Available online at www.elixirpublishers.com (Elixir International Journal)

Psychology

Elixir Psychology 72 (2014) 25532-25536

ISSN: 2229-712X

The effect of phonological educational intervention on the reading performance of students with developmental Dyslexia

Salar Faramarzi*, Elahe Ghorbanchian, Sakineh Gharaie, Sayyed Reza Poor Sayyed and Ahmad Yarmohamadian
Department of Psychology, University of Isfahan, Isfahan, Iran.

ARTICLE INFO

Article history:
Received: 30 April 2014;
Received in revised form:
19 June 2014;
Accepted: 3 July 2014;

Keywords
Phonological educational intervention,
Reading,
Students,
Developmental dyslexia.

ABSTRACT
This research aims to study the effectiveness of phonological educational intervention on the reading performance of students with developmental dyslexia. It was experimentally conducted using a pretest-post test scheme, a control group & the multiple sampling method in which 16 3rd grade female dyslexic students who met the research admission criteria were selected in the simple random method from Esfahan City public elementary schools and who were randomly assigned to 2 experimental and control groups. For information gathering, the 3rd grade elementary school reading test and list of dyslexia symptoms whose reliability and validity had been approved were used. Data were analyzed using the covariance analysis statistical method and SPSS software. The results showed a significant difference (P≤0.001) between the 2 experimental and control groups. It can thus be said that phonological educational intervention is effective on the reading performance of dyslexic children and the method can be used to optimize such children's dyslexia.

© 2014 Elixir All rights reserved.

Introduction

Learning is one of the most important issues in current psychology and, at the same time, one of the most difficult concepts to define (Hergenhahn & Olson, 1997, translated by Seif, 1998).Learning can be audaciously considered as the most fundamental process as the result of which an incapable, helpless creature converts through interaction with bodily growth in the course of time into a developed individual whose cognitive capacities and thinking know no limits. The very vast diversity and learning temporal spread of human beings which is as expanded as their life, have caused some individuals to suffer from disorders despite many differences between them in terms of learning (Duckrel & Mc Sheen, 1993, translated by Ahmadi & Asadi, 1997). Kirk (1963) was among the first ones to recommend the term "learning disorders". He used this term to describe a group of children who suffered from disorders in language development, speech, reading and skills required to establish social relations.

Children who, in terms of senses, had disabilities such as blindness & general retardedness, were thus excluded from this group (Sharifi, Daramadi et al., 2001). The USA Fderal Government laws list 3 types of problems in learning disorders:

1. Problems in language (verbal language, perception and understanding through listening)
2. Problems in reading & writing (written expression and reading skills)
3. Math problems (calculation and reasoning)

Compared with other learning disorders, dyslexia enjoys a higher percentage. It has been mentioned in DSM-IV that ~ 4 out of 5 cases of learning disorders are only dyslexia or a combination of the disorder and math disorder or disorders in written expression, the prevalence of this disorder being 3-4 times in boys than in girls (Caplan & Saduc, 2003, translated by Rafiee & Sobhanian, 2003). Some researchers of learning disorders believe that 89%-90% of children with learning disorders suffer from dyslexia (Kaloger & Kolson, 1978).

On the other hand, developmental dyslexia, the most common learning disability in primary school children, has the rate of 5%-10% (Baillieux, Vandervliet, Manto et al.,2009).

Developmental dyslexia is a condition in which children who receive regular education for reading and enjoy ordinary intelligence skills have problems in decoding written texts and consequently in the ability of text comprehension(Eden & Flowers, 2009). The individual's reading acquisition method is influenced in this disorder(Casanova et al.,2004). In another word, dyslexia is a kind of learning disorder, amongst whose features, disability in words appropriate recognition, poor ability in reading, spelling and representation can be mentioned.

