

# Meta-analysis of the efficacy of psychological and educational interventions to improve academic performance of students with learning disabilities in Iran

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## ABSTRACT

**Introduction:** with due attention to the importance of learning disabilities and necessity of presenting interventions for improvement of these disorders in order to prevent future problems, this study used meta-analysis of the research model on the impact of psychological and educational interventions to improve academic performance of students with learning disabilities. **Methods:** with the use of meta-analysis method by integrating the results of various researches, this study specifies the effect of psychological and educational interventions. In this order, 57 studies, which their methodology was accepted, were selected and meta-analysis was performed on them. The research instrument was a meta-analysis checklist. **Results:** The effect size for the effectiveness of psychological-educational interventions on improving the academic performance of students with mathematics disorder (0.57), impaired writing (0.50) and dyslexia (0.55) were reported. **Conclusions:** The result of meta-analysis showed that according to Cohen's table, the effect size is above average, and it can be said that educational and psychological interventions improve the academic performance of students with learning disabilities.

**Key words:** Educational interventions, learning disabilities, meta-analysis, psychological interventions

## INTRODUCTION

Perhaps among the realm of children with special needs, learning disabilities field is more controversial, and many multidisciplinary research has been done on this subject. According to definition of fourth statistical - diagnostic guideline of mental disorders, learning disorders are diagnosed

when the individual's achievement on standardized tests for reading, mathematics and written expression is lower than the expected sensory, intelligence, and academic level. Learning problems significantly interferes the academic achievement or in daily activities that involve reading, writing, and mathematics skills.<sup>[1]</sup>

In other words, learning disorders involves disability in reading, writing and math, despite normal intelligent quotient and it should be separated from the normal differences of cultural development and educational problems due to lack of opportunity, poor teaching, cultural factors, and visual and hearing problems.<sup>[2]</sup> Learning disorders can be divided into developmental and educational categories. Estimating the prevalence of learning disabilities is not the same; a range from 1% to 30% has been reported in different studies. The prevalence of this disorder with due attention to criteria used in all communities are different. The results of the study carried out by Narimani and Rajabi,<sup>[3]</sup> shows that between 7% and 15% of children have learning disabilities. Of gender

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differences, in reports from schools and clinics, there is a prevalence of 4–1 between boys and girls.<sup>[4]</sup>

These disorders may have a neurological origin and transformative processes that have started from preschool and continues until adulthood.<sup>[5]</sup> Because many students with learning problems, experience other emotional - behavioral problems such as anxiety, depression, low self-esteem and, it seems that with reducing learning difficulties in children, also to be somewhat improve their emotional- behavioral problems and the pave the way for their successful further study. Thus, in recent years experts in psychology and education have been developed or proposed various restorative and compensatory methods to improve these disorders.

Among the researches that has been done in this field in Iran, 22<sup>[6-27]</sup> researches in the field of in mathematics disorders, 24<sup>[27-50]</sup> researches in the field of dyslexia and 11<sup>[50-60]</sup> researches in the field of writing disorder are note able.

Some of the studies reported a high impact for psychological and educational interventions on academic performance improvement of students with learning difficulties and some others reported it less than the average according to the Kuhn's table.

Due to the discrepancy in the results of the researches into the effectiveness of different psychological and educational interventions on improving the academic performance of students with learning disabilities, it seems that doing a meta-analysis will help to determine the true value of psychological and educational interventions for this disorder and effectiveness of these interventions will be identified. In other words, a meta-analysis can be made to get a more general view of medical models (psychological and educational interventions) in the country. In fact, this research by using meta-analysis seeks to answer this question that how's the effectiveness of psychological and educational Interventions on improvement of academic performance of students with learning disabilities in Iran.

## MATERIALS AND METHODS

In this study, meta-analysis techniques are used. In meta-analysis, fundamental principle is calculating the effect size for individual studies and returning them to a common scale (general) and then combining them to obtain the mean effect.<sup>[61]</sup> This meta-analysis aims to get to an overall conclusion regarding the efficacy of psychological and educational therapy on improving the academic performance of students who have learning disabilities (math, writing and dyslexia) with surveying the results of different studies. "Statistical population" of this study was the MA and PhD theses, scientific research journals in the field of Psychology and Educational Sciences, Information Bank of University, and Documentation Center of Iran. To search the Iranian studies, Persian resources and published studies in scientific journals were used, which during the past 9 years (2012–2005) have been done in the field of

psychological and educational interventions on LD signs, and while having a reasonable sample size, in terms of validity and reliability of measurement instruments and sampling have the necessary conditions. In this meta-analysis, all studies that would obtain the requirements of the methodology have been applied; it means that about 57 research projects, theses, and articles that had entrance criteria, have been used in these studies. Entrance criteria into the study were: (1) The subject of the study is psychological and educational interventions of learning disabilities. (2) This study was performed in group format not case study and single-subject research (3) researches is to be experimental and semi-experimental (4) precise scales and reliable measures that have adequate reliability and validity have been used.

And "exit criteria" were studies that: (1) The subject matter is everything but psychological and educational interventions. (2) The researches which reported only the prevalence in various working groups. (3) The researches have been conducted in case studies, review articles, and cross correlation and descriptive form. Research tools; content analysis checklist (in terms of methodology): This check list was used for choosing the thesis, research proposals and research papers with entrance criteria and for and extracting the necessary information to perform meta-analysis of their content and the checklist includes the following components: Research title, full profile of executives, year and place of execution, research theories, tools, valid and reliable data collection instruments, statistical population, sample size, and significance level of exams. Effect size estimation methods: Meta-analysis with mean, variance, and standard deviation for each group is able to calculate effect sizes, but the most common indexes are  $r$  and  $d$  that  $d$  for group differences and  $r$  for correlation studies<sup>[61,62]</sup> are used. To obtain a measure of the effect size of no software was used and the calculations were done manually. Data extracted by two people and the third was used to resolve the inconsistency. The steps of this meta-analysis were performed based on meta-analysis of Hovit *et al.*<sup>[63]</sup> as follow:

(1) Definition of research variables. (2) Searching databases. (3) Surveying the researches. (4) Calculating the effect sizes for each study. (5) Combining the effect size of studies. (6) Signifying the combined studies. (7) Comparing the effect sizes of studies with different characteristics [Table 1]. Effect size is calculated by the formula given below:

The formula 1: Calculating the effect sizes for each study  $r = \frac{Z}{\sqrt{n}}$ .

The formula 2: Combining the effect size of studies  $R = \frac{\sum Z_r}{N}$ .

The formula 3: Signifying the combined studies  $Z = \frac{\sum Z}{\sqrt{n}}$ .

