

Effect of Teaching Reading and Traditional Methods of Language Therapy on Grammatical Quotient of Children with Down Syndrome

Mehdi Dehghan,^{*1} Fariba Yadegari,² Sima Shirazi,² Anooshirvan Kazemnejad³

1. Department of Speech Therapy, Babol University of Medical Sciences, Mazandaran, Iran
2. Department of Speech therapy, University of Welfare & Rehabilitation Sciences, Tehran, Iran
3. Department of Biostatistics, Tarbiat Modarres University, Tehran, Iran

Article information	Abstract
<p>Article history: Received: 8 Mar 2012 Accepted: 1 June 2011 Available online: 3 June 2013 ZJRMS 2014; 16(5): 54-58</p> <p>Keywords: Down syndrome Reading instruction Traditional education Grammar quotient</p> <p>*Corresponding author at: Department of Speech Therapy, Babol University of Medical Sciences, Mazandaran, Iran. E-mail: m.dehghan26@gmail.com</p>	<p>Background: The present study compares the effects of reading instruction and traditional methods on grammar quotient of 4 to 10 years old children with down syndrome having IQ scores of 40 to 60.</p> <p>Materials and Methods: In this quasi-experimental and interventional study, 20 children with down syndrome, average mean age of 63 months, and 40 to 60 IQ scores were selected from 96 children with down syndrome from rehabilitation clinics within Tehran and Karaj, using convenience sampling. Then, they were assigned into two groups in the presence of their parents, using balanced randomized method. The first group was educated by whole-word reading method and the second group by traditional methods. Both groups had three 15-minute sessions per week for a period of 6 months. Pre-test and post-test grammar quotient of both groups was assessed using the Test of Persian language development. The obtained data were analyzed using the Kolmogorov-Smirnov test, <i>t</i>-test, and paired <i>t</i>-test.</p> <p>Results: Both groups were quite similar in age, IQ, and grammar quotient, prior to training. However, the first group showed significant development in grammar quotient, after training ($p < 0.001$).</p> <p>Conclusion: In comparison with traditional methods of language therapy that emphasize on weakness of children with down syndrome by employing auditory modality, teaching reading through whole-word method based on their strength "visual memory" has more influence on grammar quotient of them.</p> <p>Copyright © 2014 Zahedan University of Medical Sciences. All rights reserved.</p>

Introduction

Many children with down syndrome have severe delayed language development, but in most cases, more severe disorder is prone to expressive language than receptive language [1]. Previous studies have reported a specific behavioral phenotype in children and adolescents with down syndrome. It is essential to identify this phenotype that includes specific deficits in expressive language, especially regarding speech clarity, syntax (grammar), and phonological working memory along with high ability in word reception, to from an effective and time-sensitive intervention [2-4]. With respect to receptive language, surveys suggest that word reception in the early stages of childhood and adolescence is commensurate with chronological age; while, grammar reception is delayed and, in general, children and adults with down syndrome exhibit specific deficits in grammar development [5, 6]. In the recent years, a considerable amount of attention has been given to the instruction and intervention methods targeting children with down syndrome, and to the effects of such instructions on expressive and receptive language statuses of such children [7], among which reading instruction and its advantages in development of speech, language, and memory skills can be noted. In the

following, a number of them would be addressed. Rozen, and Kotlinski et al. in separate studies reported the results from teaching reading to two down syndrome children, Charlotte and Joni. [8, 9] Joni who had received reading instruction from 3 years of age, began to write short stories, especially in narrative style and with absolute correct grammar by the age 10 years; Joni also could speak using full sentences including correct verb marks, conjunctions, and auxiliary verbs, and generally spoke with her chronological age [8]. Charlotte who received reading instruction by the age 2.6 years, obtained grammar reception as equal as chronological age of 5.6 year of age when she was aged 5, based on test of Reception of Grammar (TROG). In addition, she produced expressive language with full sentences having prepositions, articles, pronoun, verb, auxiliary verb, and correct verb marks [9]. According to different studies, when the down syndrome children are educated by reading instruction at vocabulary learning stage, their learning rate increases and they can produce complete sentences sooner than expected. In particular, the researchers have found that reading is not only a simple and enjoying activity; rather it is a very important factor in development of phonology and expressive grammar