Despite language which has a spontaneous development and is accomplished in the course of development, reading is a skill which is acquired at higher ages and due to educational intervention. Different skills such as understanding and discrimination of letters and sound , establishing relations between phonemes and characters, naming and symbolizing letters, understanding the meaning of words groups written in the form of sentences, memory, movement and video-audio factors which are all discussed as the components of the process of learning are involved in this cognitive complex skill (Ahmadpanah and Pacadanaya,2007). Different authors have stated various factors to describe dyslexia, though their causal relations with this disorder have not yet been exactly specified (Foorman, 2005). Yet, most researches attribute this disorder to the individual's phonological awareness (Ahmadpanah & Pacadanaya,2007). Phonological awareness, which includes both the ability to understand the presented vocabulary entwined in a set of sounds and the ability to manipulate these sounds, has been proved to be strongly associated with the proper decoding of objective and abstract written words(Naples, Chang et al., 2009). It has been discussed in different studies that the process of phonological awareness is defective in children with dyslexia (Ackerman et al., 2001; Pennigton et al., 2001; Wolf & Bowers, 1999).

Tele:
E-mail addresses: elahe.ghorbanchian@yahoo.com

© 2014 Elixir All rights reserved

Individuals with specific reading disabilities have often been described as error-prone readers. These errors seem to have been caused in decoding and words identification by a basic impairment in mastering language sounds which is phonological awareness (Stanovich, 1988; Wagner et al., 1994). The assignments which are used to measure phonological awareness require a number of skills to guide and process phonetic information (phonetic processing). Phonological awareness thus supports phonetic processing. There are many individual differences in phonological processing and extended studies have by evidence proved these differences' being criteria in the course of life in reading acquisition (Anthony et al., 2002; Atchley et al., Lyytinen et al., 2004; Sprugevica & Hoien, 2003) and these differences serve by themselves as a factor discriminating between disabled and normal readers. The diversity of the assignments used to measure phonological awareness has been embodied through a potential structure which is recognized as a basic phonetic ability (Schatschneider et al., 1999; Wagner, 1994). Despite the fact that the phonological awareness usuall stability is modified and corrected, it discusses that this feature has a permanent and continuous effect on reading acquisition and ability throughout the course of life. Specially, children and adults with reading disorders often display permanent problems in the assignments of phonological awareness under both natural development and corrective conditions (Bird et al., 1995; Fawcett & Nicolson, 1995). As an example, students with a previous history of specific reading disability who could read according to their age and educational level displayed defects in their ability to successfully manipulate the sounds as compared with a control group with no reading specific disability. (Wilson & Lesaux, 2001). These phonetic defects interestingly manifest themselves more in adults in new phonetic situations such as spelling or reading pseudowords or in the assignments which involve decision making on vocabulary (Bruck, 1992). These findings suggest that, though adults have developed corrective strategies to establish relations with their acquired vocabulary, they have yet problems in the underlying phonetic processing. This should be considered that phonological awareness is significantly hereditarily specified with a mean value of ~ 45% (Grigorenko, 2004).

Phonological awareness skills thus maintain a significant source of individual differences in the course of life. 15%-20% of specific reading disabled children have problems in either phonological awareness or quick naming, and ~60% of them simultaneously suffer from defects (Naples, Chang et al., 2009). Studies suggest that normal and dyslexic children display the most differences in phonetic representations (Meyler & Breznitz,2005). These children less properly discriminate between phonemically contrastive pairs compared with the control group(Bogliotti, Serniclaes et al., 2008).

Many studies have stressed the necessity of phonological awareness for reading acquisition and have reckoned developmental dyslexia a basic defect in phonology. A sign of this defect is an insensible impairment in speech understanding. Individuals with dyslexia do not properly pay attention to text dependent variables which a verbal message usually contains (Blomert, Mitterer & Paffen, 2004). The proof to the effect of phonology on dyslexia is obtained from studies which determine that on-time teaching of phonology enhances the power of words reading(Bryant & Bradley, 1985; Cunningham, 1990; Elbro et al, 1996; Olofson & Landberg,1985; Schneider et al, 1997). Puolakanaho, Aro & Eklund express that the knowledge of letters and phonological awareness are 2 indices which determine above 80% the individual risk for dyslexia (Puoloakanaho, Aro and Eklund, 2007).

