



UNIVERSITI PUTRA MALAYSIA

***EFFECTS OF MULTISENSORY METHOD AND COGNITIVE SKILLS
TRAINING ON PERPETUAL PERFORMANCE AND READING
ABILITY AMONG DYSLEXIC STUDENTS IN TEHRAN, IRAN***

SEYEDMORTEZA NOURBAKHSH

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By

SEYEDMORTEZA NOURBAKHSH

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfillment of the Requirements for the Degree of Doctor of Philosophy**

October 2014

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DEDICATION

This dissertation is dedicated to my family for all their love, support, and encouragement throughout this process. To my dear mother and father, Sekineh and Reza, and my dear family Farah, Farima, and Mahan who provided taught me unconditional love and encouraged me to always do my best to educate however they were not educated. They constantly push me toward my goals and for their enduring love.

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

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SEYEDMORTEZA NOURBAKHS

October 2014

Chairman : Mariani Bte Mansor, PhD

Faculty: Human Ecology

Dyslexia is an unusual type of severe reading disability that has puzzled the educational and medical communities for many years. Dyslexia affects four percent of the population in United States of American. However some studies on dyslexia in Iran indicate the incidence of dyslexia in all grades generally was about 10%. The most important factor in dyslexia is reading downfall. The purpose of this research was to examine the effects of cognitive and developmental interventions on perceptual performance and reading ability of male dyslexic students in Iran. The investigation of perception has been a controversial issue because perception occurs within the mind and is not easy to observe, test, or measure. Cognitive skills intervention and multisensory skills intervention have been used to identify dyslexia and applied in its interventions. Also there has always been the controversial issue regarding the efficacy of the current instruments to assess perceptual abilities of dyslexic students. Therefore a major gap was filled in this research to examine the efficiency of multisensory and cognitive skills interventions in improving perceptual performance and reading ability among dyslexic students.

The critical issue in randomized pre-test/post-test with control group design implied whether there were differences between the influences of interventions (multisensory and cognitive skills) on perceptual performance and reading ability of dyslexic students. It was also to determine the effective intervention for improving perceptual performance and reading ability in dyslexia. Basically, this study involves 60 dyslexic students. The respondents were divided into three experimental groups including, i.e. 20 dyslexic students as first experimental group (E1), 20 dyslexic students as second experimental group (E2), and 20 dyslexic students as control group (C). The effectiveness of the 16 weeks and 16 sessions for both E1 and E2 groups' interventions was measured using Reading and Dyslexia Test (RDT) for distinguishing dyslexic students at the beginning and then Bender Visual Motor Gestalt Test (BVMGT) and Rorschach as non-learning based test. The results were analyzed by one-way ANOVA and paired *t*-test. Findings at pre-test to post-test

among the three dyslexic groups demonstrated that although two groups improved from pre-test to post-test; the E1 group who followed by developmental intervention significantly improved by getting better perceptual performances in the direction of RDT, BVMGT, and R subscale of Rorschach test and indicated no significant differences in W%, D%, Dd%; however, E2 group who followed the cognitive intervention revealed significant difference in RDT, BVMGT, and R subscales of Rorschach test with no significant difference in W%, D%, and Dd% subscales of Rorschach test. From the results, it could be argued that the interventions improved subjects' perceptual-motor performance more than their perceptual ability; however the differences occurred by the tests which are related to learning. This showed that the current perceptual tests which have been attempted to appraise the abilities originated from learning aspects would not actually be able to evaluate perceptual ability of children with dyslexia. The research findings are more consistent with developmental lag theory, which emphasizes neuro- developmental delays, and is the major cause of dyslexia. Dyslexia occurs when the students are pushed into performing academic tasks before they are able to do so. Dyslexia is not so different from other children and they need more time to learn as well as other students. The results of this research offer suggestions to consider alternatives for evaluation and remediation of these children.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KESAN INTERVENSI KEMAHIRAN PELBAGAI DERIA DAN KOGNITIF TERHADAP PRESTASI PERSEPSUAL DAN KEUPAYAAN MEMBACA DALAM KALANGAN PELAJAR LELAKI DISLEKSIA DI TEHRAN, IRAN

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Disleksia merupakan satu jenis ketidakupayaan membaca yang luar biasa yang membingungkan komuniti pendidikan dan perubatan untuk jangka masa yang lama. Disleksia memberi kesan ke atas empat peratus dari populasi Amerika Syarikat. Walau bagaimanapun beberapa kajian di Iran menunjukkan insiden disleksia secara umumnya adalah lebih kurang 10%. Faktor yang paling penting dalam disleksia ialah ketidakbolehan membaca. Tujuan kajian ini adalah untuk mengkaji kesan intervensi kognitif dan perkembangan terhadap pencapaian dan kebolehan membaca pelajar lelaki disleksia di Iran. Kajian persepsi telah menjadi isu kontroversi memandangkan persepsi berlaku di dalam minda dan sukar untuk diperhati, diuji dan diukur. Intervensi kemahiran kognitif dan pelbagai deria telah digunakan bagi mengenalpasti disleksia dan diaplikasikan dalam intervensi tersebut. Keberkesanan instrumen bagi menilai kebolehan persepsual pelajar disleksia juga sentiasa menjadi isu kontroversi. Oleh itu, jurang utama telah dipenuhi dalam kajian ini untuk meneliti kecekapan intervensi kemahiran pelbagai deria dan kognitif dalam meningkatkan prestasi persepsi dan kebolehan membaca dalam kalangan pelajar disleksia.