## RESULT

According to the research list and refer to them, and considering the entrance and exit criteria, 57 studies were

approved by the detailed list of them, along with descriptive information as shown in Table 2 and 3. According to the studies, each of the treatment patterns is considered as the independent variable and the separate concept is the dependent variable. In order to determine the parameters used in each of the studies, Table 4 determines these variables. Table 1 shows the mean effect size of studies.

| Table 1: Results of meta-analysis the efficacy of psychological and educational interventions to improve academic performance of students with learning disabilities |              |     |        |        |       |         |
|--|--------------|-----|--------|--------|-------|---------|
| Research   | Disorder     | N   | P      | P to Z | r     | r to Zr |
| 1  | Mathematical | 100 | 0.001  | 3.09   | 0.309 | 0.310   |
| 2  |              | 20  | 0.01   | 2.326  | 0.52  | 0.576   |
| 3  |              | 20  | 0.0001 | 3.719  | 0.831 | 1.191   |
| 4  |              | 20  | 0.05   | 1.645  | 0.368 | 0.377   |
| 5  |              | 12  | 0.001  | 3.09   | 0.893 | 1.437   |
| 6  |              | 40  | 0.001  | 3.09   | 0.448 | 0.523   |
| 7  |              | 30  | 0.001  | 3.09   | 0.564 | 0.633   |
| 8  |              | 58  | 0.01   | 2.326  | 0.305 | 0.31    |
| 9  |              | 30  | 0.001  | 3.09   | 0.564 | 0.633   |
| 10   |              | 90  | 0.01   | 2.326  | 0.245 | 0.245   |
| 11   |              | 30  | 0.001  | 3.09   | 0.564 | 0.633   |
| 12   |              | 30  | 0.01   | 2.326  | 0.425 | 0.448   |
| 13   |              | 45  | 0.001  | 3.09   | 0.461 | 0.497   |
| 14   |              | 20  | 0.05   | 1.645  | 0.368 | 0.377   |
| 15   |              | 16  | 0.0001 | 3.719  | 0.929 | 1.651   |
| 16   |              | 30  | 0.001  | 3.09   | 0.564 | 0.633   |
| 17   |              | 30  | 0.0001 | 3.719  | 0.679 | 0.811   |
| 18   |              | 30  | 0.04   | 1.751  | 0.32  | 0.332   |
| 19   |              | 30  | 0.001  | 3.09   | 0.564 | 0.633   |
| 20   |              | 42  | 0.001  | 3.09   | 0.476 | 0.51    |
| 21   |              | 20  | 0.0001 | 3.719  | 0.831 | 1.191   |
| 22   |              | 30  | 0.02   | 2.054  | 0.375 | 0.388   |
| 0.57   |              |     |        |        |       |         |
| Mean of Zr   |              |     |        |        |       |         |
| 23   | Reading      | 30  | 0.0001 | 3.719  | 0.679 | 0.811   |
| 24   |              | 60  | 0.001  | 3.09   | 0.399 | 0.412   |
| 25   |              | 60  | 0.01   | 2.326  | 0.3   | 0.310   |
| 26   |              | 30  | 0.0001 | 3.719  | 0.679 | 0.811   |
| 27   |              | 20  | 0.001  | 3.09   | 0.691 | 0.848   |
| 28   |              | 48  | 0.001  | 3.09   | 0.446 | 0.472   |
| 29   |              | 40  | 0.0001 | 3.719  | 0.588 | 0.633   |
| 30   |              | 30  | 0.001  | 3.09   | 0.564 | 0.633   |
| 31   |              | 30  | 0.001  | 3.09   | 0.564 | 0.633   |
| 32   |              | 32  | 0.001  | 3.09   | 0.546 | 0.604   |
| 33   |              | 20  | 0.0001 | 3.719  | 0.831 | 1.191   |
| 34   |              | 28  | 0.001  | 3.09   | 0.584 | 0.663   |
| 35   |              | 45  | 0.001  | 3.09   | 0.461 | 0.497   |
| 36   |              | 30  | 0.05   | 1.645  | 0.3   | 0.310   |
| 37   |              | 40  | 0.05   | 1.645  | 0.26  | 0.266   |
| 38   |              | 30  | 0.0001 | 3.719  | 0.679 | 0.811   |
| 39   |              | 45  | 0.01   | 2.326  | 0.374 | 0.383   |
| 40   |              | 30  | 0.01   | 2.326  | 0.425 | 0.448   |
| 41   |              | 30  | 0.01   | 2.326  | 0.425 | 0.448   |
| 42   |              | 31  | 0.001  | 3.09   | 0.555 | 0.618   |

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The effect size for the effectiveness of psychological-educational interventions on improving the academic performance of students with mathematics disorder (0.57), impaired writing (0.50) and dyslexia (0.55) were reported. The result of meta-analysis showed that according to Cohen's table, the effect size is above average.

### CONCLUSION

Meta-analysis with integrating the results of various studies that have been conducted on several samples gives a more comprehensive view of the effect of different variables. In other words, meta-analysis technique allows the researcher to conduct research with a way to reach a better understanding of the phenomena; because the conclusion is obtained by combining the studies.<sup>[64]</sup> The findings of this meta-analysis also showed that psychological and educational interventions improve academic performance of students with math learning disability (0.57). This meta-analysis confirmed the findings of previous research who reported a large effect sizes.<sup>[6,9,10,13,15-18,23-25]</sup> Of the 22 studies reviewed in the areas of math problems, most of the effect sizes (0.929) were concerned to the research of Amani *et al.*,<sup>[25]</sup> that used neuropsychological methods, and teaching the content in math problems. These findings are match with the study of Abedi<sup>[18]</sup> who showed that neuropsychological interventions can improve the academic performance of students with learning disabilities in math. This results show the importance of working with neuropsychological tasks in reinforcing the memory and attention in among people with math disabilities. Correction strategies, aimed to mend neuropsychological deficits, help children to overcome the mathematical problems based on acquisition of skills that are associated with these defects practice of content-based correction strategies, enables the child to learn math; for example using multiplication table

| Table 1: Contd... |          |    |        |        |       |         |
|-------------------|----------|----|--------|--------|-------|---------|
| Research          | Disorder | N  | P      | P to Z | r     | r to Zr |
| 43                |          | 30 | 0.001  | 3.09   | 0.564 | 0.633   |
| 44                |          | 50 | 0.0001 | 3.719  | 0.526 | 0.576   |
| 45                |          | 60 | 0.05   | 1.645  | 0.212 | 0.213   |
| 46                |          | 16 | 0.0001 | 3.719  | 0.929 | 1.651   |
| 0.50              |          |    |        |        |       |         |
| Mean of Zr        |          |    |        |        |       |         |
| 47                | Writing  | 20 | 0.001  | 3.09   | 0.691 | 0.848   |
| 48                |          | 84 | 0.001  | 3.09   | 0.337 | 0.343   |
| 49                |          | 30 | 0.001  | 3.09   | 0.564 | 0.633   |
| 50                |          | 30 | 0.0001 | 3.719  | 0.679 | 0.811   |
| 51                |          | 30 | 0.01   | 2.326  | 0.425 | 0.448   |
| 52                |          | 40 | 0.008  | 3.09   | 0.488 | 0.523   |
| 53                |          | 20 | 0.001  | 3.09   | 0.691 | 0.848   |
| 54                |          | 24 | 0.5    | 0      | 0     | 0.1     |
| 55                |          | 60 | 0.01   | 2.326  | 0.3   | 0.310   |
| 56                |          | 15 | 0.03   | 1.881  | 0.486 | 0.523   |
| 57                |          | 50 | 0.0001 | 3.719  | 0.526 | 0.576   |
| 0.55              |          |    |        |        |       |         |
| Mean of Zr        |          |    |        |        |       |         |

