Original Article

The Effects of Whole Word Reading Program on Expressive Vocabulary of Persian - Speaking Children with Down Syndrome

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Objectives: Reading is a language skill based on visual modality which recently is addressed as a facilitator of expressive language in children with Down syndrome. The aim was designing a whole word reading protocol and examining its effects on the language skills of Persian - Speaking children with Down syndrome.

Methods: A whole word reading protocol was developed and was examined through a single- subject study with time-series design. The protocol was made up of 50 pictures of nouns which were used through assessment and treatment. The vocabulary stimuli were selected from the receptive lexicon of each child. Three children with Down syndrome (trisomy 21) participated in the study (3 Females, mean age=6.1 years, mean IQ=44), and each participant received an individualized treatment up to 20 sessions. Visual graphs and C-statistic test were used for data analysis.

Results: As a result of the treatment, naming ability of treated words was increased statistically in all children (Z= 2.46>1.64; Z=1.75>1.6; and Z=2.37>1.64).

Discussion: Whole word reading protocol seems to be effective in improving expressive vocabulary in children with Down syndrome.

Keywords: whole word reading, Down syndrome, expressive vocabulary

Introduction

Leslie Duffen, the father of Sarah, found out that his daughter could learn to read at the age of three. Sarah had Down syndrome. By three years of age, she had just begun to repeat and to utter single words in her speech. Leslie started teaching Sarah to read. He used flashcards of written words that he wished to enable her to use in her speech. Surprisingly, he noticed that his daughter began to make use of the words she had learned from the written material more rapidly than those she merely encountered in the spoken form. Sue Buckley used this approach for the first time as a research program with Joanna, who managed to learn thirty words in a month. It became promptly evident that Leslie observation with Sarah might well be applicable to other children with Down syndrome (1). The majority of studies has established the actual level of expressive language skills attained by children with Down syndrome rarely exceeds that of the typically developing children of three to five years old. Also the expressive language skills are more delayed than comprehension in these children (1-4). A key reason for the delay in expressive language development appears to be due to limited auditory short- term memory span (5). Studies indicates that visual perception and visual memory are less impaired than auditory processing and auditory memory in children with Down Syndrome (6,7). Accordingly, visuospatial perceptions and memory capacities of these children, and techniques such as reading has proved to be more effective (1). Indeed, the visual representation of language offers a way to overcome auditory processing difficulties and phonological loop deficiencies for children with Down syndrome (8). A plausible explanation for this might be that printed material provides a permanent not a transitory signal in comparison to spoken language which is easier to process in slow processing systems (9).

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Traditional speech therapy approaches mostly rely on hearing modality in speech therapy clinics because speech therapist and parents may not be familiar with word reading program and its effects. In 2009, Dehghan et al developed a Persian treatment protocol for children with Down Syndrome which may be considered the only one research of this type in Iran (10). In this research, the objective was to introduce a whole word reading protocol based on this recent study and examining the effects of it on expressive vocabulary of Persian-speaking children with Down syndrome.

Methods

Fifteen children with Down syndrome were assessed in a rehabilitation center in the city of Qom. Among them three girls (FG, NM, ZA) who had the inclusion criteria participated in the study. The Inclusion criteria were: 1) Intelligence quotient between 40 and 60 which was determined by a psychologist using the third edition of Wechsler Intelligence Scale for Children, (WISC III); 2) receptive vocabulary of at least 50 words; 3) existence of selection and matching skills which were tested by informal assessment; and 4) being monolingual Persian-speaking. The exclusion criteria for participats were: 1) The presence of extra visual, hearing or motor disabilities; and 2) The presence of speech apraxia. Demographic features of children are summarized in table (1).

Table 1. Demographic characteristics of the subjects

Subject	Age (years)	Mental age (years)	IQ
FG	5	2.5	50
NM	7	3	43
ZA	6.5	3	47

All participants were tested with the full-scale intelligence quotient score on the Wechsler intelligence scale for children (WISCI-III). A Persian receptive vocabulary task (Peymani, 2001, unpublished thesis Refrence needed) was used to specify the receptive words of the participants. Training stimuli comprised of 50 words which children could perceive. These words were picturable names of six semantic categories of fruits, animals, body parts, tools, clothes and jobs. The words were selected from a database of early expressive vocabulary of 12-24 months Persian-speaking children (11). Children were tested for these words through a picture naming task. Twenty pictures which could not be named by children in 3 trials, were selected as target words for assessment and treatment. Colored picture cards of Did-Amuz and flashcards written in B nazanin font, size 50 were used as training