Isu kritikal dalam ujian pra-pasca secara rawak dengan rekabentuk kelompok kawalan menunjukkan sama ada terdapat perbezaan antara pengaruh intervensi (pelbagai deria dan kemahiran kognitif) terhadap prestasi persepsual dan kebolehan membaca pelajar disleksia. Ianya juga untuk menentukan keberkesanan intervensi bagi meningkatkan prestasi persepsual dan kebolehan membaca dalam disleksia. Dalam kajian ini, 60 pelajar disleksia mengambil bahagian. Pelajar telah dibahagikan kepada tiga kelompok eksperimen termasuk iaitu 20 pelajar disleksia sebagai kelompok eksperimen satu (E1), 20 pelajar disleksia sebagai kelompok eksperimen dua (E2) dan 20 pelajar disleksia sebagai kelompok kawalan (C). Keberkesanan intervensi enam belas minggu dan 16 sesi bagi kedua-dua kelompok E1 dan E2 telah diukur menggunakan *Reading and Dyslexia Test* (RDT) bagi membezakan pelajar disleksia pada permulaan dan seterusnya *Bender Visual Motor Gestalt Test*

(BVMGT) dan *Rorschach* sebagai ujian asas bukan pembelajaran. Keputusan telah dianalisis menggunakan ANOVA sehalu dan ujiant berpasangan. Hasil bagi intervensi pra dan pasca dalam kalangan tiga kelompok disleksia menunjukkan bahawa walaupun kedua-dua kelompok meningkat daripada intervensi pra kepada pasca intervensi; kelompok E1 yang mengikuti intervensi perkembangan meningkat secara signifikan dengan mendapat prestasi persepsual yang baik ke atas RDT, BVMGT dan subskala R ujian *Rorschach* dan menunjukkan tiada perbezaan yang signifikan dalam $W\%, D\%, Dd\%$; walau bagaimanapun, kelompok E2 yang mengikuti intervensi kognitif menunjukkan perbezaan signifikan dalam RDT, BVMGT dan subskala R ujian *Rorschach* dan tidak menunjukkan perbezaan signifikan dalam subskala $W\%, D\%, Dd\%$ dalam ujian *Rorschach*. Daripada hasil kajian, dapat dikatakan bahawa intervensi meningkatkan prestasi motor-persepsi subjek lebih daripada kebolehan persepsual mereka; namun perbezaan perlakuan oleh ujian berkaitan dengan pembelajaran. Ini menunjukkan bahawa ujian persepsi pada masa kini yang cuba meningkatkan kebolehan berpunca dari aspek pembelajaran tidak akan benar-benar dapat menilai kemampuan persepsi kanak-kanak disleksia. Dapatan kajian adalah lebih konsisten dengan teori perkembangan lag, yang menekankan kelewatan perkembangan saraf, adalah penyebab utama disleksia. Disleksia berlaku apabila pelajar dipaksa melakukan tugas-tugas akademik sebelum mereka mampu untuk berbuat demikian. Disleksia tidak begitu berbeza daripada kanak-kanak lain dan mereka memerlukan lebih banyak masa untuk belajar seperti pelajar-pelajar lain. Hasil kajian ini mencadangkan agar mempertimbangkan beberapa alternatif bagi penilaian dan pemulihan kanak-kanak ini.

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I certify that a Thesis Examination Committee has met on (2 October 2014) to conduct the final examination of (Seyedmorteza Nourbakhsh) on his thesis entitled "Effects of Multisensory Method and Cognitive Skills Training on Perpetual Performance and Reading Ability among Dyslexic Students in Tehran, Iran" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U. (A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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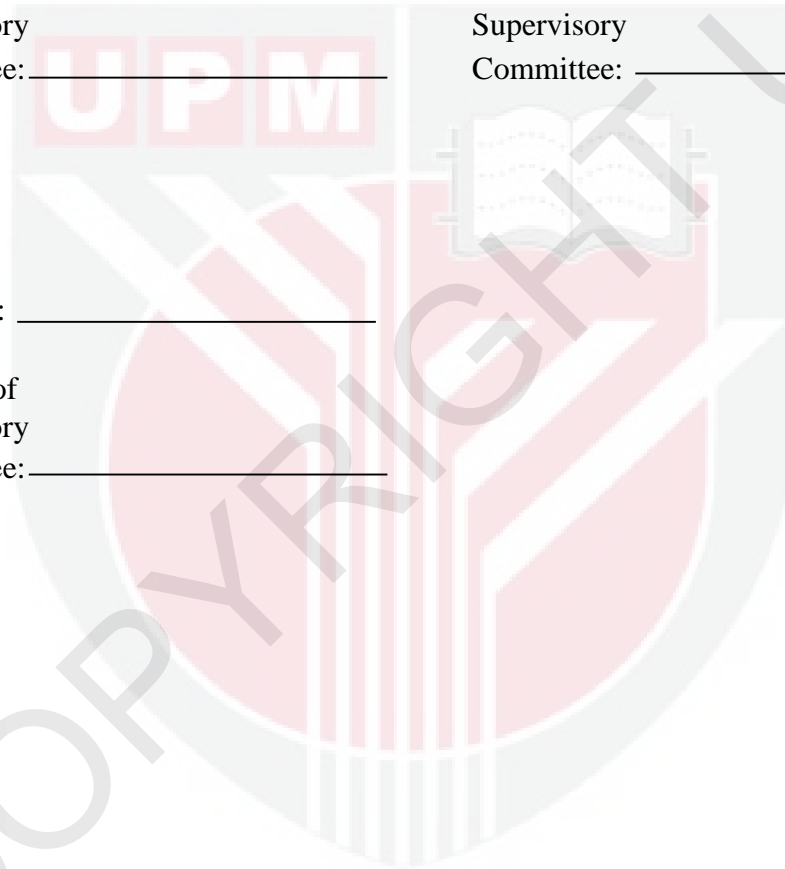


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LIST OF ABRIVATIONS

| | |
|--------------|--|
| BVGMT | Bender Visual Motor Gestalt Motor Test |
| C | Control Group |
| CV | Curriculum Vitea |
| D | Detail Response (in Rorschach test) |
| Dd | Small Detail (in Rorschach test) |
| E1 | Experimental Group 1 |
| E2 | Experimental Group 2 |
| CI | Cognitive Intervention |
| LD | Learning disability |
| LDs | Learning disabilities |
| MI | Multisensory intervention |
| R | Total Responses (in Rorschach test) |
| RDT | Reading and Dyslexia Test |
| SLD | Specific Learning Disorder |
| SLDC | Specific Learning Disability Centers |
| W | Whole Responses (in Rorschach test) |

CHAPTER 1

INTRODUCTION

1.1 Introduction

Dyslexia is an uncommon type of severe poor reading that has confused the medical and educational communities for a long time. According to the American Psychiatric Association's (2000) Diagnostic and Statistical Manual of Mental Disorders (text revision; DSM-IV-TR) dyslexia affects four percent of the population in the United States of America and also is the most common learning disability in children, affecting 10–15% of school age children (Vellutino et al., 2004). According to the Commission on Excellence in Special Education (CESE, 2005) reading is a major problem area for most learning disability children. Nearly 40% of the general school population in US experience difficulty in reading (National Center for Education Statistics, 2005).