**Table 2: The data of various studies about the efficacy of psychological and educational interventions to improve academic performance of students with learning disabilities**

| Research | Disorder      | Intervention              | Age of subject        | Length of treatment   | Follow up    | Gender       |
|----------|---------------|---------------------------|-----------------------|-----------------------|--------------|--------------|
| 1        | Mathematical  | Psychological-educational | 8-10                  | 12 sessions, 45 min   | No           | Girl and boy |
| 2        |               | Psychological-educational | 8-10                  | 10 sessions, 90 min   | No           | Girl         |
| 3        |               | Psychological-educational | 9-11                  | 10 sessions, 45 min   | No           | Boy          |
| 4        |               | Educational               | 8-11                  | 8 sessions, 60 min    | No           | Girl and boy |
| 5        |               | Educational               | 8-10                  | 54 sessions, 45 min   | No           | Girl and boy |
| 6        |               | Psychological-educational | 9-11                  | 54 sessions, 60 min   | No           | Girl         |
| 7        |               | Psychological             | 9-11                  | 15 sessions, 60 min   | No           | Boy          |
| 8        |               | Educational               | 8-11                  | 48 sessions, 45 min   | No           | Boy          |
| 9        |               | Educational               | 8-11                  | 24 sessions, 45 min   | No           | Boy          |
| 10       |               | Psychological-educational | 9-11                  | 24 sessions, 90 min   | Yes          | Girl and boy |
| 11       |               | Psychological             | 8-10                  | 14 sessions, 60 min   | No           | Girl and boy |
| 12       |               | Psychological             | 8-11                  | 18 sessions, 90 min   | No           | Girl         |
| 13       |               | Educational               | 8-11                  | 24 sessions, 75 min   | No           | Girl and boy |
| 14       |               | Psychological             | 8-11                  | 8 sessions, 60 min    | No           | Girl and boy |
| 15       |               | Psychological-educational | 8-11                  | 25 sessions, 45 min   | No           | Girl and boy |
| 16       |               | Psychological             | 9-11                  | 24 sessions, 60 min   | No           | Girl and boy |
| 17       |               | Psychological             | 9-11                  | 10 sessions, 60 min   | No           | Girl         |
| 18       |               | Educational               | 9-11                  | 10 sessions, 60 min   | No           | Girl and boy |
| 19       |               | Psychological             | 8-11                  | 10 sessions, 60 min   | Yes          | Girl         |
| 20       |               | Psychological-educational | 8-10                  | 8 sessions, 60 min    | Yes          | Girl and boy |
| 21       |               | Psychological-educational | 8-11                  | 10 sessions of 60 min | Yes          | Boy          |
| 22       | Reading       | Educational               | 8-10                  | 24 sessions of 60 min | No           | Boy          |
| 23       |               | Psychological             | 10-11                 | 8 sessions of 60 min  | No           | Boy          |
| 24       |               | Educational               | 9-12                  | 10 sessions of 90 min | No           | Boy          |
| 25       |               | Educational               | 7-11                  | -                     | No           | Boy and girl |
| 26       |               | Psychological-educational | 9-11                  | 24 sessions of 45 min | No           | Boy and girl |
| 27       |               | Educational               | 8-10                  | 15 sessions of 60 min | Yes          | Boy and girl |
| 28       |               | Educational               | 8-9                   | 6 sessions of 90 min  | Yes          | Girl         |
| 29       |               | Educational               | 8-10                  | 20 sessions of 60 min | Yes          | Boy and girl |
| 30       |               | Psychological             | 7-10                  | 10 sessions of 90 min | Yes          | Girl         |
| 31       |               | Psychological             | 8-11                  | 15 sessions of 45 min | Yes          | Boy and girl |
| 32       |               | Psychological             | 8-10                  | 12 sessions of 60 min | Yes          | Boy and girl |
| 33       |               | Psychological             | 9-10                  | 8 sessions of 60 min  | Yes          | Girl         |
| 34       |               | Psychological             | 8-10                  | 20 sessions of 45 min | Yes          | Boy and girl |
| 35       |               | Psychological             | 8-10                  | 15 sessions of 45 min | Yes          | Boy and girl |
| 36       |               | Psychological             | 8-10                  | 8 sessions of 60 min  | No           | Boy and girl |
| 37       |               | Educational               | 6-9                   | 4 sessions of 60 min  | No           | Boy and girl |
| 38       |               | Psychological             | 8-10                  | 10 sessions of 90 min | No           | Boy and girl |
| 39       |               | Psychological             | 9-11                  | 10 sessions of 60 min | No           | Boy and girl |
| 40       |               | Educational               | 7-9                   | 13 sessions of 45 min | No           | Boy and girl |
| 41       |               | Psychological             | 8-10                  | 10 sessions, 90 min   | No           | Girl and boy |
| 42       |               | Psychological             | 7-11                  | 20 sessions, 35 min   | Yes          | Boy          |
| 43       |               | Psychological-educational | 7-9                   | 24 sessions, 45 min   | Yes          | Boy          |
| 44       | Educational   | 8-10                      | 15 sessions, 45 min   | No                    | Girl and boy |              |
| 45       | Psychological | 8-10                      | 10 sessions, 45 min   | No                    | Boy          |              |
| 46       | Writing       | Psychological             | 8-10                  | 8 sessions, 60 min    | Yes          | Girl         |
| 47       |               | Psychological             | 9-11                  | 10 sessions, 60 min   | Yes          | Girl and boy |
| 48       |               | Psychological             | 8-9                   | 16 sessions, 45 min   | No           | Girl and boy |
| 49       |               | Psychological-educational | 9-10                  | 15 sessions, 45 min   | Yes          | Girl and boy |
| 50       |               | Educational               | 9-10                  | 10 sessions of 75 min | No           | Boy and girl |
| 51       |               | Psychological-educational | 9-10                  | 15 sessions of 30 min | No           | Boy and girl |
| 52       |               | Psychological-educational | 9-11                  | 10 sessions of 30 min | Yes          | Boy and girl |
| 53       |               | Psychological-educational | 8-10                  | 8 sessions of 45 min  | Yes          | Boy and girl |
| 54       | Educational   | 8-9                       | 20 sessions of 45 min | Yes                   | Boy and girl |              |

