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Designing an Educational Application of Parental-Mediated Intervention and Its Effectiveness to Promote Reading Skills Among Slow-Paced Students with Down Syndrome

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Abstract

Objectives: This study aimed to design an educational application of parental-mediated intervention and its effectiveness to promote reading skills in students with Down syndrome.

Methods: This applied semi-experimental study is a pre-test- and post-test project, follow-up with the test and control groups which was conducted on twenty slow-paced students with Down syndrome in the range of 5 to 12 years old. Patients were randomly selected and classify into two groups; test and control. Wechsler IQ test, TOLD test and peabody picture vocabulary test (PPVT) were performed for students in the pre-test however; TOLD test was conducted as the post-test and a half month at 15-day after follow-up stage.

Results: results showed $\alpha > 0.001$ for reading skills between test and control groups; however the difference is remained sustainable in follow-up stage.

Conclusions: Education with new educational technologies that focused on software may be helpful for children with Down syndrome and should be seriously considered. Family- centered parental-mediated intervention in order to promote reading skills application can be used for teaching children, families and educators.

Keywords: Education, Children with Down syndrome, Reading Skills, Parental-Mediated Intervention

1. Background

Reading is encompassed a complex system of skills and knowledge that needs not only for intervention of various sensory, motor, visual and semantic components, but necessary for cognitive, visual, auditory prerequisites specifically linguistic and any cognitive dissociation which prevents in order to learn reading skills (1).

In the training field of slow-paced students with Down syndrome, existence of the software can be suitable for process of school education of the students, in order to cause more interest to perform their practice for issues in the direction of concept of numbers, counting, words (knowing them), reading the words and to be more willing i to perform school activities, because studies have been shown that perception and visual memory in children with Down syndrome is stronger than their auditory memory and processing.

In this approach, the main essence is involved families in decision-making, cooperation and bilateral relationship (family and therapist), mutual respect, acceptance of the families, support for families, sharing information among families, dedicated and flexible service delivery and the effort to empower families (2). The research questions were:

1) Does the educational application for family-centered reading designed is effective in distinguishing the words by slow-paced students with Down syndrome?

2) Does software is effective in the production of word by slow-paced word students with Down syndrome?

3) Does the software is effective in phonological analysis of slow-paced students with Down syndrome?

4) Does the software impact on reading skills of slow-paced students with Down syndrome and, have it been constant?

2. Methods

2.1. Study Design and Population

This was an applied semi-experimental study (pre-test, post-test, and follow-up) with the test and control groups which is conducted at the Roshan Mehr, and Sayad Shirazi schools of Tehran, Iran). Informed consent was obtained from all participants that included in this study. Accumulation of Samples was started from February 2015 to February 2016. The age range was 5 to 12 years.

In order to select the subjects, children with special needs were selected among two schools after announcing

a partnership. Among these schools, after specifying the slow-paced students with Down syndrome and matching, as well as analyses of intelligence for variables of IQ (from 50 to 75), and social class (inserted in the file of students) and talking with their families, 20 people were selected randomly which 10 people were as control group and 10 people were as test group. In each school, 5 students were assigned in test group and 5 people in control group that in total, the sample size was 20 samples (10 samples for girls and 10 for boys). The test group was participated in 30 sessions. Each session was held in one day and two time limits by family. Each period of time was 15 minutes till 30 minutes, according to the conditions and the manner of cooperation of the child. Thirty-first sessions was a post-test, and follow-up was performed during a month and a half later.

2.2. Ethical Approval

The Islamic AZAD University of Tehran ethics and scientific committees has been approved the study protocol (REC.1393.9454).

The inclusion criteria were as follows:

1) Slow-paced students with Down syndrome that is studying at the age of preschool and school.

2) Semantic understand of words (approximately 500 words) using the Peabody test.

3) The ability to select and sort using advanced technology of mobile phone and tablets.

4) IQ = 50 - 75 with Wechsler intelligence test by an exceptional Children Psychologist.

5) The absence of severe hearing and vision problems (which diagnosed by opticians and audiologists)

6) The family consent and its cooperation in research projects.

The exclusion criteria were as follows:

1) IQ < 50

2) Severe hearing and vision problems

3) Low family cooperation

4) Age less than 5 years old or more than 12 years old.