Due to the importance of phonological awareness, the plan of phonological educational intervention stresses the enhancement of this ability and this method has been proved to have positively influenced students' ability of spelling (Castro, 2006). In the study of Joshi(2002), the experimental group who had received training in the phonological educational intervention method obtained statistically significant results in phonological awareness, decoding and comprehension(Joshi, Dahlgren & Gooden ,2002). By inference from the above mentioned subject, this question is thus raised that whether or not phonological educational intervention influences the reading performance of students with developmental dyslexia.

Method

The research method is methodologically of the experimental type, because the researcher searches for the effect of the independent variable of phonological educational intervention on the reading performance of students with developmental dyslexia. From experimental schemes, the pretest-posttest scheme has been used for this purpose.

Pretest-posttest scheme with a control group

Experimental group (E)	R	01	X	02
Control group (C)	R	03	-	04

Statistical universe: All the 3rd grade elementary public schools female dyslexic students in Isfahan City in the 2009-2010 academic year have formed the research statistical universe.

Sample and sampling method: A multistep sampling method was used in this research as follows:

Sampling was performed in 3 steps from educational regions, schools and classes as sampling units. In order to select dyslexic students, teachers busy teaching in the 3rd grade were initially referred to for selecting suspected dyslexic students. Considering the research admission criteria, 16 students were then randomly selected out of ~ 50 dyslexic students and were randomly divided into 2 control and experimental groups. Research admission criteria for dyslexic students were:

1. Teacher's report on the students' performance and introduction of students disabled to read.
2. Review of the students' grade sheets and records.
3. Performance of Rion's intelligence test to review the dyslexic students' mental ability regarding the fact that those students should, by definition, enjoy medium and higher intelligence.
4. Study of their life conditions for information on their health state in relation to sense, brain and nerves aspects and nonexistence of chronic diseases using check lists.
5. Study of the individuals' psychological state for information on their mental health and their not suffering from intense emotional & behavioral disorders.

Measuring instruments

1. List of dyslexia symptoms: The dyslexia symptoms form, adapted from Bazrafshan(1997), was used to diagnose dyslexic children. The form includes 15 yes/no items filled in by the researcher when the student reads the text. If, in the form, 5 yes items are ticked for a student, she will be suspected to have dyslexia. For more precise assessment, next steps are followed. Students, who based on this form, showed no problems in reading, will be considered as normal. Otherwise, they will be diagnosed as dyslexic.
2. The 3rd grade reading test: This test has been designed to provide information on specific reading skills , measures skills which are in direct relation with class-room training and has been prepared based on the "equal" assessment form and

validated by Badiean (1996). Its reliability for the 3rd grade elementary students has been assessed at 0.92 which covers the most common problems faced by students in reading programs, prepared to measure any group of such problems.

3. Interview with teachers to initially screen children with reading problems, performed by researchers.
4. Rion's intelligence test (children's color form): This test was made in 1938 by Penrose and Rion and contains 60 pictorial items.
5. Demographic questionnaire: This is a researcher-made questionnaire and contains the following items: parents' age, profession and education, number of the household, father's income, and prominent physical problems in the family.

