Evaluate the effectiveness of the software a mobile application "Kalcal"on the learning for students with dyscalculia

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Abstract- **The aim of this article is to develop an application software for 7 to 12 years old children with dyscalculia. We called this application "Kalcal". Kalcal has been built with software engineering standards considering the latest psychological results in dyscalculia control and with the help of specialists in the field and they can use it. The research method was to give Kalcal to children with dyscalculia. Each child worked with Kalcal for sixty minutes (4 sessions one hour). The evaluation method was comparison of pre and post test. Which was available to children before the first sessions and after the last sessions. Statistical analysis was done on the earned data. population includes students between the ages of 7 to 12 years in the academic year 1397-1398 with dyscalculia. This study was small scale and included only the target group. The pre-test and post-test were designed based on WISCR test. Which is standard paper based test to evaluate dyscalculia in psychology. The target group worked Kalcal consist of different activities including the concepts of addition and subtraction, numbering ,larger and smaller, multiplication table, color recognition and orientation. Statistical analysis of comparison between pre and post test showed that children improved in many criteria ,especially IQ and percentage rank. So we can got the CONCLUSION that kalcal can helped children with dyscalculia to improved in many important criteria.**

Key Words- Educational Software, Dyscalculia, Children, Mobile Application.

I. Introduction

Learning Disability (LD) affects on how a person think speak, write, read and do mathematical calculations. LD causes problems in students social, emotional and educational contexts [1]. People with Dyscalculia have problem in mathematics. Dyscalculia is a disability in calculating, counting numbers, difficulty identifying mathematical operational signs such as addition and subtraction, multiplication and division and inability to memorize basic mathematical information such as multiplication tables. According to the international diagnostic Manual of the WHO (ICD-10) [2-3], a person is considered Dyscalculic (F81.2) when the computational power of a child is significantly below the level that can be expected based on their age, General Intelligence and schooling. Children with Dyscalculia exhibit difficulty in learning or comprehending basic arithmetic skills such as understanding number sequence understand how to manipulate numbers, and master arithmetic facts [4-5]. Dyscalculia is not

understanding mathematical concepts such as "greater than or smaller than", not understanding the concept of left and right , up and down, difficulty in aligning numbers example from small to large inability to copying the numbers is color indeterminacy symptoms of this disorder are characterized by age and development of disability [6]. Dyscalculia is a learning disorder that involves difficulty in learning of mathematical concepts. The term dyscalculia comes from Greek and Latin, which means "Counting badly". The prefix "dys" comes from Greek means "badly" "calculia" comes from the Latin "calculare", which means "to count" the word "calculare" comes from "calculus" (Bweyhunle 2016). Importantly, Dyscalculia is not a unitary concept, and the associated cognitive profiles might vary widely between and within individuals [4-5] .Current surveys show that about 3-7% of all children and young people are Dyscalculic [7-8]. Very often, Dyscalculia occurs in combination with Dyslexia or ADHD on [9]. There are various ways to control learning disabilities most important the use of multimedia technologies. On top of them is the use of multimedia technologies. Recently among problems in education and learning of students is their academic progress with learning disabilities. There have been educational reforms in the world regarding mathematics education [10]. New technologies should be individually tailored to each students needs and characteristics [11]. Direct training significantly increases math lesson scores and performance. Considering the differences between students with learning disabilities compare to regular students can be motivated and interested in teaching and learning.

II. LITERATURE REVIEW

According to Mazeyanti Mohd Ariffin., et al. (2017), Dyscalculia is one of the learning disability that directed to the number and math which can affect their math learning. Therefore, Dyscalculia children need an interesting and appropriate method in teaching math effectively, such as supportive learning tools. A lot of practice and repetition after teaching each subject to the students makes them more focused. A must have for the student disability to learn training and activities that are likely to succeed. In areas with a social level and higher economic parents provide more financial opportunities to their children and schools in these areas of education better and more experienced teachers and more learning opportunities to prevent students from learning disabilities. Areas with lower socioeconomic levels do not have the said facilities so learning disabilities are likely to develop [1].

III. INITIAL CALCULIC MODEL

Simultaneous math instruction with neurosciences in schools enhances students overall performance. New methods for training and control dyscalculia helps prevent dyscalculia. Dyscalculia has several types:

1)Perceptual skills: include recognizing and reading numerical symbols and grouping figures.

2)Language skills: include understanding and naming mathematical concepts and converting them into symbols.