*Contd..*

**Table 2: Contd..**

| Research | Disorder | Intervention              | Age of subject | Length of treatment   | Follow up | Gender       |
|----------|----------|---------------------------|----------------|-----------------------|-----------|--------------|
| 55       |          | Psychological             | 7-10           | 15 sessions of 60 min | Yes       | Boy and girl |
| 56       |          | Psychological-educational | 9-10           | 8 sessions of 60 min  | Yes       | Boy and girl |
| 57       |          | Educational               | 8-11           | 4 sessions of 60 min  | No        | Boy and girl |

**Table 3: Specifications of the research have been studied in meta-analysis**

| Disorder     | Title   | Researcher                     | References   | Sample   | Treatment  | Instrument   | Statistic |
|--------------|---|--------------------------------|--|--|--|--|-----------|
| Mathematical | Investigate the mathematic disorder in the male and female students in Tehran and effectiveness of functional training, economy token and muscle relaxation to reduce their mathematical disorder | Hamid (2006)                   | Article (Journal of Education and Psychology, Shahid Chamran University) | 100<br>Experiment: 50<br>Control: 50                   | Functional training, economy token and muscle relaxation | Mathematics function test, Raven intelligence test   | F         |
|              | Compare the effectiveness of two methods of training both brain hemispheres and music education in improve the performance of girl student with dyscalculia                                       | Estaki <i>et al.</i> (2007)    | Article (Research on Exceptional Children)                               | 20<br>Experiment 1: 7<br>Experiment 2: 7<br>Control: 6 | Training both brain hemispheres and music education      | EEG, key math, WISC-IV   | F         |
|              | Effect of self-monitoring training of attention on math problem solving performance of male students in fourth primary school with math disability  | Golparvar <i>et al.</i> (2010) | Article (Journal of Applied Psychology)                                  | 20<br>Experiment: 10<br>Control: 10                    | Self-monitoring training of attention                    | The Iran key math diagnostic arithmetic  | F         |
|              | The utility of a computer-assisted instructional software (Hesabyar) for teaching mathematics to students with dyscalculia  | Yavari <i>et al.</i> (2006)    | Article (Research on Exceptional Children)                               | 20<br>Experiment: 10<br>Control: 10                    | Computer-assisted instructional software (Hesabyar)      | The Iran key math diagnostic arithmetic, computer-assisted instructional software (Hesabyar) | F         |
|              | Compared the effectiveness of teaching math methods to elementary school students with learning disabilities  | Oraizi and Abedi (2004)        | Article (Journal of Educational Innovations)                             | 12<br>Experiment: 9<br>Control: 3                      | Task training process training task. Process training    | Raven intelligence test, Bndrgshtalt test, Andre Ray test                                    | F         |
|              | Effectiveness executive functions education on improving the academic performance of students with learning disabilities in mathematics   | Khodami <i>et al.</i> (2010)   | Article (Journal of New findings in the Psychology)                      | 40<br>Experiment (3 groups): 30<br>Control: 10         | Executive functions education                            | NEPSY, WISC-IV, The Iran key math diagnostic arithmetic                                      | F         |

Contd..

**Table 3: Contd...**

| Disorder     | Title  | Researcher                        | References  | Sample                              | Treatment                                   | Instrument  | Statistic |
|--------------|--|-----------------------------------|---|-------------------------------------|---|---|-----------|
| Mathematical | Effectiveness of working memory training on the performance of children with mathematical learning disability                            | Abedi and Aghababai (2010)        | Article (Journal of Clinical Psychology)  | 30<br>Experiment: 15<br>Control: 15 | Working memory training                     | WISC-IV, mathematics function test  | F         |
|              | Effects of training rhythmic movements of the exercise on number memory function of students with learning disorders                     | Chamanabad <i>et al.</i> (2008)   | Article (Journal of Educational and Psychology Studies, Ferdowsi University of Mashhad) | 58<br>Experiment: 29<br>Control: 29 | Training rhythmic movements of the exercise | Numerical memory scale of WISC-IV   | -         |
|              | Effects of painting and pottery skills training to improve visual perception-spatial and visual memory in students with account problems | Moghadam <i>et al.</i> (2011)     | Article (Neurological Rehabilitation of Children)                                       | 30<br>Experiment: 20<br>Control: 10 | Painting and pottery skills training        | Mathematics function test, developmental test of visual perception Frastyg, The Iran key math diagnostic arithmetic | F         |
|              | Training of executive functions in mathematics and reading performance of elementary school students with specific learning disability   | Mir Mahdi <i>et al.</i> (2009)    | Article (Research on Exceptional Children)  | 90<br>Experiment: 45<br>Control: 45 | Training of executive functions             | Cooldige, key math, cornoldy  | F         |
|              | Effects of metacognition training on the improvement of mathematical function in children with mathematic learning disability            | Yarmohamadian and Asliazad (2012) | Article (Advances in Cognitive Science)   | 30<br>Experiment: 15<br>Control: 15 | Metacognition training                      | WISC-IV, the mathematic disability diagnosis test and mathematics function test                                     | F         |
|              | The effect of working memory and metacognition training on academic function of female students with mathematics learning disabilities   | Khodami <i>et al.</i> (2011)      | Article (Knowledge and Research in Applied Psychology)                                  | 30<br>Experiment: 20<br>Control: 10 | Working memory and metacognition training   | WISC-IV, the mathematic disability diagnosis test and mathematics function test                                     | F         |
| Mathematical | Evaluation of Effectiveness of task-process approach to the treatment of learning disabilities mathematics                               | Mohamadi <i>et al.</i> (2008)     | Article (Journal-University of Tabriz)  | 45<br>Experiment: 30<br>Control: 15 | Task-process approach                       | WISC-IV, the mathematic disability diagnosis test and mathematics function test                                     | F         |