materials. Therapist and the child sat in front of each other in a quiet speech therapy room in an individual training session to do the exercises. The whole word reading program consisted of 5 levels: 1) practice; 2) matching; 3) selecting; 4) reading; and 5) naming. Every five levels were administered in each therapy session. In the practice level, the researcher read the written flashcard five times while the child was listening. As the aim of this level was to familiarize the child with the stimulus, no response from the child was expected. Matching consisted of two phases: in the first phase, the child matched the written flashcards on the table; and in the second phase, the child matched written flashcard with the correspondent colored picture card. Selecting required the researcher to read the flashcard and the child was asked to select the relevant written flashcard. In reading phase, the child was asked to read the written flashcard. And finally, for naming, the child named the relavant picture card. In each step, four words were considered. Each word was removed from the treatment procedure whenever the child named it correctly in 4/4 times and then another word was introduced to the participant. Each therapy session lasted 10 minutes by average. Picure naming of twenty target words was assessed at the beginning of each therapy session.

This interventional single-subject study was administered with multiple baselines. Maintenance of therapy results was checked at the end of the procedure. The first case entered the program after three baseline assessments, the second one entered after five baseline assessments and the third child came into the program after seven baseline assessments. Twenty treatment sessions were administered for each participant. The findings are depicted in graphs. The percentage of words which were named correctly are shown as datapoints in each graph. It should be noted that just datapoints of every other session are shown in the graphs. C-statistic was calculated for each case.

Results

The results of the baseline, training method and maintenance of three participants are illustrated in figure (1). Participant FG could name 0% of expressive vocabulary and after 2-months training, her expressive vocabulary showed a 90% growth. The naming ability of training words was 100% in the maintenance phase. Participant NM gained 0% for expressive vocabulary and by completion of the 2-months training period, expressive vocabulary growth was 95%. The naming ability of training

words was kept at 95% in the maintenance phase. Correct naming responses of ZA was 0% in her multiple baselines but by 2 months of receiving therapy, expressive vocabulary growth was as much as 85%. The naming ability of training words was maintained above 80% throughout the maintenance phase. The difference between baseline and intervention periods suggest that the teaching protocol had a considerable effect. The difference was statistically significant for all participants. Statistical method of C statistic, yielded $Z=2.46>1.64$ for F.G.; $Z=1.75>164$ for N.M.; and $Z=2.37>1.64$ for Z.A.
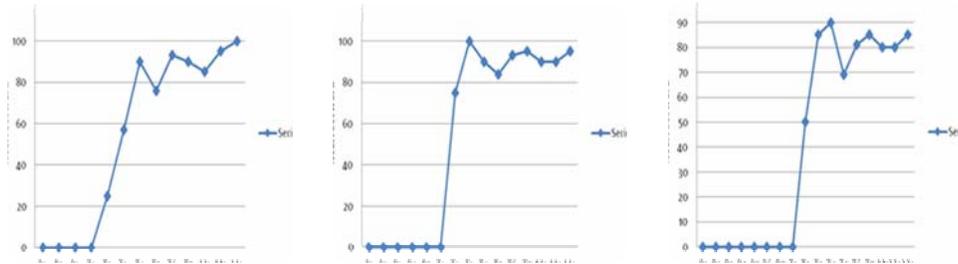

Fig 1. The changes of expressive vocabulary for FG (Left), NM (middle), ZA (Right)

Discussion

The Objectives of this research were designing a whole word reading protocol and examining the effects of this program on expressive vocabulary of Persian-speaking children with Down Syndrome. The protocol was based on the only available Persian pattern (10). As the results revealed, the use of the protocol increased oral naming ability of the words which children were able to perceive but were not able to express. This protocol was performed on 3 children with Down syndrome. The result showed that picture naming skill of children which may be considered an index of expressive vocabulary was improved significantly for all participants. The large gain in naming through training period and maintenance phase in comparison to the baseline, revealed that the whole word reading program had been effective. Current research has proved that the whole word reading is an effective approach to develop expressive language and syntax in children with Down syndrome (12). Recent studies have also demonstrated poor development of auditory memory and auditory short- term memory span relative to visual processing in these children (13). This may lead to infer that vocabulary and sentence processing, and learning grammar rules from auditory inputs to be particularly difficult for children with Down syndrome. Visual memory in children with Down syndrome has appeared be more effective than auditory memory for their language development (14). Whole word reading relies on visual processing and may be regarded as a facilitator of vocabulary and syntax development in children with Down syndrome (15). Our results suggested that learning to read had a significant impact on the development of expressive vocabulary in Persian-speaking children with Down syndrome participating in the present study. Designing the whole word reading protocol to improve syntax, performing whole word reading program on children with hearing impairment and children with autism may be the issues of the future research in Persian-speaking populations.

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