what I say'
	S/V Agr, case, aspect and tense combinations in simple and complex structures
Elicited Imitation	***Task 2*** (11 sets): **GAC**: Gerund–Agreement Clauses
	S/V Agr and gerunds
Experiment 3 (audio stimuli)	***Task 1***: **EPIC**: Elicited Production of Imperatives and Commands
	imperatives and commands
	Task 2: **SPEC** (18): Subjunctive Production Elicitation and Comprehension
Guided Production	production and comprehension of subjunctive clauses (root and embedded)
	Task 3: **EPoQ**: Elicited Production of Questions
	question formation (Papadopoulou 2013)
Experiment 4 (visual stimuli)	***Task 1a***: **STEDS–Pres**: Story Telling Elicitation in Down Syndrome – present ***Task 1b***: **STEDS–Past**: Story Telling Elicitation in Down Syndrome – past ***Task 1c***: **STEDS–Fut**: Story Telling Elicitation in Down Syndrome – future
Story Telling	tense, S/V Agr, case and different clause types for all three
Experiment 5	***Task 1***: **CompQ**: Comprehension of Questions
Guided Production	comprehension of questions (production output)

Table 1: Summary of Experimental Tasks

Example (1) illustrates one of the experimental stimuli used in *Experiment 1 – Task 1* to elicit a subjunctive clause. Nikos is watching television, seeing himself and his friends do certain things on the television. Participants needed to say what Nikos sees. When the video clip of which a shot is presented in Figure 1 appeared on the screen, participants had to produce a sentence along the lines of (1). Note that the use of a relative instead of a subjunctive clause is also grammatical.

(1) **VERCS**: Video Elicitation of Relative Clauses and Subjunctives
Relative Clauses and Subjunctive Clauses

Figure 1: Video Clip 4 of Experiment 1 – Task 1

O Nik-os vlep-i ti ...
DET.MASC.SG.NOM Nikos-MASC.SG.NOM see.IMPF-.PRES.3.SG DET.FEM.SG.ACC
... ðor-a na /pu ðjavaz-i ena vivl-io.
Dora-FEM.SG.ACC SUBJ that read.IMPF-PRES.3.SG one-NEU.SG.ACC book-NEU.SG.ACC
'Nikos sees Dora read a book.'

Experiment 1 – Task 2 also uses video stimuli. Children were given a background story and had to then produce a sentence describing the video stimuli presented to them. The main character of the story (Nikos) had a magic window. Every time he looked outside his window, the scenery would be different. Children needed to describe what Nikos saw each time he looked out the window. To illustrate, a shot of the video clip and the equivalent targeted utterance are given in (2).

(2) **MaWiC:** 'Magic Window' Clauses
Relative Clauses, Verbal and Nominal Inflection

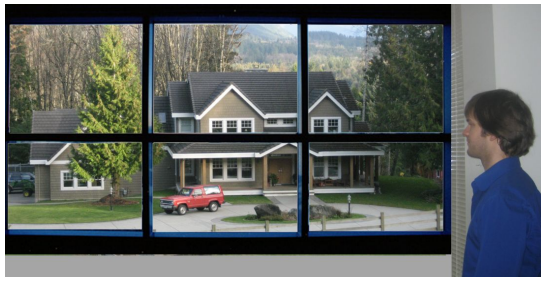


Figure 2: Video Clip 5 of *Experiment 1 – Task 2*

O Nik-os vlep-i (ekso apo …
DET.MASC.SG.NOM Nikos-MASC.SG.NOM see.IMPF-PRES.3.SG outside from
... to maɣik-on tu paraθir-o(n)), ...
DET.NEU.SG.ACC magic-NEU.SG.ACC 3.MASC.SG.GEN window-NEU.SG.ACC
... en-a meɣal-o spit-i, me en-a(n) …
one-NEU.SG.ACC big-NEU.SG.ACC house-NEU.SG.ACC with one-NEU.SG.ACC
... kokkin-o(n) aftokinit-o(n) ke en-a meɣal-o …
red-NEU.SG.ACC car-NEU.SG.ACC and one-NEU.SG.ACC big-NEU.SG.ACC
… prasin-o ðendr-o.
green-NEU.SG.ACC tree-NEU.SG.ACC
'Nikos sees (outside his magic window) a big house, with a red car and a big green tree.'