*Contd..*

**Table 3: Contd...**

| Disorder     | Title   | Researcher                         | References   | Sample                              | Treatment                                     | Instrument  | Statistic |
|--------------|---|------------------------------------|--|-------------------------------------|---|---|-----------|
|              | Effectiveness of Panoura and Philipou metacognition training on Improve the problem solving performance and metacognitive skills of students with specific deficits In mathematical | Abedi <i>et al.</i> (2012)         | Article (Journal of Psychology of Exceptional Individuals)                                     | 20<br>Experiment: 10<br>Control: 10 | Panoura and Philipou metacognition training   | Panoura and Philipou metacognition test, mathematics function test, Raven intelligence test           | F         |
|              | An examination of the effectiveness of neuropsychological and content-based training methods in the remediation of mathematics disorder   | Amani <i>et al.</i> (2012)         | Article (Journal of Learning Disabilities)   | 16<br>Experiment: 8<br>Control: 8   | Neuropsychological and content-based training | Raven intelligence test, clinical interview, neuropsychology tools                                    | F         |
|              | Investigation of effectiveness of neuropsychological Interventions for improving academic performance of children with mathematics learning disability                              | Abedi (2010)                       | Article (Advances in Cognitive Science)  | 30<br>Experiment: 15<br>Control: 15 | Neuropsychological Interventions              | NEPSY, WISC-IV, The Iran key math diagnostic arithmetic   | F         |
|              | The effect of stress inoculation training on anxiety and math performance of female students with mathematical disability   | Ghaziasgar <i>et al.</i> (2010)    | Article (Research on Exceptional Children)   | 30<br>Experiment: 15<br>Control: 15 | Stress inoculation training                   | The Iran key math diagnostic arithmetic, Cattell intelligence test, math anxiety test                 | F         |
|              | Efficacy of fine motor skills education on learning mathematical concepts In children with mathematical disorder in third grade to fifth in Meybod                                  | Kargar Shurki <i>et al.</i> (2010) | Article (Journal of Leadership and Management Educational, Islamic Azad University of Garmsar) | 30<br>Experiment: 15<br>Control: 15 | Fine motor skills education                   | WISC-IV, The Iran key math diagnostic arithmetic  | F         |
| Mathematical | Effectiveness of cognitive-behavioral treatment on mathematical problem solving fifth grade female students in Yazd   | Reisi (2007)                       | University of Esfahan  | 30<br>Experiment: 15<br>Control: 15 | Cognitive-behavioral treatment                | The Iran key math diagnostic arithmetic, cattell intelligence test, mathematical problem solving test | F         |

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**Table 3: Contd...**

| Disorder | Title   | Researcher                         | References                                      | Sample                                | Treatment  | Instrument  | Statistic |
|----------|---|------------------------------------|---|---------------------------------------|--|---|-----------|
| Reading  | Effectiveness teaching mathematics based on Gardner's multiple intelligences on student academic performance in third grade daughter with math disabilities in Isfahan  | Rezaei (2009)                      | University of Esfahan                           | 42<br>Experiment: 32<br>Control: 10   | Teaching mathematics based on Gardner's multiple intelligences                 | Cattell intelligence test, multiple intelligences scale, The Iran key math diagnostic arithmetic    | F         |
|          | The effectiveness of sensory, motor and educational combined intervention on the degree of gifted male students' mathematical learning disorder in the fourth grade of elementary schools in the city of Yazd | Tafti (2010)                       | University of Isfahan                           | 20<br>Experimental: 10<br>Control: 10 | Sensory, motor and educational combined intervention                           | Key math mathematics test, WISC, teacher-made math test   | F         |
|          | The effectiveness of visual arts education on visual perception skills of students with dyscalculia   | Moghadam <i>et al.</i> (2011)      | Journal of Children Neurological Rehabilitation | 30<br>Experimental:20<br>Control:10   | Visual arts education  | Key math mathematics test, Frastyg test   | T         |
|          | Impact of the teaching active thinking-oriented strategies and self-monitoring on reading comprehension of students with the reading difficulties   | Ghobari-Bonab <i>et al.</i> (2012) | Journal of Learning Disabilities                | 20<br>Experimental:15<br>Control:15   | Teaching active metacognitive thinking-oriented strategies and self-monitoring | Rayven test, dyslexia test, researcher-made test comprehension                                      | F         |
|          | The effectiveness of cognition-promoting software on executive functions, response inhibition and working memory of children with dyslexia and attention deficit hyperactivity                                | Givi <i>et al.</i> (2012)          | Journal of Learning Disabilities                | 60<br>Experimental:30<br>Control:30   | Cognition-promoting software   | Raven test, questionnaires Kvrnz, test of reading disorders, cognitive advance of computer software | F         |
|          | Effectiveness of teaching methods-correction based on phonological processing model on speed and accuracy of reading elementary school students with dyslexia   | Fard and Manie (2010)              | Research on Exceptional Children                | 60<br>Experimental: 30<br>Control: 30 | Teaching methods-correction  | Phonological awareness test, naming test, reading test, speed test                                  | T         |

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**Table 3: Contd...**

| Disorder | Title  | Researcher                  | References  | Sample                                | Treatment   | Instrument   | Statistic |
|----------|--|-----------------------------|---|---------------------------------------|---|--|-----------|
| Reading  | A comparison of methods for teaching reading comprehension with modern cognitive strategies and traditional method on degree comprehension fourth grade students and five children with reading problems, and without reading problems | Jabari and Khademi (2009)   | Journal of Shiraz University Education Studies and Learning | 60<br>Experimental: 20<br>Control: 10 | Methods for teaching reading comprehension with modern cognitive strategies and traditional method of comprehension | WISC, teacher-made test comprehension  | F         |
|          | The effect of Davis methods on the reading performance and self-concept children's with dyslexia   | Heidari (2010)              | University of Isfahan                                       | 20<br>Experimental: 10<br>Control: 10 | Davis methods   | WISC, reading and dyslexia test, self-concept scale                                      | F         |
|          | Effectiveness of Gardner's multiple intelligences training on reading performance of third grade students with dyslexia in Isfahan   | Alilezar (2010)             | University of Isfahan                                       | 48<br>Experimental: 24<br>Control: 24 | Gardner's multiple intelligences training   | Equal reading test, Gardner's multiple intelligences, intelligence test of Kettle Form B | F         |
|          | Effect of teaching multisensory Orton on second and third grade students reading disorder  | Zarbaksh (2010)             | University of Isfahan                                       | 40<br>Experimental: 20<br>Control: 20 | Multisensory teaching methods Orton   | Intelligence test of Kettle, dyslexia test   | F         |
|          | Effects of combined, sensory-motor-perceptual training on reading performance of elementary students with dyslexia in Isfahan  | Haghighatzadeh (2010)       | University of Isfahan                                       | 30<br>Experimental: 15<br>Control: 15 | Combined training, sensory-motor-perceptual   | Equal reading test, WISC   | F         |
|          | Effectiveness of working memory training on improvement improves reading performance of third grade students with reading disabilities   | Zaghian (2011)              | University of Isfahan                                       | 30<br>Experimental: 15<br>Control: 15 | Working memory training   | WISC-IV, checklist for identifying students with reading learning disability             | F         |
|          | Effect of self-instruction technic on reduction reading difficulties and reduction depression elementary school students with dyslexia   | Majidi <i>et al.</i> (2009) | Clinical Psychology and Personality                         | 64<br>Experimental: 32<br>Control: 32 | Effect of self-instruction technic  | WISC, reading diagnostic test  | F         |