skills [10]. The findings of recent studies attribute the main reasons for delayed, and sometimes stopped, speech and language development of such children to neuropsychological profile of this syndrome. Hearing sensation disorders, hearing process disorders, verbal short-memory deficit, and phonological memory impairment are among those reasons [11-15]. Unfortunately, many of therapy and training interventions, which are used during rehabilitation of down syndrome children, ignore that profile and are based on the patients' weaknesses. Thus, an intangible progress in a long period of time would lead to frustration in such children, their parents, and even therapists. These are called traditional methods in this study. In contrast, reading instruction method that has been introduced in recent years is based on the patients' strengths, i.e. strong visual memory. Since, in neuropsychological profile of children with down syndrome, their strengths, due to their strong visual-spatial process ability, are also presented that include strong visual memory, visual-motor integration, and visual imitation [16]. Regarding reading instruction, it is assumed that this approach not only improves pronunciation and vocabulary inventory, but also causes grammatical structures improve better and faster in children with down syndrome. Therefore, a sentence can be stretched into a complete sentence with correct syntax [17]. Since this method is not used in our country, the present study is designed and conducted with the purpose of designing and investigating the effect of traditional methods of language therapy and reading instruction on grammar quotient of children with down syndrome. In this study, all language therapy techniques including parallel talking, self talking, self correction, extension, expansion, and conditioning, in which auditory modality is used, are defined as traditional language therapy methods. The main assumption concerns that establishing syntax relationships and improving grammar quotient in down syndrome children is achieved better and quicker through reading, using visual memory, than traditional methods, which employ auditory modality and verbal memory.

Materials and Methods

In this quasi-experimental and interventional study, twenty-seven trisomy 21 children were selected from 97 children with down syndrome, using convenience sampling method and based on the study's criteria, from rehabilitation clinics of Navid-e-Asr in Tehran, Rezvan in Shahria, and Ehsan in Karaj, and down syndrome association of Karaj. The above criteria included the absence of severe motor, visual, and auditory deficits, IQ scores of 40 to 60, understanding at least 50 words, selection ability, and matching ability. Seven out of twenty-seven children were removed from the study due to lack of cooperation from their families in random grouping and depression of one of the mothers. The remaining 20 patients were allocated in two groups of ten by balanced randomized method in the presence of their

parents. The number of boys and girls in both groups were, stochastically and without any intervention, equal. Data collection was carried out through following tests: 1- Goodenough-Harris Draw-A-Person Test: this test is used to evaluate cognitive abilities of children, based on child's drawing. This test is used here for measuring mental age and intelligence quotient of children with down syndrome. Research has shown that this test has the highest accuracy in children between 3 to 10 years old [18]. 2-An adaptation of Peabody Picture Vocabulary test: Peabody Picture Vocabulary test was created by Dunn in 1959. This scale is used for measuring receptive vocabulary achievement. Here, it is used as a model to develop a checklist including 6 categories of animal, fruit, furniture, body parts, clothing, and job pictures [7]. 3-Demographic questionnaire (including first name, family name, age, sex, and bilingualism) 4-Standardized Persian adaptation of test of language development (TOLDSP3) TOLD with validity of almost over 80% is determined in three areas of content-sampling, time-sampling, and scoring differences. Reliability of the test confirms its efficiency. In general, this test is highly valid and reliable, indicating a little error rate, so the users can have confidence in the results. The test consists of six subtests: picture vocabulary, relational vocabulary, oral vocabulary, grammatical understanding, sentence imitation, and grammatic completion. In order to measure grammar quotient the scores from grammatical understanding, sentence imitation, and grammatic completion subtests have been used. Based on this quotient, child's ability in understanding and producing acceptable sentences, sorting words, organizing statements for creating proper grammatical sentences, and correct use of grammatical components such as plural and ownership signs, is assessed [19]. 5-McArthur inventories-adapted language and basic vocabulary development scale In order to implement the present project, the subjects with auditory, visual, and motor impairments were first removed, based on selection criteria, using auditory, visual, motor, and intellectual tests by the experts. In addition, those without sensory and motor difficulties with IQ scores of 40 to 60 took Peabody picture vocabulary test, and then the children with at least 50-perceptive vocabulary inventory were given matching and selection tests. On this basis, children with ability in picture, color, and size matching, and other concepts selection were selected and allocated into two groups of ten, using balanced randomized method. Then, they were given test of Persian language development (TOLD-P3) and their grammar quotient was obtained. Next, the first and second groups were in turn educated by whole-word method and traditional method. These training continued for 6 month, three 15-minute sessions per week. At the end, they were given TOLD-P3 and their grammar quotient was measured, again. The studies were done in an open label fashion. Ethically, at the beginning of the survey, the parents were asked to participate in a session ensuring their personal information and that of their children would remain confidential. In addition, they

were told that their children would be at no risk and informed about both methods, and it was emphasized that in both methods the main purpose is education. Moreover, they were said that grouping would be done randomly in their presence. However, six parents were not willing to perform random grouping, and so their children removed from the research. Another child was also removed as his/her mother had depression and for lack of cooperation. Additionally, the colleagues who performed TOLD-P3 were not aware of instruction method or the instruction per se. Furthermore, similar therapy elements, such as vocabulary, were used in both groups, and the only different was in instruction method. First, normal distribution of subjects was assessed in both groups, using Kolmogorov-Smirnov (K-S) test. Then, *t*-test was used to compare both groups pre and post training. To draw intergroup comparison between the effects of instruction methods in both groups, paired *t*-test was employed.