3)Attention skills: such as copying figures correctly and remembering transferred figures [6].

4)Math skills: such as observing math steps, counting and learning multiplication tables.

Dyscalculia cause problem in students behavior such as low self-esteem and then lead to adulthood. These people also have the disability to calculate income and expenses and sometimes bankruptcy. They also have trouble choosing a job. Lack of learning math some children start at an early age but often show up in elementary school and up to middle school and high school [12]. It also goes on students should be better controlled before they reach puberty be. Solutions for controlling dyscalculia including appropriate mathematics instruction by parents and teachers, performing math games, using multimedia technologies, using visual techniques such as drawing a figure or diagram, encouraging students to read aloud, individual education program,[1] using RTI[2] in

[1] IEP

[2] RTI (Response To Intervention)

schools, using of education psychotherapy has been. Computer aided technologies can reduce educational failure and predictability provides and enhances the students disability to reason and solve homework. This reinforces the self-concept of students is. When the simultaneous information from the auditory and visual channel enters the students memory, the memory capacity increases. This information with the individual previous knowledge is combined and produces new information and stability in memory. Child-centered graphics with attractive graphics tailored to the child age and adding songs and lyrics learning becomes and learning increases. Solving multimedia math exercises increases your passion and interest the effort is on the students. This logic is rooted in cognitive learning theory it has multimedia. One of the limitations of this method is the lack of complete equipment and software facilities. At a study conducted by Abdollahi et al. in 2014 used pre test and post test in which the environment was used. Consider multimedia education as an independent variable and learning as a dependent variable. Research titled "video games for the math improvement of different students "by Kim and Chang in 2010 is. The results showed that students who speak English and use math games had a poorer performance in math compared to students who did not use the game [2]. A study entitled "Qualitative approaches to mathematics education" different challenges and solutions by Sharma conducted a study showing that students who are important in teaching and learning disabilities [10]. Also in 2015 a study entitled "Are virtual learning environments for are students with appropriate dyscalculia? "conducted by Laura lens et al. simulation reality is designed [13]. Others they believe that the prevalence of learning disorder in girls and boys is equal [15]. Some researchers believe that the prevalence of learning disorder is higher in boys than in girls [14].

The present study is an applied-practical one and has been done to investigate the effectiveness of statistical analysis mobile application by pre-test and post-test. The statistical population of this study was students of7-12 years (first to sixth grade) in the academic year1397-1398. In this study both girls and boys in the statistical population. This study was small scale and8 individuals were selected. The purpose of this study was to control the problems of students with dyscalculia with the help of mobile application. Pre-test and post-test were performed with the experimental group .Samples were selected from a private Isfahan learning disability center.

Research tools : The following tools were used for data collection:

A)Wechsler test

This test was developed by Wechsler in 1969. It has12 sub –tests including 2 tests of storage, 6 tests of verbal and 6 non-verbal tests. Some of his sub-tests are adapted from various parts of the revised Stanford Bient1937(comprehension, computation ,extracurricular digits, similarities and vocabulary). Other subtests of army group exams(image adjustment), cubes design, alpha army test (information, comprehension), beta test (symbols, figures, coding), Hayley picture completion test (picture completion), the Pinter-Paterson test(component interpolation) is taken[15]. This test is also used to compare peer children. Wechsler intelligence test is a measure of students mental and cognitive ability and intelligence. Success in the Wechsler test cannot guarantee the success or failure of students in their education and career. This test can identify clever students with metrics of working memory, speed of mental processing, verbal comprehension and reasoning. In addition to general intelligence, Wechsler test also recognizes linguistic and non-linguistic intelligence (practical intelligence). Wechsler test rating is estimated to be 70 years old. This test was used to detect dyscalculia in students. Pre-test and post-test the study was based on the Wechsler test.

B)Application software

Much research has been done on dyscalculia and tools have been introduced to control dyscalculia. Traditional and modern methods are used throughout the world to teach arithmetic and computational skills. One of the modern tools available to everyone through the advent of mobile and computer is educational-therapeutic software, but all software tools are in English language and are not accordance with Iranian culture. Elite in Iran has designed but is not implemented an education software called according for math learning in students with dyscalculia.