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**Table 3: Contd...**

| Disorder | Title   | Researcher                            | References                       | Sample                                | Treatment                                       | Instrument   | Statistic |
|----------|---|---------------------------------------|----------------------------------|---------------------------------------|---|--|-----------|
| Reading  | Compare the effectiveness of metacognitive strategies and training documents on comprehension elementary students dyslexia                                | Dehghani Firuz Abadi (2007)           | University of Isfahan            | 20<br>Experimental: 10<br>Control: 10 | Metacognitive strategies and training documents | Checklist for identifying students with reading learning disability, intelligence test of Kettle | F         |
|          | Effects of neuropsychology treatment on the reading efficiency of Iranian students with developmental dyslexia of linguistic type                         | Baezat <i>et al.</i> (2006)           | Psychological Studies            | 28<br>Experimental: 13<br>Control: 15 | Neuropsychological treatment                    | WISC-R, CSI-4, tactile training box, Reading disorder test                                       | F         |
|          | Comparison effectiveness of multisensory approach Fernald and Orton on the reading performance of third grade elementary school boys dyslexia             | Zianivand (2008)                      | University of Isfahan            | 45<br>Experimental: 30<br>Control: 15 | Multisensory approach Fernald and Orton         | Equal reading test, intelligence test of Kettle  | F         |
|          | The impact of visual reception skills training on reading performance in students with dyslexia   | Same Siahkalrudi <i>et al.</i> (2009) | Advances in Cognitive Science    | 30<br>Experimental: 15<br>Control: 15 | Visual reception skills training                | Equal reading test, Andre Ray test   | T         |
|          | Application of milad educational software based on neuropsychological color vision models for teaching dyslexic students                                  | Asgari <i>et al.</i> (2007)           | Research on Exceptional Children | 40<br>Experimental: 20<br>Control: 20 | Milad educational software                      | Checklist for identifying students with reading learning disability, WISC-IV                     | T         |
|          | Effectiveness of auditory perceptual training on reading performance of dyslexic students in third grade of Khomeini Shahr                                | Vatandust (2010)                      | University of Isfahan            | 30<br>Experimental: 20<br>Control: 10 | Auditory perceptual training                    | WISC-IV, reading diagnostic test   | F         |
|          | The effect of executive function Training on the mathematical and reading performance in elementary school students' with exceptional learning disability | Mirmehdy <i>et al.</i> (2009)         | Research on Exceptional Children | 90<br>Experimental: 45<br>Control: 45 | Executive function training                     | Cooldige test, keymath, cornoldy, reading diagnostic test  | F         |
| Reading  | The efficacy of the sina training in reduce errors of dyslexic children   | Bahari GHare Goz <i>et al.</i> (2008) | Journal of Iranian Psychologists | 30<br>Experimental: 15<br>Control: 15 | Sina training                                   | WISC-IV, reading diagnostic test   | F         |

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**Table 3: Contd...**

| Disorder | Title   | Researcher                    | References  | Sample                              | Treatment  | Instrument  | Statistic |
|----------|---|-------------------------------|---|-------------------------------------|--|---|-----------|
|          | Effect of rehearsal on working memory performance in dyslexic students  | Arjmandnia and naraghi (2009) | Article (Journal of Behavioral Sciences)          | 30<br>Experiment: 15<br>Control: 15 | Rehearsal  | WMTB-C  | F         |
|          | The impact of EEG neurobiofeedback on dyslexia symptoms   | Narimani <i>et al.</i> (2012) | Article (Iranian Journal of Exceptional Children) | 31<br>Experiment: 16<br>Control: 15 | EEG neurobiofeedback   | Neurofeedback, ADHD Vanderbilt assessment scale (parent form), Impairment tests in reading and WISC | F         |
|          | Effect of phonological awareness training on phonological awareness abilities, nonword reading and reading speed in dyslexic boys                   | Ali pur <i>et al.</i> (2011)  | Article (Iranian Journal of Exceptional Children) | 30<br>Experiment: 15<br>Control: 15 | Phonological awareness training                                | Tests of cognitive knowledge, WISC-IV, reading word and nonword                                     | F         |
|          | Effect of learning combining phonemes method on improved dyslexia in second and third grade students of elementary schools in Shahriar (88–87)      | Musavi (2009)                 | Allameh Tabatabai University                      | 50<br>Experiment: 25<br>Control: 25 | Learning combining phonemes                                    | Writing spelling test, reading test, Raven's tests  | F         |
|          | Effect of cognitive-behavioral play therapy on Improved reading performance of students with dyslexia in second grade and third grade Hamedan       | Ghaisari (2010)               | Payam Noor University of Tehran                   | 30<br>Experiment: 15<br>Control: 15 | Cognitive-behavioral play therapy                              | Dyslexia diagnostics test, WISC-IV  | F         |
| Reading  | Effect of Orton multi-sensory teaching method Everton on reading performance of third-and fourth-grade female students in public schools in Isfahan | Gharai (2010)                 | University of Isfahan                             | 16<br>Experiment: 8<br>Control: 8   | Orton multi-sensory teaching method                            | Reading test, Raven's tests   | F         |
| Writing  | Effectiveness self-regulation to reduce spelling errors of students with writing disorders  | Ba ezat and Izadi fard (2009) | Article (Research on Exceptional Children)        | 20<br>Experiment: 10<br>Control: 10 | Self-regulation  | Dyslexia diagnostics test, WISC-IV  | F         |
|          | Evaluation and comparison multi-sensory therapy of Fernald and perceptual-motor of Kepar on reducing impaired students with writing disorders       | Haidari <i>et al.</i> (2010)  | Article (New Findings in Psychology)              | 84<br>Experiment: 56<br>Control: 28 | Multi-sensory therapy of Fernald and perceptual-motor of Kepar | Raven's test and spelling test and academic performance   | F         |

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**Table 3: Contd...**

| Disorder | Title   | Researcher                    | References                              | Sample                                | Treatment  | Instrument   | Statistic |
|----------|---|-------------------------------|---|---------------------------------------|--|--|-----------|
| Writing  | Role of word processing with self-question strategies in improving spelling problems in third primary school students with writing disorder     | Ba ezat (2009)                | Article (Journal of Applied Psychology) | 30<br>Experiment: 15<br>Control: 15   | Word processing with self-question strategies      | Dyslexia diagnostics test, WISC-IV   | F         |
|          | The efficacy of multimedia training on the treatment of spelling disorders in special students learn of Kermanshah in the 2006–2007 school year | Malekian and Akhundi (2009)   | New Ideas in Education                  | 30<br>Experiment: 15<br>Control: 15   | Multimedia training                                | WISC-IV, checklist for identifying students with spelling problem  | F         |
|          | The efficacy of process training and task-process training methods on spelling performance in elementary school students                        | Dorkhani <i>et al.</i> (2009) | Research on Exceptional children        | 30<br>Experiment: 20<br>Control: 10   | Process training and task-process training methods | Spelling diagnostic test, intelligence test of Kettle  | F         |
|          | Educational methods of written expression on students with learning disorder in primary schools   | Bahrami <i>et al.</i> (2011)  | Iranian Journal of Exceptional Children | 40<br>Experiment: 20<br>Control: 20   | Methods of written expression                      | Content analysis of written expression, Rutter affective-behavioral disorders questionnaire reading and spelling tests | F         |
|          | Effect of phonological awareness training package on reduction of spelling errors of primary school students with writing disorder              | Ba ezzat <i>et al.</i> (2012) | Journal of Behavioral Science           | 40<br>Experimenta: 20<br>Control: 20  | Phonological awareness training                    | Wechsler children intelligence test, writing disorder test   | F         |
|          | The effectiveness of Fernald sensory integration method on dysgraphia and dictation in second elementary students in Kashan City                | Mansur nejad (2009)           | University of Isfahan                   | 24<br>Experimenta: 12<br>Control: 12  | Fernald sensory integration method                 | Researcher-made dictation test and handwriting check list  | F         |
|          | Examining the effectiveness of training precision on the dictation ability of elementary students with learning disorder in Isfahan             | Hoonjani (2007)               | University of Isfahan                   | 60<br>Experimental: 30<br>Control: 30 | Training precision                                 | Tolzpearon precision test, Jordan attention deficit index, diagnostic dictation disorder                               | F         |