Research conduction method: The scheme in question is of the experimental type. In order to gather the required information and data, the following steps have thus been designed and taken:

1. Selection of the sample group from the students considering the sampling method and research admission criteria.
2. Division of the sample group into 2 experimental and control groups.
3. Conduction of reading tests on both groups to gather information to study reading performance as a pretest.
4. Application of the independent variable which is, in this research, the program of phonological educational intervention based on the phonetic learning method of "Gilingham & Stilman". Having been designed for 6-year age groups up to the end of secondary school, this method stresses the ability of auditory recognition and motor and tactile senses (Hammil & Bartel, 2004; Chalfant & Kirk, 1984). Having been designed based on the educational context of the Let's Read and Write books based on "Gilingham & Stilman" phonetic learning method, the phonological educational intervention program was performed for 10 sessions (2 sessions a week) on the experimental group. The control group received no intervention.
5. Conduction of reading tests on both groups to gather information to study the reading performance as a posttest.

Data analysis method: Data were analyzed using the SPSS software. For data descriptive analysis, mean, median, SD and coefficient of correlation, and at the inferential statistics level, ANOVA, were used.

Results

Table 1: Descriptive indices obtained in relation to the reading performance in terms of the groups

Groups	Steps	Mean	SD	Min Score	Max Score
Experimental	Pretest	33	15.154	15	42
	Posttest	72.375	11.426	50	86
Control	Pretest	33	6.045	20	45
	Posttest	39	7.030	30	50

Table 1 lists children's reading ability dependent variable central tendency descriptive indices based on the reading test in terms of the groups and steps. The scores have been presented on the reading test based on the testees' correct responses. The 3rd grade experimental group testees' correct responses mean significant increase from 33 in the pretest step to 72.375 in the posttest thus suggests the phonological educational intervention's effectiveness.

Levin's test results are presented in Table 2 to measure the hypothesis of variances equality for all the research variables in grade 3.

Table 2: Levin's test to measure the hypothesis of variances equality for all the research variables.

Research variable	Step	Levin's statistic	Degree of freedom 1	Degree of freedom 2	Significance level
Reading performance	Posttest	1.050	1	14	0.323

As observed, there is not a significant difference between the groups variances in any of the variables. All the variances equality has thus been observed for all the variables and parametric tests can be used for data analysis.

The ANOVA results on the effect of phonological educational intervention on the 3rd grade students' reading ability level are listed in Table 3.

Table 3: ANOVA results on the effect of phonological educational intervention on the 3rd grade students' reading ability level

Variables	Sum of Squares	Degree of freedom	Mean	F	Significance level	Effect magnitude	Statistical power
Pretest	1079.779	1	1079.779	77.943	0.001	0.764	1
Group Membership	4455.563	1	4455.563	620	0.001	0.884	1
			321				

As Table 3 shows, phonological educational intervention has influenced the 3rd grade dyslexic students' reading ability level, the difference being significant ($P \leq 0.001$). Group membership justifies 0.88% of variations relevant to the students reading ability in the posttest step ($P \leq 0.001$). Statistical power 1 shows that the sample size has been sufficient to test this hypothesis. The research hypothesis indicating the effectiveness of phonological educational intervention on the 3rd grade dyslexic students reading ability is thus approved.

Discussion and conclusion

Aiming to study the level of the effect of phonological educational intervention on the 3rd grade dyslexic elementary female students' reading performance, this research was conducted. Results showed that there is a significant difference between the 3rd grade experimental & control groups ($P \leq 0.001$). That is, in terms of data from the reading test in the posttest step and relevant comparison with the reading pretest, the reading ability level of the testees under training has increased while such an increase is not observed in the control group. Regarding the level of effect of 0.88 in this class, it can be concluded that phonological educational intervention has significantly increased the testees' reading ability level. In the survey of the research hypothesis, statistical power 1 is indicative of the sample sufficient size to conclude on the hypothesis confirmation or rejection.

Evidences and documents suggest that insufficient fluency in words recognition is, in most cases, due to more basic defects in alphabetical enciphering, and this fact is in effect the major cause of learning acquisition problems (Vellution, Fletcher et al.,2004). One of the most important hypotheses on the cause of dyslexia is the "hypothesis of defect in phonological awareness" (Ahmadpanah & Pacadanaya,2007; and Ashtari & Shirazi, 2004). Phonological awareness development and growth and the reading performance have a mutual relation with each other and the growth rate of either of them can predict that of the other one (Lerkkanen, Puttonen, Aunola et al.,2004).