Accordance with DSM-5 dyslexia has been categorized as a neurodevelopmental disorders or intellectual developmental disorder which specifies a Specific Learning Disorder (SLD). The disorder contains reading, written expression, and mathematics. The reading deficits are defined in different ways as dyslexia because learning difficulties in the parts of reading, mathematics, and written expression usually occur together.

Some studies on dyslexia in Iran indicate the incidence of dyslexia in all grades generally was about 10% (roughly 66% male and 34% female) (Fallahchai, 1995; Ghonsooly, 2009; Narimani et al., 2009; Sedaghati et al., 2010; Seif-e-naraghy et al., 2005). Rahimian, Boogar and Sadeghi (2007) reported that the prevalence of dyslexia in third grade students was 9.5% for boys and 4.4% for girls in Shahreza (Naghdi, 2011). Sedaghati, Foroughi, Shafiei, and Maracy (2010) conducted a survey in Isfahan, Iran on prevalence of dyslexia in first to fifth grade elementary students. This survey revealed the highest prevalence of reading disorder in the first grade male students (25%), and the lowest in fifth grade female students (0%). The incidence of dyslexia in all grades generally was 10%. The overall incidence in boys (66%) was two times more than this portion in girls (34%). Additionally, in another province (Ardabil, Iran) the incidence was reported 13% by Narimany and Rajabi (2005). In a meta-analysis by Behrad (2005), the incidence of dyslexia in Iranian students was reported 4.58%. Narimany, abolghasemi, rajabi, Nazari and Zahed (2009) conducted a study in Ardabil province. According to Narimany et al. (2012) one fourth of academic failure in primary schools is explained by dyslexia. Additionally, dyslexia leads to low self-esteem, and poor interpersonal relationship. This learning disability is also sometimes comorbid with Attention deficit and hyperactivity disorder and conduct disorder. Taken together, in accordance with high prevalence of dyslexia in Iran and last long outcomes of it, this study tries to address this problem.

Mercer and Pullen (2005); and McNamara (2007) documented that most learning disabled students because of unsuccessful instructional experiences do not enjoy academic achievement and educational inadequacy leads to poor negative consequences, low self-concept, emotional disorder such as isolation, depression, loneliness, even suicide; motivational and social cognition problems, and also behavioral disorders. Readers who struggle with dyslexia face significant learning difficulties. Elementary pupils need a broad range of interventions to encounter the challenges and pressures of these students (Biancarosa et al., 2004). Also elementary mentors often lack the knowledge and abilities for advocating students' reading skills and suggest minor and ineffectual measures of addressing reading insufficiencies to a population of pupils perceived to be "reading to learn," not learning to read, by the time they leave elementary school (Kamil, 2003).

It is supposed that amongst all aspects of the learning process, perception plays an essential role in learning procedure and also ultimate academic skills such as writing and reading (Venn, 2004). The term perception is identified as ability to attribute meaning to sensory information or the procedure by which an organism interprets and detects information from the environment by means of the sensory sensations (Eysenck, 2004). Smith (2004) indicated that the perception, particularly visual perception, has a significant role in differentiating students with and without dyslexia.

The common reading problems in dyslexic students that originate from visual perception are confusing similar-looking letters, difficulty recognizing and remembering "sight" words, frequently losing place when reading, confusing similar-looking words, reversing words, poor memory for printed words, trouble for finding letters in words (words in sentences), poor comprehension of themes and main ideas, and also number sequences, diagrams, illustrations and so on (See ICD-10 & DSM-IV).

Etiologically, on the basis of the main deficit theories on the causes of characteristics of dyslexia, it indicated that there are three major deficits: the phonological deficit theory that explains children with dyslexia show difficulties in connecting sounds with symbols in reading, the theory of cerebellar deficit proposes indicates there is a problem in appropriate processing related to reading, the theory of magnocellular deficit proposes the problems occur as a result of auditory or visual deficits (Ministry of Education, 2012).

The assessment and intervention of dyslexia is influenced by the effective definitions pertaining to discrepancy between mental ability and achievement in one or more cognitive and developmental aspects. There are some agreements among theoreticians in terms of assessing general reading ability including reading and spelling skills, in particular across single word and connected text levels, cognitive skills and memory performances including storage and retrieval, and identifying phonological processing deficiency including phonological awareness, phonological memory, and rapid naming in children with dyslexia (Frost & Emery, 2009; Thomson, 2010).

The search to find the effective remedial interventions for dyslexic students has been a long one. Nevertheless, recently several studies indicate some objective information which provides reliable solutions to basic matters about educative interventions for students with poor reading. The most obvious and yet main reason is that reading difficulties are heterogeneous. For instance, in a comprehensive summary of study on reading and instruction of reading printed by the National Research Council in the United States, three major reasons for reading problems were recognized: 1) difficulties in perception and applying the alphabetic structures to attain accurate reading skills; 2) poor verbal strategies and knowledge that are exactly necessary for understanding of written items; and, 3) lack of original motivation to read and disappointment to develop a mature appreciation of the rewards of reading (Torgesen, 2006).

Intervention researches focusing on children with dyslexia definitely produce different assumptions about the necessary elements of any intervention and education. This diversity of attitudes also reveals the fact that dyslexia is a continuum and ranges from moderate to serious and also different interventions and methods in different degrees are supposed necessary in answering to the needs of children with dyslexia (Elliot, Davidson & Lewin, 2007).

Regardless of the respective underpinning perspectives, some authors suggest any educational interventions should consider a set of effective strategies and practices that include the main approaches. For example Tompson (2010) pointed out the key content aspects of an effective educational intervention for working with dyslexic children are explicit training in phonological processing including phonological awareness, word-level work and phonological decoding, independent and supported reading of progressively more problematic texts, and preparation of comprehension strategies in period of reading texts. Moreover, the key process aspects of an effective educational intervention for working with children with dyslexia are using phonetic instruction, employing multisensory interventions; insuring automatization through practice and review; providing mental modelling; giving cumulative, sequential, and small steps; and providing opportunities for success.

1.2 Problem Statement

Reading is very important to progress in our society. If our children cannot read, they cannot succeed in life. Without the ability to read, the opportunities for academic and occupational success are limited. Failure in reading not only constitutes educational problems, but it also rises to the level of a major public health problem (Lerner & Kline, 2006). Reading experience strongly influences a student's self-image, self-respect and feeling of competency; furthermore, reading failure can lead to misbehavior, anxiety, and a lack of motivation (Mercer & Pullen, 2009), and for this reason several theories have been advanced to explain the nature, assessment and remediate reading difficulties.