On the other hand considering the appeal and availability of mobile, the necessity of designing and producing a Persian device compatible with Iranian mobile culture was felt. The research method was designed and implemented by mobile application in accordance with the Wechsler test and the latest changes in students mathematics textbooks between 7 to 12 years in Persian. In this software the questions are randomized and designed to control the problems of students with dyscalculia. The students were then given a pre-test to determine the extent of their mathematical impairment and then they worked individually in 4 60-minutes sessions with a mobile application and then one month later they did post-test. How to use this software was explained to the students in the first session by the designer and programmer.[۲] Student entering the mobile application "Kalcal " faces a profile page where there are three fields name, degree and age of student that field and grade of knowledge tutorials must be filled in for questions to be presented to the student by age and grade .Next, click on the login button and enter the program menu. This page also contains the poll form and the about us page. The student can opt of the program by selecting the red cross button and the mobile back button. Figure1shows the entrance page for student profile.

Fig.1. student profile entry page

Program menus include color recognition, the concept of larger and smaller, orientation, numbering, subtraction and multiplication table. The multiplication table game is for the third grade of elementary school. figure 2 shows the menu of the program menus.

[۲]Programed and designed "kalcal" by engineer hanie dehghani.

Fig.2.Aplication menus page

figure 3 shows the page for Direction concept game page.

Fig.3.Direction concept game page

figure 4 shows game page bigger and smaller concept.

Fig.4.Direction concept game page

figure 5 shows guide game page bigger and smaller concept.

Fig.5.Direction concept game page

figure 6 shows the page for color recognition concept. On this page the student must color the cells at the bottom according to the number of shapes.

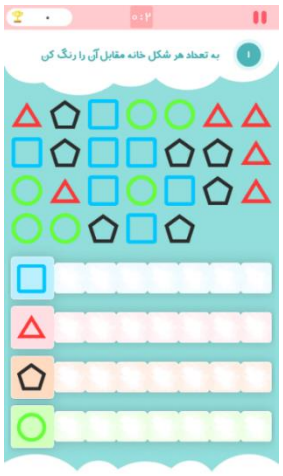

Fig.6. color recognition concept game page

figure 7 shows the page for addition and subtraction concept. In this game the student must calculate the sum and subtraction and write in the appropriate box.

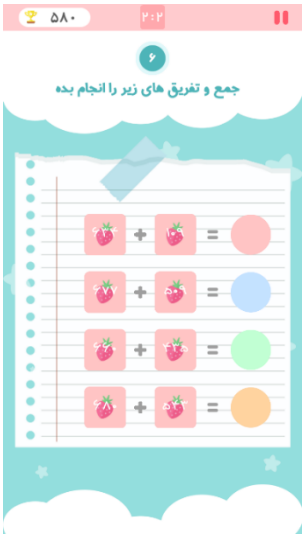

Fig.7. Addition and subtraction concept game page

IV. Methods

After completion of Kalcal now is time to evaluate the effectiveness of the software. 8 children aged 7 to 12 years old were applied to the study. For pre-test we applied WISCR test (standard psychology test). After conducting pre-test we gave Kalcal to the target group. they worked with Kalcal for sixty minutes (4 sessions one hour).We were in contact with each participant during the study. A room were dedicated to the study in the children adolescence clinic called "tootia" in Esfahan .Participants attended for working with Kalcal in clinic and a Supervisor which was a person defer from the designer of the software were Supervising them to make sure that study was conducting precisely. After finishing the 4 sessions the post-test were conducted. Gathering old these data we started to analysis data statistically.

Each game is designed implemented for a specific purpose. For example the purpose of game design in the concept of directions, control problem of not understanding directions (up, down, right or left) in students with dyscalculia. Become familiar with the concept of directions and control them by practicing and repeating their problem.

To analyze the statistical data of this study, Wechsler test criteria were used which were compared in pre-test and post-test and their progress was evaluated. The raw score is not considered in the Tukler test criteria. We grade the scores and rank them by age, and the score is considered in the Wechsler test and based on the score, the 13 year old student may be less intelligent than the 7 year old student.

Question 1:Is the mobile application of designed and implemented applicable to all Wechsler test criteria in knowledge in are students with math impairment affected?

Figure 8 shows the progression of the criteria in the post-test compared to the pre-test. These improvements are in percentage terms and is measured against the maximum criteria.