This example demonstrates the richness of the language in inflectional marking. The examples in (3) give some of the syntactic structures used in the imitation production task (*Experiment 2 – Task 1*).

(3) "Say what I say": Elicited imitation of simple and complex structures

a. *Clause Targeting Nominative Case and Present, 3rd Person*

O	Petros	kolimb-a	kaθe	Kiriak-i.
DET.MASC.SG.NOM	*Petros-MASC.SG.NOM*	*swim.IMPF-PRES.3.SG*	*every*	*Sunday*

'Peter swims every Sunday.'

b. *Clause Targeting Negation, Verbal and Nominal Inflection*

En	mu	e-ði-an	ta	pexnið-ja	tu.
NEG	*1.SG.GEN*	*PAST-give.IMPF-PAST.3.SG*	*DET.NEU.PL.ACC*	*toy-NEU.PL.ACC*	*3.MASC.SG.GEN*

'He wouldn't give me his toys.'

c. *Clause Targeting Predication and Nominal inflection*

i	Elen-a	ine	i …
DET.FEM.SG.ACC	*Elena-FEM.SG.ACC*	*be.PRES.3.SG/PL*	*DET.FEM.SG.ACC*

… kaliter-i	mu	fil-i.
best-FEM.SG.ACC	*1.SG.GEN*	*friend-FEM.SG.ACC*

'Elena is my best friend.'

Next, we present an example of the participants' favorite task, eliciting the production and comprehension of subjunctive clauses. In this task, the child was instructed to construct a sentence to express what each of the puppets (Cat and Dog) wanted to do. After producing a structure, participants were presented with a set of four pictures and had to choose the one that best matched their production. Images consisted of (i) a targeted picture, (ii) a picture matching the agent of the action targeted (Cat or Dog) but depicting a different action, (iii) a picture where the same action as the one used in the targeted stimulus was depicted but with the other puppet than the one used in the targeted stimulus performing the action, and (iv) a distractor. Images were randomized.

(4) **SPEC**: Subjunctive Production Elicitation and Comprehension

a. Prime: *xorevo/xorefko 'dance'*

i	ɣat-a	θel-i	***na***	***xorep-s-i***.
DET.FEM.SG.NOM	*cat-FEM.SG.NOM*	*want.IMPF-PRES.3.SG*	*SUBJ*	*dance-PRF-DEP.3.SG*

'The cat wants to dance.'

b. Prime: *potiz-o 'water', luluđja 'flowers'*

O	skil-os	θel-i …
DET.FEM.SG.NOM	*dog-MASC.SG.NOM*	*want.IMPF-PRES.3.SG*

… ***na***	***poti-s-i***	***ta***	***luluð-ja***.
SUBJ	*water-PRF-DEP.3.SG*	*DET.FEM.SG.ACC*	*flower-FEM.SG.ACC*

'The dog wants to water the flowers.'

c. Prime: *pezo 'play', kiθara 'guitar'*

O skil-os θel-i …
DET.FEM.SG.NOM *dog-MASC.SG.NOM* *want.IMPF-PRES.3.SG*
… ***na*** ***fa-i*** ***lukanik-o***.
SUBJ *eat.PRF-DEP.3.SG* *sausage-NEU.SG.ACC*
'The dog wants to eat (a) sausage.'

Productions were recorded in Praat at a sampling rate of 44,100Hz directly onto a MacBook Pro. As a supplementary device, in case of technical failure, we used two external digital recording devices, a Panasonic RR-US570 portable 500MB IC digital voice recorder and a Zoom H1 handy stereo recorder 2.0. All utterances were transcribed while listening to the audio, and observing both the spectrogram and the waveform in Praat, using semi-narrow transcription. We evaluate productions on two factors. First, we evaluate produced utterances based on whether they matched or deviated from the targeted or expected utterance; 'targeted utterance' is the one based on controlled elicitation stimuli, 'expected utterance' is one that we would expect to be produced in experimental tasks based on the context and goal of free elicitation tasks. Second, we also considered what was actually produced, based on the linguistic environment in which it was produced. There were many occasions where the use of alternative forms than the ones targeted were grammatical, based on the structure they were used. This is possible either because the dialect allows for a grammatical alternative or because participants had performed syntactic or morphological reorganization, by altering the structure to accommodate the form used. The latter has also been reported by Schaner-Wolles (2004) with Ger_{DS}.