Some researchers believe that more than 25% of educational drop off is originated from the dyslexia in primary students. Shafiee et al (2010) reported that the incidence

of the dyslexia in Iran is 10%. On the other hand, studies have shown that if these dyslexia students get recognized at early years of the school time and referred to therapeutical centers, about 85% of these students can be reached to the norm level; in addition, the lack of recognition of these students can make deepest problem in these students; hence, the intervention on these students is very crucial issue (Siahkalroudi, Alizadeh, and Kooshesh, 2009). There have been few studies on intervention methods in students with dyslexia in Iran (Esfahani Khaleghi1, Asgharnejad Farid, Ahadi and Mousavi, 2013; Haghightazade, 2012; Mihandoost, et al., 2012; Heidari et al., 2012; Yaghoubi and Ahadi, 2004; Dehghani et al, 2007).

Esfahani Khaleghi1 et al. (2013) compared methods of meta-cognition teaching and teaching of fine motor skills on reading functions of male dyslexia students at 3rd grade of elementary schools in Iran. Results showed that meta-cognition teaching was more effective on reading function of dyslexia students. However, the meta-cognitive interventions cannot make recovery in sub-scales of calling pictures and process sign of dyslexia students.

Heidari et al. (2012) investigated the effectiveness of Davis and Fernald methods on reading performance of dyslexia in third elementary school students in Iran. The results showed that there was a significant difference between the mean scores of reading test in the experimental and the control groups in the post test ($p < 0.001$). Also, the results of pair wise comparison of groups showed that there was significant difference between the mean scores of Davis and Fernald groups in the post test ($p < 0.001$).

Haghightazade (2012) examined the effects of the mixed-motor-perception training on the reading performances of the dyslexia elementary students of Isfahan, Iran. The results revealed that there was a significant difference ($p < 0.001$) between the average scores of the post-tests of the experimental and the control group. The overall results of the present study showed that the mixed-sensory-motor-perception training has been effective on the dyslexia students' reading performances and has made a significant raise in the average scores of their post-tests.

Mihandoost et al. (2012) investigated the effectiveness of the Barton intervention programme on reading skills of 64 dyslexic students in Ilam, Iran. The findings showed that experimental groups outperformed the control after the treatment of Barton intervention programme in the reading phonics, reading comprehension and reading fluency. Yaghoubi and Ahadi (2004) found that training of meta-cognition approaches can lead to the recovery of dyslexia students' reading affairs. Dehghani et al (2007) also showed that training of meta-cognitive approaches lead to the healing of dyslexia students' reading issues. Most of studies in this field focus on traditional methods of intervention on students with dyslexia. Students with dyslexia experience developmental problems with reading that these methods do not pay attention to them. Additionally, the study aims to measure the effectiveness of developmental and cognitive intervention using learning based and non-learning based methods.

Generally, there is still debate about the exact nature of dyslexia, and this has led to different approaches, interventions and strategies based on the relevant theories. For instance, Elliot et al. (2007) pointed to some of the traditional and also the most recent attitudes used for approval the achievement and educational experience of dyslexic learners such as development of phonological skills, additional support strategies, intensive remedial instruction, facilitating a positive sense of self, partnership between parents and teachers, multisensory teaching system, spelling and vocabulary training, teaching based on learners' preferred learning style, and use of special computer software.

Amongst many remedial approaches to dyslexia, cognitive and developmental approaches more than other ideas are going to answer the problems related to learning disabilities in particular dyslexia or reading efficiency (Lerner & Kline, 2006). These approaches in recent years take into account both qualitative and quantitative information and may consider discrepancy scores, which measure the discrepancy between the student's achievement and potential. For this reason these two remedial approaches are selected for comparison in the current study.

Developmental studies consider learning difficulties as a result of immaturity. Learning problems may be mainly a lag in a child's maturation of a certain process for example; Diamond (1983) found younger students in the early grades are disposed to have learning difficulties than older children placed in those grades. The maturational studies to dyslexia stress the natural progression of the child's growth and the sequential development of cognitive abilities that are needed for the child to acquire certain abilities (Lerner & Johns, 2008). On the other hand, dyslexia result from slow maturation of motor, attention processes, visual-perceptual, and language that lead to learning and cognitive difficulties (Smith, 2004). The maturational studies are based on the hypothesis that children mature at rates according to their biological clock (Allen et al., 2009). As research has indicated children who enter pre-school center ready for the school's program remain as the top students from grade to grade. Meanwhile, it is predictable that more than 50% percent of children who enter pre-school center are not ready for the school's program (Smith, 2004).

Bender (1957) claimed maturational lag refers to slowness in specific aspects of neurological development. Accordingly, each person has a preset rate of growth for various human functions, including cognitive abilities. The maturational lag adopts a developmental viewpoint and considers the cerebral maturation to be less rapid in children with dyslexia (Dalby, 1979). The maturational lag assumption was originally formulated to characterize different assumptions about the neurobiology of reading dysfunction, with some researchers particularly theorizing that reading difficulties represented a delay in the maturation of the brain (Satz et al., 1979). These applications of lag model were tested in longitudinal studies of a variety of skills in dyslexia that were thought to index brain function. The maturational lag hypothesis predicted that poor readers would "catch up" with peers on these skills as the brain matured (Francis et al., 1996). Based on this hypothesis several interventions and instructional methods have been developed to remediate learning disabilities in particular dyslexia. One of the most important and broad developmental interventions is Orton-Gillingham method (multisensory) that is

commonly used with both children and adults with reading disabilities (Olitsky et al., 2006). The phrase “multisensory intervention” refers to the structured, sequential, multisensory techniques established by Dr. Orton and Ms. Gillingham (IDA, 2012). Multisensory intervention relies on the use of the sensory modalities including visual, auditory, and kinesthetic and tactile pathways in order to reinforce learning in the brain (Hoefler, 2004).

On the other hand, cognitive studies to learning disabilities consider the major cause for occurring dyslexia is cognitive and perceptual deficits. Deficiencies in one or more fundamental cognitive processing and meta-cognitive skills causes dyslexia, so that they cannot easily learn how to learn, how to control, and how to direct their thoughts in order to learn (Lerner et al., 2006). These children are faced with inadequate processing, organizing, and interpreting. Cognitive psychologists acknowledge reading to be one of the most interactive and complex examples of human information processing. Accordingly, they suppose students with dyslexia display difficulties with cognitive processing that negatively influence their reading performances which include difficulties with executive functioning, self-regulation, and different aspects of cognitive processes such as some difficulties in memory, attention, perception, monitoring, and learning strategies, short term memory, processing speed, and nonverbal reasoning (Vaughn et al., 2012).