Results

The results from comparison between the two groups with respect to the mentioned background and dependent variables are presented in table 1, indicating similar conditions of both groups before intervention.

With respect to the grammar quotient scores measured based on the scores from grammatical understanding, sentence imitation, and grammatic completion subtests, no significant difference were seen between the two groups, and they were statistically in same conditions. However, after making intervention in both groups, grammar quotient showed better improvement in the first group (receiving reading instruction). In addition, both groups had statistically significant difference ($p=0.001$).

Subsequently, for investigating intergroup data, paired *t*-test was employed to measure development in each group and to determine the significance and validity of such development. The obtained data were presented in Table 2. According to table 2, development rate is statistically significant ($p=0.001$) in the first group (receiving reading instruction), and proper development was observed in the subjects (of first group) with respect to grammar quotient. However, in second group (receiving traditional language therapy methods) this rate of development was not statistically significant, and its subjects did not show major development.

Table 1. Pre-test background and dependent variables

Variables	Group	Mean±SD	<i>p</i> -Value
Age	Reading	61.50±12.03	0.648
	Traditionan	64.50±16.52	
IQ	Reading	58.00±2.40	0.893
	Traditionan	57.80±3.96	
Grammar Quotient	Reading	54.20±5.61	0.871
	Traditionan	54.60 ±5.27	

Table 2. Pre and post intervention scores and their difference

Variable	Group	Pre-test Scores	Post-test Scores	Differences Scores	SD	<i>p</i> -Value
Grammatical Quotient	reading	54.20	68.30	14.10	8.72	0.001
	Traditional	54.60	54.40	-0.20	4.75	0.897

Discussion

The results of the study indicate that grammar skills of children with down syndrome can be improved by instruction. In this regard, in comparison with traditional methods of language therapy, reading instruction by emphasizing on strengths of such children, i.e. visual memory, improved their grammar quotient better and quicker. The findings were in consistent with many of previous studies such as Pieters and Center's results in 1984, and Pieters' study in 1988 [21, 22], separate studies by Rozen [8] and Kotlinski and Kotlinski [9] reports by parents of down syndrome children educated by reading instruction, Byrne et al., two studies by Buckley et al. and Laws et al. [23-26].

By looking at table 2, it can be found out that while the subjects in both groups scored better in grammar understanding, sentence imitation, and grammar completion subtests in pre-test than post-test, but in traditional group grammar quotient improvement was negative. The point to note is that based on TOLDP3, the scores of traditional group subjects were not commensurate with their chronological ages. Consequently, grammar quotient scores measured in post-test were lower than in pre-test, administered six months earlier, so negative difference score was obtained indicating inefficiency of these methods in improvement of grammar quotient of children with down syndrome as such approaches. It is so because such methods are based on auditory modality, emphasize on auditory process, and focus on verbal memory that all are of weaknesses of children with down syndrome located in their neuropsychological profile. Therefore, those methods not only do not lead to progress in such children, but also waste their fairly valuable time for early intervention. The reasons can be found in the studies that attribute grammar difficulties of down syndrome children to their phonological working memory and verbal short-term memory deficits [13, 14]. Learning grammar rules (syntax) through hearing requires keeping 5 to 6-word sentences in the working memory and processing their internal semantic and syntactic relationships, while children with down syndrome cannot do it at young ages, so lose the opportunity for such learning [27].

Although, in the first group, this task is upon visual memory, so such children could have memorized the rules more easily, and use them because of repetition. It seems that down syndrome children are regularly generating a visual pattern inventory from written words, as like as what they do with verbal words in form of an auditory pattern inventory. Then, both inventories are related through word meaning (semantic knowledge), grammar (syntax knowledge), and speech production system (motor-phonological aspect of speech). Therefore, they can read words and sentences loudly while expressing their thoughts in form of oral words and sentences [10]. In this study, children with down syndrome educated by reading instruction (first group) learned to use written vocabularies in speech, organize such vocabularies syntactically, and relate them semantically in form of sentences, better and quicker than their peers in the second group. In general, it can be said that reading affects different language areas of children with down

syndrome and can be a specific way for improving grammatical structures in expressive language of such children, as reading is a visual language.

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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