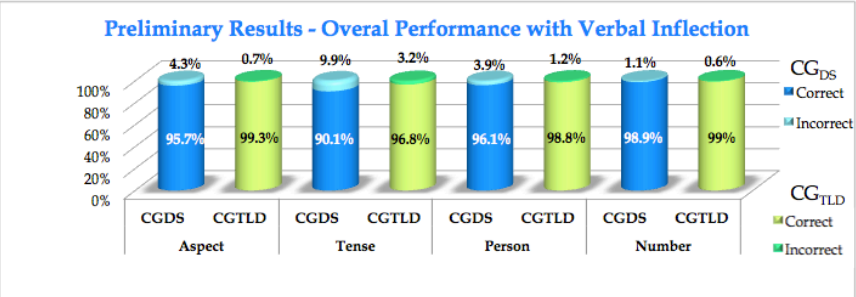
4. Results

The results presented in this paper are preliminary, since only a very small fraction of the collected data has been analyzed thus far. We first present results on the participants' overall performance with verbal inflectional features. We then zoom in on discussing tense productions in detail. Finally, we discuss the participants' comprehension and production of subjunctive clauses and interrogative structures. On the whole, both CG_{DS} and CG_{TLD} children perform quite accurately on all verbal inflectional features. Graph 1 below illustrates that percentages of accurate use for all features inflected on verbs are at 90% and higher for both groups.

Both groups appear to have acquired the verbal inflectional system, with percentages of accuracy ranging from 90%–99% for CG_{DS} children and adolescents[1] and 96%–99% for CG_{TLD} children. In comparison, the two groups

[1] An analysis of how participants from different age groups performed is not available at the moment, but data used for this preliminary analysis were from participants aged 8;0–13;10 for CG_{DS} and 4;0–6;0 for CG_{TLD}.

perform quite similarly on number, with 99% accuracy rates. CG_{DS}, however, lag slightly behind with aspect, tense, and person.



Correct	704	868	649	848	705	863	712	869
Incorrect	13	6	68	28	12	11	5	5

Graph 1: Preliminary Results on Verbal Inflection

4.1. Tense

We now zoom in to one of the four features, tense. The results presented in the confusion matrix Table 2 are divided based on the targeted tense value. The sum of each row gives the overall number of tense productions. We gather the overall number of productions for each tense value by adding the numbers under each tense column. Diagonal cells, highlighted in black, inform us of the number of matched instances for each tense value.

	CG_{DS}					CG_{TLD}				
	PRES	PAST	DEP	IMP	MATCH	PRES	PAST	DEP	IMP	MATCH
PRES	256	0	18	0	93.4%	405	1	11	0	97.1%
PAST	38	112	3	0	73.2%	23	136	0	0	85.5%
DEP	20	0	173	0	89.6%	11	0	244	0	95.7%
IMP	0	0	41	49	54.4%	0	0	6	37	86.1%

(Legend: PRES= Present, PAST= Past, DEP= Dependent, IMP= Imperative)
Table 2: Confusion Matrix of Tense Production by CG_{DS} and CG_{TLD}

The highest percentages of match tense productions are recorded with the dependent tense value for CG_{DS} and the present tense for the CG_{TLD}. The lowest percentage of match productions is observed with the imperative for CG_{DS} and the past and imperative for CG_{TLD}. This is mainly due to the fact that participants from both groups had a preference for a grammatical alternative in expressing commands. They used the 'less-than-a-forceful-command' use of the subjunctive, which still expresses a command but in a milder, 'less harsh' manner. This resulted in participants using the dependent as an alternative quite frequently. This alternative coping strategy was also observed for adult CG_{DS} as well as older CG_{TLD} (Christodoulou 2011). It is also worth mentioning that the other preferred tense value to be used as an alternative to other tense values is

present with a total of 58 alternative uses for CG_{DS} (38 instances of present production instead of past and 20 instances of present production instead of dependent) and 34 for CG_{TLD} (23 instances of present production instead of past and 11 instances of present production instead of dependent).