This is important to consider that fundamentally dyslexia is a difficulty with information processing and students with dyslexia have difficulties at different stages of information processing (Reid, 2005). In view of that, learning is a change in individuals’ mental structures that creates the capacity to demonstrate different behaviors (Eggen et al., 2007) and focus on how stimulation from the environment goes through the processes of attention, perception, and storage throughout a series of distinct memory stores (Moos, 2012).

Based on information processing approach, three important techniques are developed that include techniques for analyzing cognitive processing (e.g., “What are the cognitive processes involved to accomplish a cognitive task?”), techniques for analyzing mental representations (e.g., “How is knowledge represented in memory?”), and a description of the architecture of the cognitive system (e.g., “How does information flow through the human memory system?”) (Reynolds et al., 2003). Therefore, cognitive intervention for children with dyslexia focus on integrating executive functions and self-regulation into academic activities, strengthening visual and auditory memory performances while engaged in reading, developing mnemonic devices to remember information, using graphic organizers and other text organizers to remember what they read or learn, and applying cognitive and metacognitive strategies into reading activities (Vaughn et al., 2012).

Generally, on the one hand, researches based on maturational lag hypothesis suppose that maturational delay leads to reading difficulties in dyslexic students and there is not any deficiency. While the cognitive studies assume cognitive and metacognitive deficiencies lead to reading problems in student with dyslexia and there is not any maturational delay. To response to this challenge, the main problem of the present

research is to compare the effectiveness of multisensory training adopted from Orton-Gillingham program and cognitive skills intervention on reading and perceptual abilities of students with dyslexia.

The second problem in the present research is related to another controversial issue about dyslexia. There is an agreement among all approaches to dyslexia, which indicates there is a discrepancy between reading problems in dyslexic children's actual academic performance and their apparent potential to learn. As Lyon (2001) demonstrated, the concept of dyslexia focuses on the notion of a discrepancy between a child's academic achievement and his/her apparent capacity to learn because the important part of the definition of dyslexic is its exclusion: these kinds of students, whose condition cannot be attributed primarily to mental retardation, emotional disturbance, cultural difference, or disadvantages. That is a child with dyslexia has a severe discrepancy between achievement (what a student has actually learned) and intellectual ability (what a student is potentially capable of learning). With the discrepancy clarified, there are further instruments needed but not any based on learning, verbal and achievement.

Most of the current tests and measures to assess learning and cognitive (perception and memory) abilities of learning disabled students are achievement test, rather than a measure of potential (ability) of learning by disabled children (Mather et al., 2006). In addition, most of the current instruments to evaluate the effectiveness of interventions for dyslexic children are based on learning, experiences, and pre-academic skills. As this case, there is still debate that the available instruments to assess dyslexic students are not sufficient (Swanson et al., 2005). Thereby, it appears that all the current remedial programs and interventions, which have been applied for dyslexic students, were designed on the basis of the results of the existing instruments and consequently these interventions are confronted with different results and disagreement. Thus, the second problem in the present research focused on comparing perceptual abilities of dyslexic students in two types of measure, means learning based test including Bender Visual Motor Gestalt Test (BVMGT) and non-learning based test (Rorschach test) before and after the interventions.

Overall, the main problems in the present study focused on two aspects: What are the influences of interventions (multisensory and cognitive skills interventions) on perceptual performances and reading ability of students with dyslexia? Also, are there any differences between the effects of multisensory and cognitive skills interventions on the perceptual performances and reading ability of students with dyslexia?

1.3 Significance of the Study

There is a problem with awareness of specific learning difficulties in Iran. A high measure of Iranian students is considered dyslexic children while there is a lack of comprehensive knowledge of literacy problems. However, currently the increase in research in this area (Aguilar-Vafaiea et al., 2012; Ameri et al., 2010; Amini, 1997; Danekar, 1993; Fallahi et al., 2011; Shirazi, 1996; Tehrani Golami, 2004), as well as

the increase in the numbers of graduating exceptional children's psychologists and speech therapists, and special centers for serving children with learning disabilities have helped in raising public awareness of learning difficulties (Tehrani Golami, 2004). At the present time there are several supportive educational centers as well as specific centers for children with learning disabilities and psychology and counseling services in most of cities in Iran that serve students with learning disabilities. Furthermore, there are a number of private special schools dedicated to instruction of dyslexic children (Tehrani Golami, 2004). In Iran, generally different methods include speech therapy, behavior therapy, multisensory therapy, and cognitive and metacognitive skills training are used employ to help children with learning difficulties. Unfortunately, there is no remedial and interventional comprehensive system and program to guide specialists on what the effective interventions there are for helping children with different types of learning disabilities.

The purpose of this study was to examine the effect of specialized education on reading ability skills with dyslexic students in third grade. The critical issue in explanation, prediction, and management of perceptual abilities in students with dyslexia is whether cognitive deficiencies lead to dyslexia as supposed by information processing theory (cognitive approach) or developmental lag and immaturity as supposed by maturational lag theory (developmental approach). It could be assumed that because of the above mentioned widening gap; there is a need to clarify the capability of these two theories and their role to evoke challenges and supports related to the controversial debate between the psychological theories, in particular the two main theories including developmental and cognitive approaches such clarification would learn to a better understanding of weaknesses and strengths of current instruments and interventions which help in the measurement and remediation of dyslexia.

This study is significant to administrators in special education departments who determine qualifications for specialized instruction. That is, a special needs student requires specialized instruction. Teachers and psychologists determine if a student is in need of specialized instruction, and if so, then the student may be considered to have a special need. If a student does not require special instruction to keep up with his peers, then his needs can be handled by regular educators. This is what is special about a special needs student.

This study could also be significant to educators who have students who are at risk for reading failure, to assist in determining methods of instruction and development of lesson plans and curriculum. Moreover, the effort is to try and use the results of this study to help determining the most effective method of intervention for children with dyslexia. The result is to implement special education for all school systems.