*Contd..*

**Table 3: Contd...**

| Disorder | Title   | Researcher                  | References                              | Sample                               | Treatment  | Instrument                               | Statistic |
|----------|---|-----------------------------|---|--------------------------------------|--|--|-----------|
|          | The comparison of the effectiveness of direct instruction, phonological awareness and the combined method on the reduction of elementary student spelling problem                     | Karimi <i>et al.</i> (2011) | Iranian Journal of Exceptional Children | 30<br>Experimenta: 15<br>Control: 15 | Direct instruction, phonological awareness and the combined method | WISC-R, achievement test for spelling    | F         |
|          | The effectiveness of method of combine phonemes teaching on dyslexia correction and dysgraphia in second and third grade students of elementary schools in the city of Shahriar 88-87 | Musavi (2009)               | University of Allame Tabtabae           | 50<br>Experimenta: 25<br>Control: 25 | Combine phonemes teaching  | Reading test, spelling test, Rayven test | F         |

EEG=Electroencephalography, WISC=Wechsler intelligence scale for children, WMTB-C=Working memory test battery for children, CSI=Child syndrome inventory, ADHD=Attention-deficit/hyperactivity disorder

**Table 4: Dependent and independent variables in each of the studies**

| Research | Disorder     | In depended variable 1                              | In depended variable 2           | In depended variable 3 | Depended variable 1   | Depended variable 2  |
|----------|--------------|---|----------------------------------|------------------------|---|----------------------|
| 1        | Mathematical | Functional training                                 | Economy token                    | Muscle relaxation      | Reduce the mathematical disorder                              |                      |
| 2        |              | Training both brain hemispheres                     | Music education                  |                        | Improve the dyscalculia performance                           |                      |
| 3        |              | Self-monitoring training of attention               |                                  |                        | Math problem solving performance                              |                      |
| 4        |              | Computer-assisted instructional software (Hesabyar) |                                  |                        | Teaching mathematics  |                      |
| 5        |              | Teaching math methods                               |                                  |                        | Improve the dyscalculia performance                           |                      |
| 6        |              | Executive functions education                       |                                  |                        | Academic performance  |                      |
| 7        |              | Working memory training                             |                                  |                        | Performance of children with mathematical learning disability |                      |
| 8        |              | Training rhythmic movements of the exercise         |                                  |                        | Number memory function  |                      |
| 9        |              | Painting training                                   | Pottery training                 |                        | Visual perception-spatial                                     | Visual memory        |
| 10       |              | Training of executive functions                     |                                  |                        | Mathematics performance                                       | Reading performance  |
| 11       |              | Metacognition training                              |                                  |                        | Mathematical Function   |                      |
| 12       |              | Working memory training                             | Metacognition training           |                        | Academic function   |                      |
| 13       |              | Task-process approach                               |                                  |                        | Treatment of learning disabilities mathematics                |                      |
| 14       |              | Panoura metacognition training                      | Philippou metacognition training |                        | Problem solving performance                                   | Metacognitive skills |
| 15       |              | Neuropsychological training                         | Content-based training           |                        | Remediation of mathematics disorder                           |                      |
| 16       |              | Neuropsychological interventions                    |                                  |                        | Academic Performance  |                      |

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**Table 4: Contd...**

| Research | Disorder     | In depended variable 1   | In depended variable 2                    | In depended variable 3           | Depended variable 1                   | Depended variable 2                    |
|----------|--------------|--|---|----------------------------------|---------------------------------------|--|
| 17       |              | Stress inoculation training  |   |                                  | Anxiety                               | Math performance                       |
| 18       |              | Fine motor skills education  |   |                                  | Learning mathematical concepts        |  |
| 19       |              | Cognitive-behavioral treatment                                     |   |                                  | Mathematical problem solving          |  |
| 20       | Mathematical | Teaching mathematics   |   |                                  | Academic performance                  |  |
| 21       |              | Intervention sensory, motor  | Intervention educational                  |                                  | Degree mathematical learning disorder |  |
| 22       |              | Education visual arts education                                    |   |                                  | Visual perception skills              |  |
| 23       | Reading      | Teaching active thinking-oriented strategies                       | Self-monitoring                           |                                  | Reading comprehension                 |  |
| 24       |              | Cognition-promoting software                                       |   |                                  | Executive functions                   | Response inhibition and working memory |
| 25       |              | Teaching-correction methods based on phonological processing model |   |                                  | Speed of reading                      | Accuracy of reading                    |
| 26       |              | Methods for teaching reading comprehension                         | Modern cognitive strategies comprehension | Traditional method               | Degree comprehension                  |  |
| 27       |              | Davis method   |   |                                  | The reading performance               | Self-concept                           |
| 28       |              | Gardner's multiple intelligences training                          |   |                                  | The reading performance               |  |
| 29       |              | Teaching multisensory Orton  |   |                                  | Reading disorder                      |  |
| 30       |              | Combined, sensory-motor-perceptual training                        |   |                                  | Reading performance                   |  |
| 31       |              | Working memory training  |   |                                  | Improvement reading performance       |  |
| 32       |              | Self-instruction technic   |   |                                  | Reduction reading difficulties        | Reduction depression                   |
| 33       |              | Metacognitive strategies   | Training documents                        |                                  | Comprehension                         |  |
| 34       |              | Neuropsychology treatment  |   |                                  | Reading efficiency                    |  |
| 35       |              | Multisensory approach Fernald                                      | Multisensory approach Orton               |                                  | Reading performance                   |  |
| 36       |              | Visual reception skills training                                   |   |                                  | Reading performance                   |  |
| 37       |              | Milad educational  |   |                                  | Teaching dyslexic students            |  |
| 38       |              | Auditory perceptual training                                       |   |                                  | Reading performance                   |  |
| 39       |              | Executive function training  |   |                                  | Mathematical performance              | Reading performance                    |
| 40       |              | Sina training  |   |                                  | Reduce errors of dyslexic             |  |
| 41       | Reading      | Rehearsal  |   | Working memory performance       |                                       |  |
| 42       |              | EEG neurobiofeedback   |   | Dyslexia symptoms                |                                       |  |
| 43       |              | Phonological awareness training                                    |   | Phonological awareness abilities | Nonword reading                       | Reading speed                          |