Table 3 provides the distribution of tense productions in greater detail. It shows the raw numbers of productions (CORR = Correct, INC = Incorrect), including the percentage of incorrect use (INC%) based on both match and alternative forms. As expected, given that (Cypriot) Greek inflectional marking on verbs and nominal expressions is obligatory, percentages of affix drop are less than 2% for both groups. As clearly observed in Table 3, not all alternative uses were ungrammatical, since we considered the syntactic environment in which they were produced, in addition to the targeted tense value.

	CG_{DS}				CG_{TLD}			
Tense	Match	Alternative		INC %	Match	Alternative		INC %
	CORR	CORR	INC		CORR	CORR	INC	
Present	256	27	31	9.9%	405	12	22	5.0%
Past	112	0	0	0%	136	0	1	0.6%
Dependent	173	28	34	14.5%	244	12	5	1.9%
Imperative	49	0	0	0%	37	0	0	0%
Total	590	55	65	9.2%	822	24	28	3.2%
Affix Drop	12			1.6%	5			0.6%

Table 3: Distribution of Tense Production by CG_{DS} and CG_{TLD}

As evident from Table 3, neither of the two groups uses imperative as an alternative to any of the remaining tense values. In addition, CG_{DS} children also make no use of past as an alternative, while one such instance was recorded with CG_{TLD}. In contrast, present and dependent are the most preferred tense values, used as an alternative to all other values, including reciprocally (for which one exactly can be deduced from Table 2 above). Present is typically used as an alternative to past tense, as instances of narrative present in story-telling, while the dependent tense value is used as an alternative to imperative (commands) in subjunctive clauses. Finally, given that the highest percentages of incorrect use, CG_{DS} are more likely to use dependent incorrectly when using it as an alternative than when using present tense. The reverse is true for CG_{TLD} children. Overall, however, percentages of incorrect use are quite low for both groups, but much lower for CG_{TLD} than CG_{DS} children.

To illustrate how participants used tense in their productions, we present the actual production for the targeted utterances presented in (1) and (2) (repeated here for convenience as (5) and (6)) as produced by CG_{DS} children.

(5) **VERCS**: Video Elicitation of Relative Clauses and Subjunctives

a. *Targeted Utterance (Experiment 1 – Task 1)*

O Nik-os vlep-i ti ...

DET.MASC.SG.NOM Nikos-MASC.SG.NOM see.IMPF-.PRES.3.SG DET.FEM.SG.ACC

... ðor-a na /pu ðjavaz-i ena vivl-io.
Dora-FEM.SG.ACC SUBJ that read.IMPF-PRES.3.SG one-NEU.SG.ACC book-NEU.SG.ACC
'Nikos sees Dora read a book.'

b. *CG_{DS} Production – Experiment 1 – Task I*
O Nik-o(s)[2] vlep-i ti∅ ...
DET.MASC.SG.NOM Nikos-MASC.SG.NOM see.IMPF-.PRES.3.SG DET.FEM.SG.ACC
... kopell-a na ∅javaz-i vivl-io.
girl-FEM.SG.ACC SUBJ read.IMPF-PRES.3.SG book-NEU.SG.ACC
'Nikos sees the girl read a book.' **[DS8 10;0]**

(6) **MaWiC:** 'Magic Window' Clauses

a. *Targeted Utterance (Experiment 1 – Task 2)*
O Nik-os vlep-i (ekso apo …
DET.MASC.SG.NOM Nikos-MASC.SG.NOM see.IMPF-PRES.3.SG outside from
... to maɣik-on tu paraθir-o(n)), ...
DET.NEU.SG.ACC magic-NEU.SG.ACC 3.MASC.SG.GEN window-NEU.SG.ACC
... en-a meɣal-o spit-i, me en-a(n) …
one-NEU.SG.ACC big-NEU.SG.ACC house-NEU.SG.ACC with one-NEU.SG.ACC
... kokkin-o(n) aftokinit-o(n) ke en-a meɣal-o …
red-NEU.SG.ACC car-NEU.SG.ACC and one-NEU.SG.ACC big-NEU.SG.ACC
… prasin-o ðendr-o.
green-NEU.SG.ACC tree-NEU.SG.ACC
'Nikos sees (outside his magic window) a big house, with a red car and a big green tree.'