Aside from the benefits to administrators and educators this study could also assist in changing social attitude toward the treatment of these kinds of children and enable hundreds of thousands of dyslexia children throughout Iran to receive the necessary reading interventions to succeed in reading. With academic support for all students who experience reading failure or risk for failure, the number of illiterate adults in

the country will be drastically decreased. With this research, along with related research, our society will be equipped with the understanding and tools necessary to guide our education system so that all children may receive an education that fits their specific needs.

Hence, the present research takes an essential step to address the lack of clarity and disagreements in two areas pertaining to assessment and intervention. Additionally, the findings of this study are also expected to have practical value and important implications for parents, educational practitioners, and mental health professionals. Moreover, results of this research can be applicable for child guidance centers, psychiatry and psychology clinics and specific learning disability clinics, and also can be usable for child research centers.

1.4 Objectives of the Study

The general objective of the study was to examine the effects of multisensory intervention and cognitive skills intervention on the perceptual performance and reading ability of dyslexic students in elementary schools in Tehran Iran.

Specific objectives

The study has two specific objectives as follows:

To examine the effect of multisensory intervention on perceptual performance and reading ability of dyslexic students

To examine the effect of cognitive skills intervention on perceptual performance and reading ability of dyslexic students

To compare the effect of multisensory intervention and cognitive skills intervention on perceptual performance and reading ability of dyslexic students

1.5 Null Hypotheses

In this study, six main null hypotheses were tested. Each main hypothesis comprised several sub-hypotheses. The hypotheses tested were as follows:

H01: There are no significant differences in Reading and Dyslexia Test (RDT) performances before and after intervention among dyslexic students in E1, E2, and control groups.

H02: There are no significant differences in the Bender Visual Motor Gestalt Motor Test (BVMGT) performances before and after intervention among dyslexic students in E1, E2, and control groups.

H03: There are no significant differences in performances of R subscale of Rorschach test before and after intervention among dyslexic students in E1, E2, and control groups.

H04: There are no significant differences in performances of W% symbol of Rorschach test before and after intervention among dyslexic students E1, E2, and control groups.

H05: There are no significant differences in performances of D% symbol of Rorschach test before and after intervention among dyslexic students in E1, E2, and control groups.

H06: There are no significant differences in performances of Dd% subscale of Rorschach test before and after intervention among dyslexic students in E1, E2, and control groups.

1.6 Definitions of Terms

Dyslexia

Conceptual: Dyslexia is known as a series of reading disabilities without any significant problem in sensory, IQ limitation, serious emotional trauma, and educational deprivation suffering from deficiencies to speak, listen, read, write, spell, reason, and organize information (Shaywitz, 2008).

Operational: In this research students with dyslexia were referred to the Specific learning disabilities centers in Tehran (Iran) and received a comprehensive diagnostic evaluation and participated in the research. At first, participants took the Reading and Dyslexic Test (RDT) to detect their reading abilities and also their reading difficulties. Evaluation was conducted by centers' experienced psychologists according to ICD-10 and DSM-IV codes: F81.0/315.00. Criteria for participation in the study were that the child was affected in any part of the reading ability comprising difficulty with accurate or fluent word recognition, deficit in word decoding, problem in reading rate, weakness in oral reading, and reading comprehension. Participants were selected according to referrals by ordinary school in two specific learning disabilities centers (SLDC) amongst 4 public centers in Tehran (where these students referred there). Between 344 referral students at beginning of the education year (2010), 244 students met the criteria for a diagnosis of LD according to comprehensive diagnostic evaluations. Among students with LD, 96 students were diagnosed as dyslexic by the same criteria. Participants took the RDT to detect their reading ability or disability. Finally, 60 dyslexic students remained and participated in the research and placed into 3 groups by equally including two experimental and one control groups - each group 20 - were entered to the research. The groups also were examined by learning based test (BVMGT) and non-learning-based test (Rorschach). All the tests were conducted individually.

Cognitive skills intervention

Conceptual: Cognitive skills intervention is derived from the information processing theory of learning difficulties including some the most important of cognitive skills and meta-cognitive strategies that are used to improve cognitive skills in people with learning difficulties including dyslexia. These strategies will be used to help dyslexic students process and manipulate the information in their mind and examples include taking notes, asking questions, or filling out a chart. Cognitive strategies tend to be very task specific, meaning that certain cognitive strategies are useful when learning or performing certain tasks. Meta-cognitive strategies are more executive in nature. They are the strategies that a student uses when planning, monitoring, and evaluating learning or strategy performance. For this reason, they are often referred to as self-regulatory strategies.

Operational: In the present research cognitive skills intervention focused on memory strategies, word recognition skills, reading accuracy and fluency, self-questioning strategy followed by visual imagery, and meta-cognition strategies.

Perceptual performance

Conceptual: Perceptual performance is the wide range a process of understanding information received by the senses has been done in areas of perceptual motor proficiency. The measurement of perceptual performance assesses the level of perceptual abilities and identifies deficits in perceptual skills development.

Operational: In the research perceptual performance including performance of students with dyslexia in learning based test (BVMGT) and non-learning based test (Rorschach test) in students with dyslexia. That is, the present research focused on comparing perceptual abilities of dyslexic students before and after the interventions in two types of measures: learning based test (BVMGT) and non-learning-based test (Rorschach test).

Reading ability

Conceptual: Reading ability including reading and spelling skills, in particular across single word and connected text levels, cognitive skills and memory performances including storage and retrieval, and identifying phonological processing deficiency including phonological awareness, phonological memory, and rapid naming in children with dyslexia

Operational: In the study reading ability focus on performances of dyslexic students in reading ability, therefore five subscales of this research are related to reading performance. In this research reading ability is scored the performances in five subscales such words reading, word chains reading, word comprehension, phoneme deletion, and pseudo-word reading.

Multisensory intervention

Conceptual: The multisensory intervention is a frequently used intervention method for students with learning disabilities. Multisensory intervention employs two or more sensory modalities simultaneously (visual, auditory, tactile, and kinesthetic). Hence, it offers multiple pathways for helping students to learn alphabetic patterns and words. Many multisensory programs are based on the Orton-Gillingham instructional approach for teaching language-based academic skills. The Orton-Gillingham instructional approach stresses the core content must include sequenced teaching of the structure and use of sounds, syllables, words, sentences, and written discourse. Orton-Gillingham instructional approach was created by Dr. Samuel Orton in 1937 and was developed into a curriculum by Anna Gillingham and Bessie Stillman (The International Dyslexia Association [IDA], 2012).