Regarding this hypothesis, the most basic effect of phonological educational intervention is the dyslexic students' phonological awareness increase and many researches have reckoned phonological awareness increase-based trainings effective on decreasing the reading disability (Bryant & Bradley, 1985; Cunnigham, 1993; Elbro et al. 1996; Olofson and Landberg, 1985; Schneider et al., 1997).

The findings of this research is consistent with those of researches by Zarbakhsh (1999) and Kakaee (2003) in Iran, and by Castro(2006), Joshi, Dahlgren & Gooden(2002) and Torgesen, Alexander & Wagner(2001).

Regarding the results of this research, phonological educational intervention can be said, as a proper method to apply to dyslexic children, to be interesting and applicable. After participating in phonological educational classes, the testees felt an optimization in their reading ability. The conduction of the research only on the female sex, because of the researcher's time shortage for sampling from both sexes, is one of the limitations of this research. Let's hope for dealing with it in the future.

Conclusion

This article aimed to examine the effects of phonological educational intervention on reading performance of students with developmental dyslexia. The results of this study proved that there are significant differences between control and experimental group ($P<0.001$). This means that based on the collected data from reading test in the posttest and the results of reading test in pretest stage, students' reading abilities increased significantly. But this is not observed in control group. With respect to the amount of effect on this group (88%), it is concluded that phonological educational intervention influences reading performance of students with developmental dyslexia significantly. In analyzing the research hypothesis, the statistical power demonstrated that the sample size was sufficient to conclude results.

Other evidences illustrated that insufficient easiness in identifying vocabularies are derived from the most basic alphabetic decoding defections in most cases. Indeed, this issue is the main reason of reading problems in most cases (Vellution and et al., 2004). One of the important hypotheses about reasons of dyslexia is "detection in phonological awareness" (Ahmadpanah and et al., 2007; Vashtari and et al., 2004). There are significant interrelationships between growth and revolution of phonological awareness with reading performance. Therefore, the amount of each variable's growth could predict another's growth (Lerkkanen, Puttonen, & Aunola, 2004). With respect to the results, the main effect of phonological educational intervention on reading performance is increased phonological awareness of students with developmental dyslexia. There are different studies that considered learning in terms of phonological awareness as an effective method to decrease reading disabilities (Brayant and et al., 1985; cunnighum, 1990; Alber and et al., 1996; Schenider and et al., 1997). The results of this study are supported by Zarbakhsh (1999), Kakaei (2003), Kastro (2006), Joushi and et al. (2002), Torgesen, Alexander, & Wagner (2001).

Concerning the results of this study, it is concluded that phonological educational intervention influences reading performance of developmental dyslexic students. Therefore, phonological educational intervention should attend as an appropriate method in terms of reading performance of developmental dyslexic students. The respondents' perceptions were improved significantly after attending these phonological educational intervention plans sessions. This study has one limitation; it is only conducted on female students. Therefore it is suggested for future researchers and authors to conduct this study for male and female students simultaneously.

References

Ackerman, P.T. Holloway, C. A. Youngdahl, P. L. & et al.(2001).The double – deficit theory of reading disability does not fit all. Learning Disabilities Research & Practice, 16, 152-160.

Ahmadpanah, M. Pakadanaya, P. (2007), Dyslexia: Review of the Latest Srudies, Journal of Research in exceptional children, Vol. 7T pp 337-352.

Anthony, J. L. Lonigan, C. J. Burgess, S. R. & et al.(2002).Structure of preschool phonological sensitivity: overlapping sensitivity to rhyme, words, syllables, and phonemes. Journal of Experimental Child Psychology, 82, 65-92.

