Language learning in children with Down syndrome (DS):
Receptive and expressive morphosyntactic abilities

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Abstract
Down syndrome is the most common known cause of intellectual disability and occurs in approximately 1 in 700 births. Language skills of children with DS are more severely affected than their nonverbal cognition. Expressive language skills are poorer than receptive ones, especially syntax which tends to be considerably delayed. Moreover, children with DS tend to make more grammatical errors than typically developing children. The purpose of this study is to examine whether morphosyntactic abilities of children with DS are poorer than the abilities of typically developing children, taking into consideration that research is extremely poor in this area and especially in the Greek language. For this purpose, 10 children with DS and 10 typically developing children have been examined in a 45 minute morphosyntactic abilities task. Our findings are in line with previous research, proving that expressive and receptive syntax is delayed and severely affected in children with DS.

1. Introduction
Down syndrome (DS) is caused by triplication of the 21st chromosome and is associated with particular deficits in the morphosyntactic field. DS is the leading genetic cause of intellectual disability accounting for 25%-30% of people with mental retardation (Nadel, 1999). The degree of intellectual disability varies widely from close to normal intelligence to severe mental retardation, with 80% of individuals showing moderate retardation (Roizen, 2002). Despite considerable variability, individuals with DS have been described as having phenotypically distinct behavioral patterns in language and cognition, following a consistent profile in their linguistic development (Chapman et al., 2002). Down syndrome has been shown to have a specific behavioral phenotype in language that includes delays in expressive syntax, errors in grammatical morphemes omission and use and deficits in intelligibility (Chapman & Hesketh, 2000; Miller, Leddy & Leavitt, 1999). Research has shown that children with DS develop syntactic skills and early morpheme rules in the same sequence as typically developing children do.
(Rutter & Buckley, 1994). Children with DS have more difficulties with the structural aspects of language, including morphology (word endings) and syntax (word order and grammatical rules) than the other components of language (Kumin, 1996). Moreover, individuals with DS achieve a limited Mean Length of Utterance (MLU), perform poorly on tasks on comprehension and elicitation of grammatical morphemes and more complex syntactic structures (Rondal & Complain, 1996). Furthermore, in the expressive domain, deletion of unstressed syllables, errors in syllable final sounds, reduction of consonant clusters, substitutions, omissions and additions of particular sounds are present in childhood and often persist in adulthood (Dodd & Thompson, 2001). Chapman et al., (1998) found a more inconsistent use of both bound morphemes (plural –s, possessive –s, third person singular, contractible auxiliaries and copulas, present progressive –ing, regular past tense –ed) and free function words (copulas, auxiliaries, modal auxiliaries, articles, prepositions, pronouns, adverbial adjuncts, conjunctions and infinitive ‘to’) in children with DS than in those with typical intelligence. Research in the morphosyntactic abilities of children with DS in the Greek language is extremely poor. Only one research has been conducted related to perfective past tense in Greek adolescents with DS (Stathopoulou & Clahsen, 2010). In view of the above, we conducted an experiment in order to examine the level of morphosyntactic abilities of children with DS in the Greek language compared to those of typically developing ones.

2.Method

2.1 Participants

Ten children with DS (six boys and four girls) aged from 4.7 to 7.0 (mean: 6.7 years of age) participated in the current study. In addition, a control group of ten typically developing children aged from 4.2-6.8 (mean: 5.8 years of age) also participated in the study. All DS children of our sample had standard trisomy 21. The typically developing children did not have any reported learning disabilities or hearing difficulties and they did not exhibit any signs of neurological or psychological disorders. All typically developing children attended Greek kindergarten and primary schools in Thessaloniki at the time of testing. The participants with DS were recruited from the Down Syndrome Association of Greece. Both groups of participants were native Greek monolingual speakers.

2.1.1 Materials

We used a standardized morphosyntactic abilities test (Tzouriadou et al., 2008) which is divided into four tasks, morphosyntactic comprehension, morphosyntactic completion and articulation (part 1 and part 2). The first task includes 13 items and examines receptive morphosyntactic abilities. The participant has to choose from three pictures presented, the one that fits the sentence-stimulus. For example, the researcher presents four pictures and says /polia skilia kathonte kato/ (many dogs are sitting down) and the child has to choose the correct one. The second task includes 13 items and examines expressive morphosyntactic abilities. The researcher says a sentence while showing two pictures and stops at the point where the child has to continue with the right word that matches the picture pointed by the researcher. For example, the researcher says the following sentence showing two pictures with trucks /afto to fortigo kuvalai pola kutia. Afto kuvala i …../ (this truck carries many boxes, this one carries…) and the child had to answer /ena kuti/ (one box).