Operational: In the present research, multisensory intervention focused on three sensory modalities simultaneously (visual, auditory, and tactile) that include visual perception skills, auditory perception skills, visual tracking skills, phoneme tracking skills in reading, alphabet tracking skills in reading, spell tracking skills in reading, and word tracking skills in reading.

Learning-based tests

Conceptual: The tests which are directly dependent on learning. In addition, learning also is based on culture science, memory, practice, training and laboratorial effects. The factors are influence in reducing or increasing the responses and about the age range.

Operational: In the present research the tests which are directly dependent on learning abilities are RDT and BVMGT.

Reading and Dyslexia Test (RDT): the test is an individually administered test for diagnosing reading ability or disability in dyslexic students and designed to assess reading abilities for male and female students in grades 1 to 5 in elementary school. The test has five subtests and is capable of recognizing students' performances in areas of word reading, chain word reading, word comprehension, phoneme deletion, and pseudo-word reading.

Bender Visual Motor Gestalt Test (BVMGT): the test is a psychological assessment instrument used to evaluate visual-motor functioning, visual perception skills and motor coordination in both children and adults. BVMGT is an individually administered test of performance in copying designs and provides for diagnosis of two indications including brain damage and developmental scoring for young children aged 5 to 11 years (Lerner & Kline, 2006). These figures are presented to the examinee one at a time; then, the examinee is asked to copy the figure on a blank sheet of paper; scores on the test are used to identify possible organic brain damage and the degree of maturation of the nervous system. There is also the individually administered test of performance in copying designs (Lerner & Kline, 2006). In this research, the developmental indicator of students is considered.

Non-learning based test

Conceptual: In the present research the test which is not directly dependent on learning, science, memory, practice, training and laboratorial effects, is the Rorschach test (Exner, 1993).

Rorschach test: The test is often considered as a classic projective instrument. Rorschach consists of 1 bilaterally symmetrically inkblot 5½-9½-inch cards. Five cards are in black and white, two cards are red and gray, and three are multicolored. The subjects of this study respond by telling and the examiner records, codes, scores, and interpret responses. This test has three features categories that include location (or which part of blot does the response occur), determinants (or why an object is reported), and additionally popular (high frequency or ordinary responses) and original (or extraordinary responses). Each of the three main categories contains many subcategories (Groth-Marnat, 2003).

Operational: The test is a perception test which is not directly dependent on learning and no depends on the culture and is independent from learning effects on children perception of their environment and their interactions with their surroundings.

1.7 Theoretical Framework

In this study two intervention methods were administered; multisensory intervention which is adopted from the Orton-Gillingham program based on maturational lag theory (developmental approach) and cognitive skills intervention which is based on information processing theory.

The maturational developmental theory stresses that dyslexia result from slower maturing of visual-perceptual, motor, language, and attention processes that lead to cognitive and learning difficulties (Smith, 2004). Based on maturational theory several interventions and instructional methods have been developed to remediate learning disabilities in particular dyslexia. One of the most important and broad developmental interventions is Orton-Gillingham method that commonly is used with both children and adults with other reading disabilities. Multisensory intervention has its roots in the Orton-Gillingham approach. Orton theorized that dyslexia result from a dysfunction in visual perception, visual memory, and perceptual functioning caused by a neurological-maturational lag (Olitsky & Nelson, 2006). The Orton-Gillingham method has focused on the language triangle, which uses the visual, auditory, and kinaesthetic pathways to teach dyslexic students the structure of the language. This program is originally based on Vygotsky's theory which suggests that what children can do today with assistance, they will be able to do tomorrow proficiently on their own (Cazdan, 1981). Moreover, the Orton-Gillingham approach emphasizes that the core content of remedial program has to include carefully sequenced teaching of the structure and use of sounds, syllables, words, sentences, and written discourse (Birsh, 2005). In the present research, multisensory intervention focused on three sensory modalities simultaneously (visual, auditory, and tactile) that include visual perception skills, auditory perception

skills, visual tracking skills, phoneme tracking skills in reading, alphabet tracking skills in reading, spell tracking skills in reading, and word tracking skills in reading.

On the other hand, cognitive skills intervention programs are rooted in cognitive theories including information processing model. As research has indicated, children with dyslexia have different problems in different stages of information processing such as difficulties on tasks involving processing of visual-spatial information (Weiler et al., 2002), more cognitive inhibition (Wang et al., 2012), difficulties on higher-order processing or executive control processes (Mercer & Pullen, 2009), deficits in visual attention span (Bosse et al., 2007), and difficulties in perceptual processing speed (Stenneken et al., 2011). According to this, a considerable amount of literature has been published on remediation cognitive and metacognitive deficits in different stage of information processing in children with dyslexia. These studies focus on improving attention span and memories strategies; learning the complex concept and fundamental problem-solving skills, and practice to retain abstract information (Vaughn et al., 2007); increasing phonological awareness and skills (Schneider et al., 2000; Vadasy et al., 2002); and training decoding, and word reading, writing exercises, and also practicing comprehension methods while reading texts (Scammacca et al., 2007). The instructional interventions based on information processing theory for children with dyslexia focus on integrating executive functions and self-regulation into academic activities, strengthening visual and auditory memory performances while engaged in reading, developing mnemonic devices to remember information, using graphic organizers and other text organizers to remember what they read or learn, and applying cognitive and metacognitive strategies into reading activities (Vaughn et al., 2012). In present research cognitive skills intervention focused on memory strategies, word recognition skills, reading accuracy and fluency, self-questioning strategy followed by visual imagery, and meta-cognition strategies.

The reason for selecting these two types of theories for the present research is because there is a challenge between maturational lag theory and information processing theory. As mentioned before, maturational lag theory supposes that maturational delay leads to reading difficulties in dyslexic students although there is no deficiency. On the other hand, information processing theory suppose cognitive and metacognitive deficiencies lead to reading problems in student with dyslexia and there is not any maturational delay. To respond to this challenge, the effectiveness of multisensory intervention adopted from Orton-Gillingham program based on maturational lag theory and cognitive skills intervention based on information processing theory on reading and perceptual abilities of students with dyslexia are examined.

As well, two types of tests, including learning based test (BVMGT) and non-learning based test (Rorschach test) were administered to investigate the effectiveness of the interventions in students with dyslexia. BVMGT was applied as a visual motor test (and as a learning-based test) for assessing visual-motor perception among dyslexic students. The Rorschach test was administered to assess visual perception of dyslexic students as a test that is not dependent on academic learning.