b. *CG_{DS} Production (Experiment 1 – Task 2)*
O Nik-os vlep-i ðio spitj-a …
DET.MASC.SG.NOM Nikos-MASC.SG.NOM see.IMPF-PRES.3.SG two house-NEU.PL.ACC
... en-a(n) meɣal-o k(e) en-a mikr-o …
one-NEU.SG.ACC big-NEU.SG.ACC and one-NEU.SG.ACC small-NEU.SG.ACC
… k(e) ex-i meɣal-o prasin-o ðendr-o …
and have-PRES.3.SG big-NEU.SG.ACC green-NEU.SG.ACC tree-NEU.SG.ACC
… ke to aftokinit-o(n) ine kokkin-o(n).
and DET.NEU.SG.ACC car-NEU.SG.ACC be.PRES.3.SG/PL red-NEU.SG.ACC
'Nikos sees two houses, a big one and a small one, and there is a big, green tree, and the car is red.' **[DS3 – 13;10]**

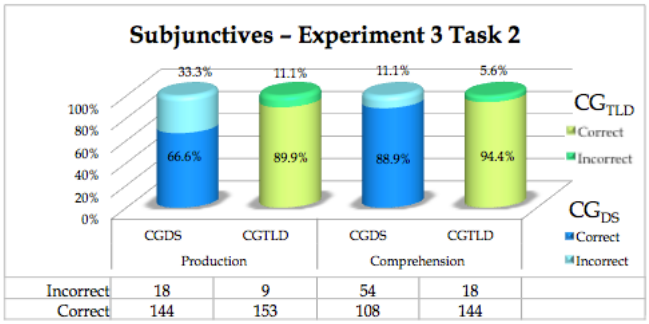
Notice how the produced utterances differ from the targeted ones. We see that in both instances the participants produced the targeted utterances exactly as targeted, despite the minor phonological differences. The produced utterance in (6b) is particularly interesting since the participant uses an even more complex structure to produce the stimulus, with clausal coordination. In the following

[2] Per CHILDES transcription conventions, parentheses indicate that a phoneme was not produced and square brackets that a phoneme has been substituted; ∅ indicates omission.

two sections we discuss the participants performance (both comprehension and production) with two complex syntactic environments: subjunctive clauses and *wh*-questions.

4.2. Subjunctive Clauses

Subjunctive clauses are widely used by participants from both groups. In fact, we recorded the production of subjunctive clauses in every single experimental task. In this section however, we only analyze a very small portion of the participants' use of the subjunctive in *Experiment 3 – Task 2*. Graph 2 illustrates participants' percentages of accuracy and incorrect use for the production and comprehension of the subjunctive.



Incorrect	18	9	54	18
Correct	144	153	108	144

Graph 2: Preliminary Results on Subjunctives

Results show that both groups are better with the comprehension rather than the production of subjunctive clauses, especially CG_{DS}. Their performance was much lower than CG_{TLD}, especially with the production of subjunctive clauses.

At this point, we would like to mention a few observations we recorded with the participants' overall performance with subjunctive clauses. We first observed that younger CG_{TLD} (2;0–2;8) have difficulties with the production part of *Experiment 3 – Task 2* but are quite accurate on the comprehension part. However, in spontaneous speech and story-telling, productions of subjunctive clauses seemed quite intuitive and effortless. Second, with regard to the same task, we noted a preference for the production of either (i) only the subjunctive clause or (ii) a *pro*-drop sentence with the omission of the subject, by both CG_{DS} and CG_{TLD} but especially with younger CG_{TLD}. Third, during the comprehension part, there was sometimes confusion by younger CG_{TLD} with the 'agent character' (Dog or Cat) used in the target utterance and the one depicted in the picture that matched the target. Namely, even though the child would produce the targeted utterance exactly as targeted, as in (7) below, in the comprehension part, they might point to the picture showing Dog wanting to dance, as opposed to Cat. Finally, considering the CG_{DS} and CG_{TLD} overall performance with the subjunctive, we predict that these are acquired early, despite their grammatical

complexity. The examples in (7) show the CG_{DS} participants' performance on the same three targeted utterances presented in (4) above.