The third task, the task of articulation, is divided in two parts. The first part includes 13 items followed by pictures and examines the correct pronunciation of the words said by the child. For example, the researcher says a sentence by showing a picture to the child. So the researcher says /ta malia exun poles…./ (hair have too many…) and the child has to pronounce correctly the word /tribes/ (hairs). The second part includes 16 items and examines morphosyntactic completion combined with correct articulation. For example, the researcher says the following sentence /To Pasha…avga/ (At Easter we…eggs) and the child has to continue the sentence by finding and pronouncing correctly the word /tsougkrizume/ (break).
2.1.1. Procedure

Each participant was tested individually in his/her class or home. The tasks were given all together and their mean time of completion was approximately 45 minutes. The participants’ answers were marked on a separate answer sheet.

2.1.1.1. Statistical Analysis

Correlation analysis was used to examine whether there is a correlation between the different tasks of the morphosyntactic abilities test and one way MANOVA was used in order to detect possible statistically significant differences between children with DS and typically developing ones in the morphosyntactic tasks given.

3. Results

Cronbach alpha analysis showed an overall high reliability between the four tasks (.971). In addition, it showed a high correlation between morphosyntactic comprehension and morphosyntactic completion (.908), a high correlation between morphosyntactic comprehension and the first part of the articulation task (.895) and a high correlation between morphosyntactic comprehension and the second part of the articulation task (.877). Moreover, morphosyntactic completion showed a high correlation with both articulation parts: Part 1: .894, Part 2: .914. Finally, there was a high correlation (.910) between the two parts of the articulation task.

The results from one way MANOVA showed that the effect of all variables (morphosyntactic comprehension, morphosyntactic completion, articulation Part 1 and Part 2) is statistically significant: F=52.551 (df=15.000), p=0.000.

The mean number of correct answers for all four tasks in both groups, children with DS and typically developing children, are shown in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>DS</th>
<th>TD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morhosyntactic Comprehension</td>
<td>0.377*</td>
<td>0.315*</td>
<td>.029</td>
</tr>
<tr>
<td>Morhosyntactic Completion</td>
<td>0.315*</td>
<td>0.300*</td>
<td>.029</td>
</tr>
<tr>
<td>Articulation Part 1</td>
<td>0.306**</td>
<td>0.300**</td>
<td>.032</td>
</tr>
<tr>
<td>Articulation Part 2</td>
<td>0.306**</td>
<td>0.300**</td>
<td>.032</td>
</tr>
</tbody>
</table>

* out of 13
** out of 16
*** statistically significant (p<.01)

4. Discussion

In summary, we found that the morphosyntactic domain of language is a region of deficit in children with Down syndrome. More specifically, our results showed that children with DS scored much lower than typically developing children in all tasks that constituted the morphosyntactic abilities test they were given. This means that children with DS seem to have serious problems in both their receptive and expressive morphosyntactic abilities. Our findings are in line with those of other researches which proved that morphosyntax is vulnerable in this specific population (Fowler, 1998). Previous research findings have also shown that speech processing abilities are related to grammatical impairments in children with DS (Yoder et al., 2004) and that the syntactic organization of language is severely affected in this population (Perovic, 2006). However, our findings run contrary to those of Stathopoulou & Clahsen (2010) who found that the perfective past tense formation of existing verbs in greek adolescents with DS was parallel to that of typically developing controls. The fact that the aforementioned study focused only on a very specific grammatical phenomenon, that of the perfective past tense formation, and did not examine other aspects of morphosyntactic development in DS could provide an explanation to its findings.
However, our results must be treated with caution since this study was only a small-scale investigation and typically developing children and children with DS who consisted our sample were not followed longitudinally. Therefore, more longitudinal research studies in DS are needed with large samples which will be followed from childhood right through adolescence and adulthood. In addition, since the bulk of the research in DS concerns the English language, more research is needed in the morphosyntactic development of DS children in the Greek language as these two languages are very different in terms of syntax and morphology (Goodluck, 1986).

References