Ashtariatiye, S. T. (2004), the examination and Comparison of Phonological Awareness Skills and the Speed of Naming in Children with Dyslexia Reading, Journal of rehabitation, Vol. 18, pp 49-54.

Atchley, R. A. Halderman, L. Kwasny, K. & et al. (2003). The processing of pseudohomophones by adults with a history of developmental language disabilities. Brain and Cognition, 53, 139-144.

Baillieux, H. Vandervliet, E. J. M. Manto, M. & et al. (2009). Developmental dyslexia and widespread activation across the cerebellar hemispheres. Brain and Language, 108, 122- 132.

Bazrafshanmoghadam, A. (1997), the Examination of Prevalence of dyslexia dyslexia reading and writing between the second and third grade of secondary school girls and boys in Mashhad, MA Thesis, University of Tehran.

Bird, J. Bishop, D. V. M. Freeman, N. H. (1995). Phonological awareness and literacy development in children with expressive phonological impairments. Journal of Speech and Hearing Research, 38, 446-462.

Blomert, L. Mitterer, H. Paffen, CH. (2004). In search of auditory, phonetic, and/or phonological problems in dyslexia: context effects in speech perception. Journal of Speech, Language, and Hearing Research, 47, 1030-1048.

Bogliotti, C. Serniclaes, W. Messaoud-Galusi, S. & et al. (2008). Discrimination of speech sounds by children with dyslexia: comparisons with chronological age and reading level controls. J Exp Child Psychology, 101, 137-155.

Bruck, M. (1992). Persistence of dyslexics phonological awareness deficits. Developmental Psychology, 28, 874-886.

Bryant, P. Bradley, L. (1985) Children`s reading problems. Oxford: Blackwell.

Casanova, M. F. Araque, J. Giedd, J. Rumsey, J. M. (2004). Reduced brain size and gyrification in the brain of dyslexia patients. Journal of Children Neurology, 19, 275- 281.

Castro , C .V . (2006) . The effects of modified Orton - Gillingham instructional strutional strategies on phonological processing deficits in a first – year college Spanish students. Purdue University , 193

Chalfant, J; Kirk, S. (1984). Academic and Developmental Learning Disabilities.United States. Love Pub Co

Cunningham, A. E. (1990) Explicit versus implicit instruction in phonetic awareness. Journal of Experimental and Child Psychology, 50, 429-444.

Dekral, J. Macshin, J. (1997), the Cognitive Perspective to Child's Learning Problems, translated by Ahmadi and et al., Tehran: Rosh publishers.

Eden, G. F. Flowers, D. L. (2009). Dyslexia: neuro developmental basis. Encyclopedia of Neuroscience. 741-747.

Elbro, C. Rasmussen, I. Spelling, B. (1996) Teaching reading to disable readers with language disorders: A controlled evaluation of synthetic speech feedback. Scandinavian Journal of Psychology, 37, 140-155.

Fawcett, A. J. Nicolson, R. I. (1995). Persistence of phonological awareness deficits in older children with dyslexia. Reading and Writing, 7,361-376.