(7) **SPEC**: Subjunctive Production Elicitation and Comprehension Subjunctives

a. i ɣat-a θel-i ***na*** ***xore[t]-s-i***.
DET.FEM.SG.NOM *cat-FEM.SG.NOM* *want.IMPF-PRES.3.SG* *SUBJ* *dance-PRF-DEP.3.SG*
'The cat wants to dance.' **[DS6 – 10;6]**

b. O skil-os ***potiz-i*** …
DET.FEM.SG.NOM *dog-MASC.SG.NOM* *water.IMPF-PRES.3.SG*
… ***ta*** ***luluð-ja***.
DET.FEM.SG.ACC *flower-FEM.SG.ACC*
'The dog is watering the flowers.' **[DS2 – 12;0]**

c. O skil-o(s)[3] θel-i ***na*** ***fa-i*** …
DET.FEM.SG.NOM *dog-MASC.SG.NOM* *want.IMPF-PRES.3.SG* *SUBJ* *eat.PRF-DEP.3.SG*
… ***lu[n]anik-o***.
sausage-FEM.SG.ACC
'The dog wants to eat (a) sausage.' **[DS8 – 13;10]**

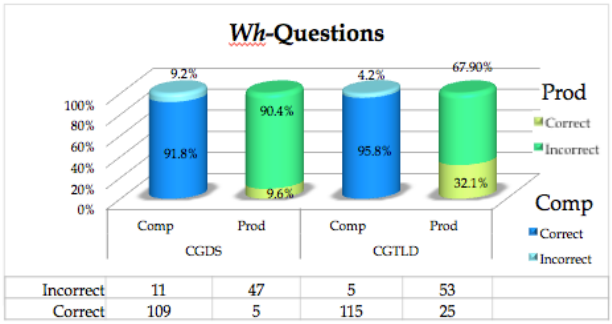
In (7a) we see an exact match between the targeted utterance and the CG_{DS} participant's production. The only difference is a phonological substitution of /p/ for [t]. The same can also be seen in the CG_{DS} production in (7c); the production of the main clause–subjunctive clause is as targeted, with two minor phonetic-phonological deviations: /s/ omission with the nominal *skilos* 'dog' and /k/ to /n/ substitution in *lu**ka**n**i**ko* 'sausage', possibly in conjunction with backward coping/spreading of the phonological features of /n/ in the syllable [ni] to the syllable /ka/, surfacing as [na]. Finally, in (7b) we give an instance where a CG_{DS} participant produces a simple indicative clause instead of a main clause + subjunctive clause. Such productions were considered incorrect, since they did not express what the agent wanted to do, as the task required them to produce, but rather what the agent was actually doing at that time. It should be stressed, though, that such productions are perfectly grammatical. The final part of this section summarizes preliminary results with the participants' performance on *wh*-questions.

4.3. *Wh*-Questions

Since the syntactic operations involved in the formation of *wh*-questions are quite complex, we expected low percentages of accuracy, and this is indeed what the preliminary results show, despite the fact that data were considered

[3] Even though the omission of /s/ in the nominal *skilos* 'dog' results in a change of case-marking from nominative to accusative, we do not mark this as such, given the fact already established that /s/ omissions are phonetically conditioned. For details, see Christodoulou (2011).

from only a handful of participants. Graph 3 shows participants' performance on the production and comprehension of *wh*-questions. The collected data that was considered for this analysis came from the administration of *Experiment 3 – Task 3* and *Experiment 5 – Task 1*. Production of *wh*-questions appeared to be quite challenging for both groups, with percentages of accuracy far below chance: 9.6% for CG_{DS} and 32.1% for CG_{TLD}. In contrast, accuracy rates for the comprehension of *wh*-questions were almost at ceiling: 91.8% CG_{DS} and 95.8% for CG_{TLD} — a striking difference with the accuracy rates for *wh*-question production. This asymmetry between production and comprehension might be a prime example of how performance may not be representative of competence (performance factors may interfere with the expression of all the competence participants might have with a particular grammatical phenomenon, or in general), or of how competence might precede performance.