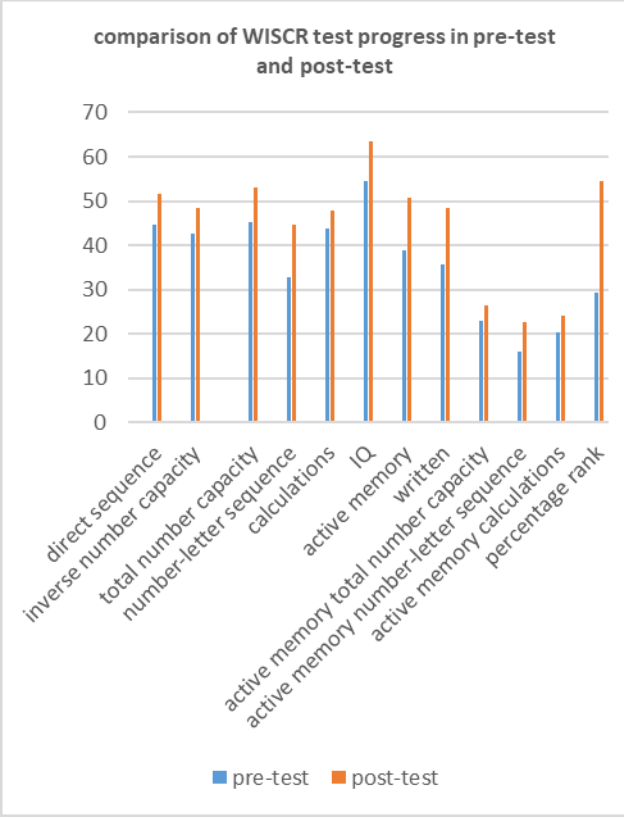

Fig.8. comparison of WISCR test progress in pre-test and post-test

Therefore, it can be concluded that the whole software, in all criteria of Wechsler test in students with dyscalculia it has a positive impact.

Question 2: Does the use of the current designed and implemented software program affect the Wechsler direct number capacity test in students with dyscalculia?

The part of the integer(direct sequence) capacity of the tester is that a number is told to the student that he or she has to put the number in his or her memory and repeat the same sequence. The mean of direct integer capacity was 8.5 in the pre-test and 9.8 in the post-test. This difference indicates the development of direct number capacity improvement was 6.84%.

Figure 7 shows the graph of the capacity enhancement of a straight number.

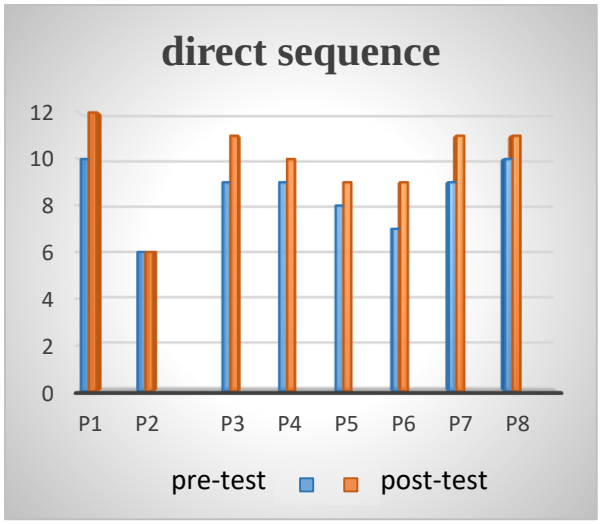

Fig.8. direct sequence

Therefore, it can be concluded that the present software program is based on the Wechsler direct number capacity test in students with dyscalculia has a positive effect.

V. CONCLUSION & FUTURE WORK

For this purpose we designed and implemented a software based on WISCR test (standard psychology test) called Kalcal. Children 7 to 12 years old with dyscalculia worked with Kalcal for sixty minutes (4 sessions one hour). Results of this research hypothesis showed that the application of a well-designed and implemented mobile application(Kalcal)in students with dyscalculia has been significantly influenced by the improvement in the Wechsler test criteria and their problem control. One of the limitations of the present study is the difficulty of finding a statistical population with respect to time constraint. The main reason was refused of families to let their children to participant in this study. The result of this study was similar to the result of studies Beigian (1394) and Yavari et al (1385) earned similar . At the end the concepts are suggested add more software to control these students problems

and this research with a larger statistical population in two control and experimental team taking more time between pre-test and pose-test and other versions of software in environments other implementations including windows, IOS and web. Also this software and research for students under 7 years and above 12 years done. Especially designing software in different environments for students with dyscalculia to researchers recommended.

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