2.3. Research Tools

The Individual questionnaire including demographic data (name, age in terms of months, bilingualism, social, family, and education conditions, sex, etc.); it was used to obtain information about social, economic, and educational fields in order to match the samples in the test and control groups (3). In the present study for IQ and also in order to match slow-paced students the Wechsler intelligence scale for children - revised (WISC-R) was adopted and was standardized by Shahim for children. These tests were performed individually, in standard conditions, according to the instructions (4). A checklist was in six categories, including animals, fruit, furniture, body parts, clothing and jobs which was prepared and used. Both in the process of software designing and sample matching that condition for presence in the research understanding the meaning of 50 words, not its expression (5). We used the Test of language development (TOLD) for a two-dimensional pattern that in total has the nine subtests, which six subtests of them are related to the semantics and syntax; and three subtests are related to reading (6).

2.4. Statistical Analysis

The distinction of the word, phonological analysis, reading skill and production of word were compared in two arms of this study using an analysis of covariance, and α. α more than 0.001 was considered significant. The Bonferroni follow-up test was used in order to analyze the repeated measurements. The significant α was more than 0.001.

2.5. A Researcher-Made Educational Application for Reading

This software has been made by the researcher, with the aim of new training technology along with advances in the field of children's reading and language skills for children with Down syndrome. This software can be used for Android mobile phone systems and tablets. The software also has been created by utilizing technology, psychological affairs, and speech science, and it has been tried to consider many aspects by taking advantage of the most frequency routine words among children, as well as the Whole-word reading method along with an animation of everyday behaviors and familiar images in their life (real images of family members) and placement in the family. The children can take advantage of this software.

The software has two areas; education of words, which pursued the different and regular categories; and education of verbs, which included three categories: sense, past, and imperative verbs. On the other hand, it includes two-word and three-word phrases and pronouns. Furthermore, passing through the steps is subject to follow it and it has been designed in two models for word games.

2.6. The Structure of the Program Implemented

This program has been implemented in the two sections: the training and game that each will be described in detail.

In order to implement program, each of sections after breaking down into more minor parts, were given to companies of Gonbad Kabud (for graphical design) and Aria Gostar (computer programming).

2.7. Graphical Design

In all parts of the program, a required graphical component (on the basis of psychological projection given by the researcher) was conducted by aforementioned company. The graphical components implemented was included: the main character in the program (boy and girl with faces matched with Down syndrome sufferers), pictures and animations are related to the program concepts and graphical components used in the program that each of pictures and concepts has closest conditions with living of students.

At the first, after providing sample pictures of children with Down syndrome to graphic designers of the project, male and female characters were designed. After the initial implementation, and applying the necessary changes, final sample was prepared. After the initial implementation of the program by the graphic company, and after examination by the researcher and presenting to the pilot group, necessary changes in components and concepts contained in the program was performed in order to achieve the desired sample.

2.8. Computer Design

In order to conduct the computer program that can be used in the Android operating system, first, based on the studies and design provided by researcher the overall program logic was given to the Psychology department, and was implemented; then, after examination, the necessary changes were applied. After preparation of overall configuration of the program, all required details were anticipated.

After completion of the design on paper, and after presentation and discussion of the plan details, the computer implementation was performed by the ARIA Gostar Co. The implementation process of this program was planned in four phases: initial, middle, final, and support.

2.9. Examples of the Implemented Program Levels

2.9.1. Review and Practice

The first level includes a review and practice, writing shape of words was shown 5 times for the child and the word has been read with sound. At this level, there is no expectation for a response from child, and it is performed in order to introduce the written form of words.

2.9.2. Accordance

The second level was accordance, that means the written shape or image of the word is shown for the child and he or she must accord it with written and visual form. Accordance the word has two parts: 1) text accordance-word form; 2) word form-text.

2.9.3. Selection

In the level selection, word can be read and child must select written shape in accordance with the read word.

2.9.4. To read the Word Aloud

The words are that child reads them loudly in response to the relevant text shape, based on the word detection pattern and not read letter by letter.

2.9.5. Calling the Image

The words are that child activates the relevant visual representation in response to the relevant image and call the image name.

It should be noted the next steps in terms of sentence length (verbs, two- word, and three-word, etc.) were implemented animationally and used in training.

Below there is a picture of this area

3. Results

At first the descriptive statistics of the reading skills of children with Down syndrome were raised and then, based on tables of descriptive statistics and inferential statistics, research questions were answered. Children who participated in this research were 20 students that 10 people were assigned to the experimental group and 10 people in the control group.