Incorrect	11	47	5	53
Correct	109	5	115	25

Graph 3: Preliminary Results on *Wh*-Questions

Despite the fact that results presented in this paper are preliminary, we now report a number of tendencies observed during data collection and analysis. As with subjunctive clauses, a number of observations relating to the production and comprehension of *wh*-questions can be mentioned. First, with regards to comprehension, we noted the highest percentages of correct responses with *ti* 'what' and *pcos/pcia/pco* 'who'; the lowest accuracy rates were recorded with *pos* 'how, and *me ti* 'with what'. Second, most participants had difficulties comprehending and responding to the Cypriot Greek-specific *wh*-words. The experimenter often had to rephrase, using the equivalent Standard Greek *wh*-word. Age did not seem to play a role. Third, concerning the production of *wh*-questions, most participants revealed a tendency to start with one type of *wh*-word (e.g., *ti* 'what' or *pjos* 'who') and continue with the same one throughout the entire duration of the task. Any attempts to get participants to use other *wh*-words, by asking them to re-perform a short version of the comprehension part, had surprisingly no effect at all on the participants' performance. Productions in (8) and (9) illustrate participants' production and comprehension of wh-questions.

(8) **CompQ**: Comprehension of Questions

a. *Why Question (Experiment 5 – Task 1)*

ʝati e-val-en i mam-a
why *PAST-put.PRF-PAST.3.SG* *DET.FEM.SG.NOM* *mum-FEM.SG.NOM*
ta ɣlik-a s-to furn-o?
DET.NEU.PL.ACC *sweet-NEU.PL.ACC* *in-DET.MASC.SG.ACC* *oven-MASC.SG.ACC*
'Why did mum put the sweets in the oven?'

Participant's Response (Experiment 5 – Task 1)
ʝa na psiθun ce na ∅ fame.
so.that *SUBJ* *bake.PRF-DEP.3.PL* *and* *SUBJ* *CL* *eat.PRF-DEP.3.SG*
'In order for them to cook and to eat them.' **[DS6 – 10;6]**

b. *Where Question (Experiment 5 – Task 1)*

Pu tu e-ppe-s-en i bal-a?
where *3.MASC.SG.GEN* *PAST-fall-PRF-PAST.3.SG* *DET.FEM.SG.NOM* *ball-FEM.SG.NOM*
'Where did the ball drop/fall?'

Participant's Response (Experiment 5 – Task 1)
Prep-i na pe[t]-s-i.
must.IMPF-PRES.3.SG *SUBJ* *play-PRF-DEP.3.SG*
'S/he has to play.' **[DS11 – 12;5]**

(9) **EPoQ**: Elicited Production of Questions (*Experiment 3 – Task 3*)

Ti kani to ɣat-ak-i …
what *do.IMPF-PRES.3.SG* *DET.NEU.SG.ACC* *cat-DIM-NEU.SG.ACC*
… s-to(n) kanape? **[DS13 – 13;8]**
at-DET.MASC.SG.ACC *sofa-MASC.SG.ACC*
'What is the kitten doing on/to? the sofa?'

In (8a) the participant responds to a *why*-question accurately and even elaborates further. In (8b) the CG_{DS} participant misinterprets the question and gives an irrelevant answer. Finally, example (9) shows one of the rare instances in which a CG_{DS} participant produced a *wh*-question. The participant produces a grammatical *what*-question, succeeding in creating a *wh*-question to best describe the visual stimulus he was presented with.

It should be noted that acquisition of *wh*-questions for both groups is neither delayed nor impaired to the degree that *Experiment 3 – Task 3* shows. Data from spontaneous utterances support the acquisition of at least *ti* 'what' and *pcos, pca, pco* 'who' (masculine, feminine, neuter).

5. Discussion

The results reported in this paper show that participants from the two experimental groups, CG_{DS} (Cypriot Greek-speaking children diagnosed with Down Syndrome) and CG_{TLD} (Cypriot Greek-speaking children with typical language development), make use of a number of alternative strategies. First, alternative feature value is the primary coping strategy, which is up to this point recorded at percentages from 1%–15%. Both CG_{DS} and CG_{TLD} children exhibit a clear consistency in the use of alternative feature values as well as in the production of targeted and alternative syntactic structures. Second, participants' use of alternative syntactic structures to those targeted is currently observed at approximately 5%. Third, very small percentages of affix drop (around 1%–2%) are also recorded for both groups, especially towards the end of utterances, which might suggest that suffix omission was a performance effect, lowering of the voice (undetectable even on a waveform and spectrogram) frequently occurring in typical speech as well.