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**Table 4: Contd...**

| Research | Disorder | In depended variable 1                        | In depended variable 2     | In depended variable 3 | Depended variable 1                               | Depended variable 2 |
|----------|----------|---|----------------------------|------------------------|---|---------------------|
| 44       |          | Learning combining phonemes                   |                            | Dyslexia symptoms      |   |                     |
| 45       |          | Cognitive-behavioral play therapy             |                            | Reading performance    |   |                     |
| 46       |          | Orton multi-sensory teaching method           |                            | Reading performance    |   |                     |
| 47       | Writing  | Self-regulation                               |                            |                        | Reduce spelling errors                            |                     |
| 48       |          | Multi-sensory therapy of Fernald              | Perceptual-motor of Kupert |                        | Reducing impaired students with writing disorders |                     |
| 49       |          | Word processing with self-question strategies |                            |                        | Improving spelling problems                       |                     |
| 50       |          | Multimedia training                           |                            |                        | Treatment of spelling disorders                   |                     |
| 51       |          | Process training                              | Task-process training      |                        | On spelling performance                           |                     |
| 52       |          | Educational methods of written expression     |                            |                        | Students with learning disorder                   |                     |
| 53       |          | Phonological awareness training               |                            |                        | Reduction of spelling errors                      |                     |
| 54       |          | Fernald sensory integration method            |                            |                        | Dysgraphia  | Dictation           |
| 55       |          | Training precision                            |                            |                        | Dictation ability                                 |                     |
| 56       |          | Direct instruction                            | Phonological awareness     | Combined method        | Reduction of spelling problem                     |                     |
| 57       |          | Combine phonemes teaching                     |                            |                        | Dyslexia correction                               | Dysgraphia          |

EEG=Electroencephalography

increases the speed of calculating operation. It seems that if neuropsychological approach along with correction methods based on teaching content is used to treat the mathematics disorder, not only helps to understand mathematical concepts and strategies, but also helps in the application of these methods in appropriate fields.<sup>[25]</sup> Correction method of teaching content is a direct instruction model, so it can be said that this study is in line with the findings of<sup>[65,66]</sup> that direct instruction model had positive effects on students' math achievement.

And also in the field of dyslexia, the findings of this meta-analysis showed that psychological-educational interventions have an upper intermediate (0.55) impact on improving the academic performance of dyslexic students. This meta-analysis confirmed the findings of previous research that reported a large effect size.<sup>[28,29,33,35-38,41-43,45,46,48,50]</sup> Of the 24 studies reviewed in this area, the research of Gharai,<sup>[38]</sup> had the most of the effect sizes (0.929) that used Everton's multi-sensory training method on reading performance. Multi-sensory method is based on this assumption that if the data are received through some senses instead of one, learning will be facilitated for some students. Gharai quoting Becker and Carnine also pointed to the important role of multi-sensory method in restoring the coding problems of reading and says that in this method the basic premise is that within learning process the child needs his sensory

pathways complex, and all of them, together will strengthen and increase the learning.<sup>[38]</sup> Multi-sensory approach helps individuals with learning disabilities to gain greater success by using different senses and strengthening them. This is an attempt to teach the sounds represented by letters of alphabet all together by using a multi-sensory approach. In this way, the child sees the letter, reads and writes it. Theorists accepted this systematic approach for learning letters, learning voice, combining vowels and consonants together in a word. Kakaee<sup>[67]</sup> also stated that using this method will improve reading of students.

The findings of this meta-analysis showed that psychological - educational interventions on the academic performance of students with learning writing difficulties has a moderate to high effect (0.5). Findings of this meta-analysis confirmed some previous research, which reported a high effect size.<sup>[50,57,58,59,60]</sup> Of the 11 studies reviewed in the field of writing disorder, most effect size (0.691) was related to the study of Baezzat *et al.*,<sup>[59]</sup> and Baezat and Izadi Fard<sup>[53]</sup> that used self-regulation and phonological awareness training. More than two decades, self-regulation model has been proven as an education strategy for changing the educational approach and self-regulation among students with learning difficulties.<sup>[68]</sup> A small number of students are completely self-regulated; but the students who have better self-regulation skills, with less effort, learn more and

they report higher levels of academic satisfaction.<sup>[69,70]</sup> In contrast, students who don't have self-regulation, show more impulsive behaviors, have lower academic achievement, and cannot show their abilities.<sup>[68]</sup> Thus, self-regulated learning relates to our ability to understand and control the learning environment; for this purpose, we try to identify the goals, choose strategies that can help us to achieve these goals, do strategies, and use these strategies to achieve our goals. The findings are consistent with the research of<sup>[68,71-73]</sup> these researchers have emphasized on the existence of a strong association between self-regulation strategies and writing skills. On the other hand, the phonological awareness is a kind of meta cognitive ability to use a phonological system that requires conscious thought. Phonological awareness, phonological analytic skill in identifying and using unfamiliar words, is an essential skill while reading and writing, in skills that shows the effect of phonological awareness training on improving the spelling difficulties of those students with writing disorders.<sup>[74]</sup> Therefore, Phonological awareness is essential in development processes of reading, writing, and spelling.<sup>[74-76]</sup> Attention to the cultural contexts in different communities can be effective in effectiveness of various treatment approaches. One of the features of meta-analysis is that it provides the possibility of comparing the efficacy of different treatment patterns in different cultural contexts. However, the application of different therapeutic approaches in the treatment of problems is obvious. However, what is better to be considered, is the success rate of the model to solve the considered problem. In this meta-analysis, it was tried that with integrating psychological treatments, survey the success rate of this model. But only one model of therapy and comparison with no treatment is not enough. And with studying the other treatment models a comparison should be made between the different approaches to determine the effectiveness and success of each pattern compared to untreated and to each other. Based on these findings the therapists can choose and run proper treatment patterns according to the problems they face and achieve better and more reliable results. Lack of a coherent and systematic database in the country, which prevents easy access to the various articles and theses, and also lack of parameters required for the analysis of the studies that enter the meta-analysis, were the limitations of this study. Other limitations of the study are the lack of quality assessment results and to weight the studies according to their quality by professionals. Finally, it is recommended that the different topics are welcome to repeat to view more samples of the population, and with putting together the results of different samples a better view of social reality would be available. It also is hoped to increase the sensitivity in complete and accurate printing of results with emphasizing on some statistical reports, fairly accurate estimation of the significance level and effect size, and increasing meta-analysis approach.

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