Foorman, H. A.(2005).Dyslexia and educational factors. Reading Improvement, 42, 314-326.
Grigorenko, E. L. (2004). Genetic bases of developmental dyslexia: a capsule review of heritability estimates. Enfance, 3, 273-287.
Joshi , R . Dahlgren , M . Gooden, R. B. (2002) . Teaching reading in an inncer city school through a multisensory teaching . Annals of Dyslexia , 52 , 214 -226.
Hammill, Donald D.;Bartel, Nettie R. (2004). Teaching Children with Learning And Behavior Problems. USA. Allyn & Bacon, Incorporate.
Harganhan, B., Walson, M.H., (1998), an Introduction to learning theories, translated by Seyf and et al., Tehran, Douran publishers.
Kaloger, M. Kolson, G . R . (1978). Specific learning difficulty (dyslexia) and intervention. Journal of Support for Learning . 9,114-119.
Kakayi, E. (2003), the effectiveness of multisensory method in decreasing writing disorder in Ilam, MA Thesis, Alzahra University.
Kaplan, I. K Benjamin, J.S. (2004).Comprehensive Textbook of Psychiatry, translated by Rafei and et al., (2004), ninth edition, Arjmand publishers.
Lerkkanen, M. K. Puttonen, H. R. Aunola, K. & et al. (2004). Developmental dyslexia of phonemic awareness and reading performance during the first of primary school. Journal of Early Childhood Research, 2, 139-156.
Lyytinen, H. Ahonen, T. Eklund, K. & et al.(2004). Early development of children at familial risk for dyslexia-follow-up from birth to school age. Dyslexia: An International Journal of Research & Practice, 10, 146-178.
Meyler, A. Breznitz, Z. (2005). Impaired phonological and orthographic word representations among adult dyslexic readers: Evidence from event-related potentials. The Journal of genetic Psychology, 166, 215-224.
Naples, A. J. Chang, J. T. Katz, L & et al.(2009).Same or different? Insights into the etiology of phonological awareness and rapid naming. Biological Psychology, 80, 226-239.
Olofsson, A. Lundbrg, I. (1985) Evaluation of long-term effects of phonemic awareness traning in kindergarten: Illustration of some methodological problems in evaiuation research . Scandinavian Journal of Psychology, 16, 21-34.
Pennington, B. F. Cardoso-Martins, C. Green, P. A. & et al.(2001).Comparing the phonological and double deficit hypotheses for developmental dyslexia. Reading and Writing, 14, 707-755.
Puolakanaho , A . Ahonen , T. Aro , M . (2007).Very early phonological and language skills :estimating individual risk of reading disability. Journal of Research in Special Education Needs , 48 , 923.
Schneider, W. Kuspert, P. Roth, E. Vise, M. Marx, H. (1997) Short-and long-term effects of training phonological awareness in kindergarten: Evidence from two German studies. Journal of Experimental Child Psychology, 66, 311-340.
Schatschneider, C. Francis, D. Foorman, B. R. & et al. (1999). The dimensionality of phonological awareness: an application of item response theory. Journal of Educational Psychology, 91, 439-449.
Sharifidaramadi, P. (2001), an Introduction to education and learning of Exceptional children from theory to practice, Tehran: Ravansanji.
Sprugevica, I. Hoien, T(2003). Early phonological skills as a predictor of reading acquisition: a follow-up study from kindergarten to the middle of grade 2.Scandinavian Journal of Psychology, 44, 119-124.
Stanovich, K. E. (1988). Explaining the differences between the dyslexic and the garden-variety poor reader: the phonological-core variable-difference model. Journal of Learning Disabilities, 21,590-604.
Torgesen, J. K. Alexander, A. W. Wagner, R. K. & et al. (2001). Intensive remedial instruction for children with severe reading disabilities. Journal of Learning Disabilities, 34, 33-58.
Vellution, F. R. Fletcher, J. M. Snowling, M. J. & et al. (2004). Specific reading disability (Dyslexia): what have we learned in the past four decades?. Journal of Child Psychology and psychiatry, 45, 2-40.
Wagner, R. K. Torgesen, J. K. Rashotte, C. A.(1994). Development of reading-related phonological processing abilities: new evidence of bidirectional causality from a latent variable longitudinal study. Developmental Psychology, 30, 73-87.
Wilson, A. lesaux, K. (2001). Persistence of phonological processing deficits in college students with dyslexia who have age-appropriate reading skills. Journal of learning Disabilities, 34, 394-401.
Wolf, M. Bowers, P G.(1999).The double-deficit hypothesis for the developmental dyslexia. Journal of Educational Psychology, 91,415-438.
Zarbakhsh, M. (1999), the examination of Multisensory Learning Method Effects on Students with dyslexia, MA Thesis, university of Isfahan