Focusing on the second strategy, syntactic re-organization, we can deduce that the participants' overall performance shows that they have indeed acquired the structure but sometimes have a preference for a grammatical alternative to the targeted structure. Some examples are (i) use of a subjunctive clause instead of imperative, (ii) use of rising intonation questions instead of *wh*-questions, (iii) use of narrative present instead of past, (iv) use of relative clauses instead of subjunctive clauses, and so on. It should be stressed that all of the alternatives noted are grammatical alternatives of each target in adult language.

With this preliminary analysis of a very small amount of data we can discern differences between the two grammars on three levels: (i) phonetic/ phonological (for the most part), (ii) morphological, and (iii) syntactic. Presently, given how little we have, we cannot decide to what degree each of the above contributes to the differences between the two groups and how vital the role each plays is in the formation of grammar in each group.

A significant question that arises from this preliminary study is whether the reported differences are enough to claim that CG_{DS}, and DS in general, have a distinct development and hence a distinct grammar. Though at this point we cannot fully answer this question, we anticipate that after the completion of our data analysis, we might be able to provide a well founded answer.

On a final note, we would like to raise some issues and implications related to this research. We anticipate that once data analysis is completed, we will be able to address these issues and test the several implications related to our research. First, what does the use of alternative feature values and syntactic re-organization imply for the syntactic development of CG_{DS} and CG_{TLD} children? Do these observations have an overall effect and could possibly be extended to make generalizations about the grammatical system of DS and TLD children in general? Second, what are the implications of external factors? How can data be misinterpreted and present an entirely different picture of participants' specific or overall abilities? Third, are differences observed between the two groups, in

combination with previous research on adult CG_{DS} (Christodoulou 2011, to appear), enough to claim that DS have a distinct language development, hence a distinct grammar? If so, in relation to the CG_{TLD} grammar, would this mean that the DS grammar is delayed, deviant, or both? Lastly, what are the implications of the restricted cognitive abilities on the development of a fully functioning grammar, one that is quite parallel to that of individuals with TLD? And to what extent is language dependent on or independent of cognition?

6. Conclusions

Preliminary results from the current study suggest that — at least for this group of individuals diagnosed with the neurodevelopmental disorder of Down Syndrome — full mastery of the inflectional system is possible, both morphologically and syntactically. Challenges with complex syntactic structures are evident, but we will anticipate the completion of data analysis to draw conclusions as to what level CG_{DS} morphosyntactic abilities can reach. This study makes numerous contributions to the linguistic development of CG_{TLD}, CG_{DS}, and DS in general.

First, it provides valuable information on the relation between language and cognition; we show that mastery of at least the inflectional system is plausible, despite cognitive limitations. In accordance, this study also sheds light on what is controlled by the genome, and to what degree, what is pre-determined based on genetic abnormalities, and which linguistic difficulties individuals with DS can overcome. Fowler et al. (1994) conclude that age, IQ, and language level are all determinant of language growth. They suggest that constraints in the process of language acquisition greatly affect the progress in language learning. Most importantly, they argue that restrictions on cognitive development may play a vital role in acquiring or even recognizing the grammatical system of their language. Results from this study however, show almost adult-like accuracy with the inflectional system, despite the fact that the Greek morphosyntactic system is more complex, given its richness, than the English one.

Finally, once results are categorized based on age and in combination with results from Christodoulou (2011, to appear), we will be able to provide a first developmental trajectory for CG_{DS} (perhaps even DS in general) and CG_{TLD}. Based on preliminary observations, some of which we make reference to in this paper, differences between CG_{DS} and CG_{TLD} across different ages are already evident, where language mastery gradually progresses, verifying our claim that linguistic development for DS does not stop. We expect that results from the current study will also shed light on what is controlled by the genome (and to what degree) as well as what could be overcome and be fully acquired, and what cannot. We believe that children diagnosed with DS can indeed fully "master" the adult grammatical system to a great extent, and that the linguistic limitations that cannot be fully "conquered", due to genetic reasons and differing physiology, can at least be improved.

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