Based on the descriptive results which obtained, from pre-test the mean test scores of samples in the both groups were almost close to together. While in the post-test stage and also follow-up stage, the scores of the subjects in the test group changed appreciably. According to the result of these tables this application can be useful for improvement of all skills of children with Down syndrome (Table 1 - 3).

4. Discussion

The results of the research questions showed that the designed educational application of family-centered reading was effective in order to increase of word distinction and the word production skills. This effect was sustainable word production, and in the word distinction it is also statistically sustainable. In phonological analysis, it was statistically neither effective nor sustainable. According to numerous studies about the difficulties in reading, especially the issue of phonological analysis and language skills of children with special needs, children with Down syndrome, the preparation and implementation of appropriate training programs and intervention, that fits the need of these people, is an undeniable necessity.

Table 1. Descriptive Properties of Variables of Reading Skill in the Test and Control Group

		Mean ± SD	Mean ± SD	Mean ± SD
Distinction	Test	2.3 ± 0.483	3 ± 0.471	2.7 ± 0.483
	Control	2.3 ±0.483	2.4 ± 0.516	2.4 ± 0.516
Phonological Analysis	Test	3.1 ± 0.567	1.4 ± 0.994	4.1 ± 1.2
	Control	3.4 ± 0.516	3.4 ± 0.516	3.4 ± 0.516
Word Production	Test	1.6 ± 0.966	4.10 ± 0.875	3.9 ± 0.738
	Control	1.3 ± 0.483	2.6 ± 0.699	2.5 ± 0.85

Table 2. Results of Covariance Analysis on the Effect of Educational Family-Based Reading Application Designed on Variables

Variable	SS	DF	MS	F	Significance Level
Distinct of the word	1.80	1	1.80	7.364	0.001
Phonological Analysis	2.45	1	2.45	3.9	0.001
Production of the Word	11.25	1	11.25	17.920	0.001
Reading Skills	12489.86	2	6344.93	209.146	0.001

Table 3. Results of Bonferroni Follow-Up Test Analyzing of Repeated Measurements in the Follow-Up Test

I	J	The Mean Difference (I - J) ± SD	Significance Level
Pre-test	Post-test	-40.80* ± 2.245	0.001
	Follow-up	-45.40* ± 2.849	0.001
Post-test	Pre-test	40.800* ± 2.245	0.001
	Follow-up	-4.60* ± 2.182	0.193
Follow-up	Pre-test	45.40* ± 2.849	0.001
	Post-test	4.60* ± 2.182	0.193

In this regard, the current research was conducted with the goal of designing the software application based on the needs of family-centered reading education of children is generally exceptional and in particular with regard to the needs of children with Down syndrome. The effectiveness of this software on increasing reading skills was confirmed. The Environment during this tutorial caused that the children show a positive reaction to the teaching process and leads to increase its durability, as well as, traditional obstacles that are causing failures in the reading process, are very weak and low-impact. Therefore, they are more confident in their abilities and believe it; as a result, it makes them happy.

One of the reasons for the effectiveness of this software may be found on the main basis for the program. The technologies with the using of graphic design, sound, and color and motion animation can capture children for hours. Providing programs tailored to exceptional children's special needs, especially children with Down syndrome leads to take the actions in order to achieve the goal of children's education, and as a result, it became clear that these technologies, in addition to the game, can be helped the breezy educational assistance which sometimes a child can use them independently and alone.

4.1. Conclusions

In summary it must be said that in discussion of educational rehabilitation rather than paying attention to learning quantify in children, learning quality and creating interest in the children must be paid attention. In this regard, with the growth of multiple technologies, the new educational affairs can be associated with a family-centered approach that emphasizes the importance of family and their role in children rehabilitation of the exceptional child and family to move forward with a positive feel. In general, it can be said that reading affects different areas of language in children with Down syndrome can be a special way to improve the structures of language skills, including the expressive language, understanding language and spoken language, and the other structure in children because reading is a visual language. In compare to other studies this new application showed to be useful in improvement of reading skills in children with down syndrome .This study was faced with limitations, including coordination and cooperation with schools of children with special needs, development of a sense of con-

fidence in research project in the family members in order to carry out regular training, coordination between all graphic, computer, programming designers and giving an awareness to engineers who did not have exact knowledge about this children.

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Footnote

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