These two types of tests (learning based and non-learning based tests) were selected because the review of literatures showed there is a discrepancy between academic learning and performances of learning by disabled children and their potential to learn. It should be noted that most of the current tests to assess learning and cognitive abilities of learning among disabled students including dyslexia, are achievement and learning based tests, rather than a measure of potential of learning by disabled children (Mather & Gregg, 2006). To respond these challenge perceptual abilities of dyslexic students have been compared in two types of measure, means learning based test (BVMGT) and non-learning based test (Rorschach test) before and after the interventions.

1.8 Conceptual Framework

The conceptual framework of this research was designed based on a pretest-posttest experimental design with control group. This based on the literature related to developmental and cognitive theories, which identified several factors that influence perceptual performance and reading abilities of dyslexic students. As related to developmental and cognitive theories, the concept under this study indicated that the student's reading achievement is suggested to be strongly influenced by perceptual ability.

Regarding to the developmental theory the perceptual and reading ability are dependent variables (DV) while developmental skills training is a predictor variable of the proposed model of the study namely, multisensory factors (visual, auditory, and kinesthetic) related to maturational lag. Related to cognitive theory the concept study in this research is that the students' learning ability is assumed perceptual problems may be the most important factor in learning and strongly is influenced by cognitive skills intervention which is required processing, organizing, and interpreting on information.

This study focused on two types of interventions as the main independent variables (IV) including multisensory intervention for the first experimental group and cognitive skills intervention for the second experimental group. In relation to the two dependent variables (DV 1 and 2) that are perceptual performance (DV1) and reading ability (DV2) of dyslexic students, the first dependent variable (DV1) is perceptual performance including performance of students with dyslexia on learning based test including BVMGT and non-learning based test comprising Rorschach, and the second dependent variable (DV2) is reading abilities in students with dyslexia. It should be mentioned that no relevant intervention plans take place on the control group.

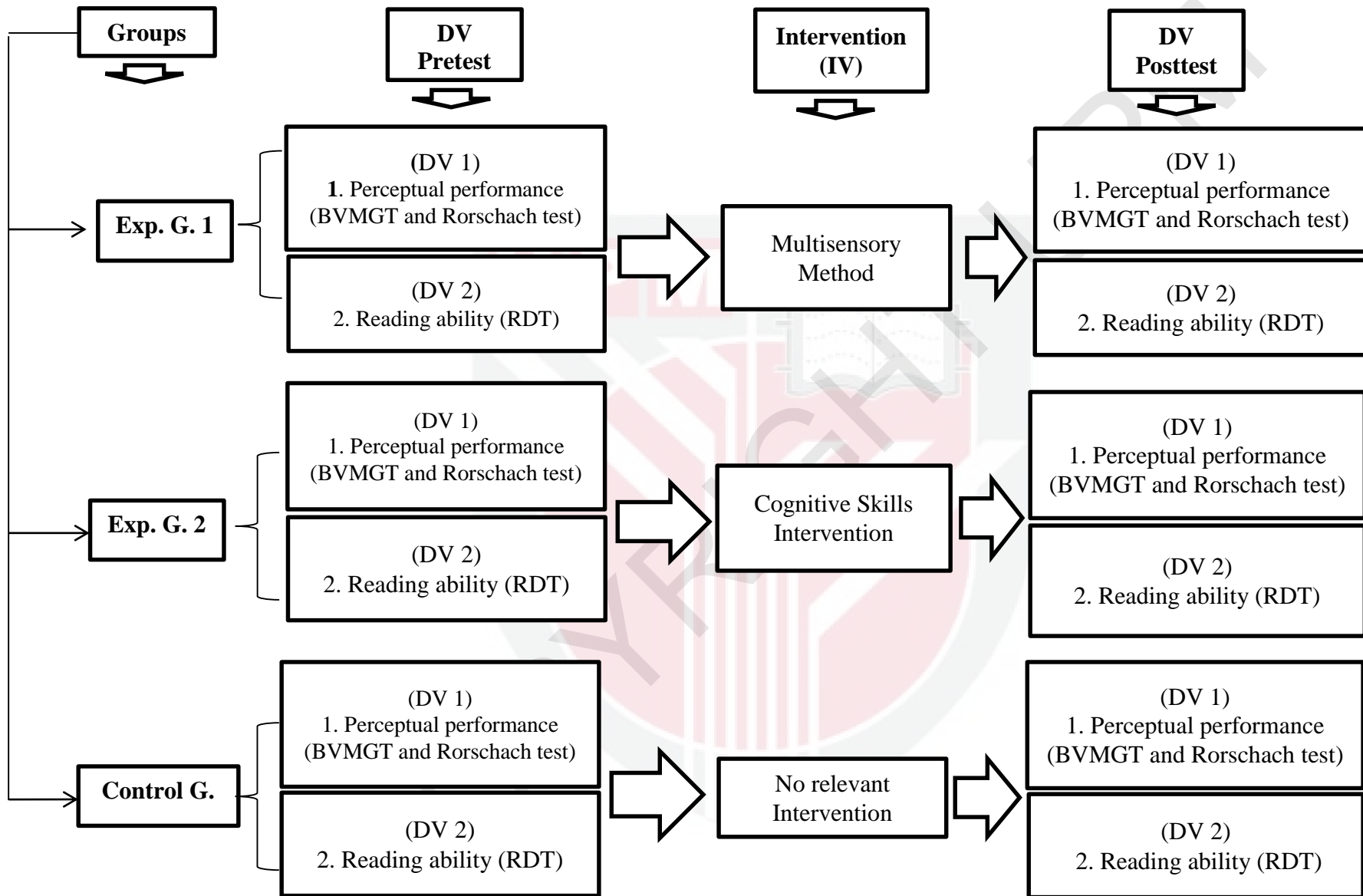


Figure 0.1 Conceptual framework of the study

1.9 Limitation of the Study

This study was conducted based on certain limitations:

Although medical concerns and psychotropic medication were considered as importance states of this research and earlier the research was controlled but selection of dyslexic students who had never received any psychotropic medication was not considered in this study, this may influenced the outcome of the research.

Although it was stated that there was no any psycho-educational training before the research that may influence the result of the research, it was not seriously considered in this study. Since the participants of this research were selected from referrals by elementary third grade ordinary school to Specific Learning Disability Centers, it could be viewed that most of these students have been served educational remediation considerations when they were in the first and second grade, as this result, finding pure students without learning and educational manipulations was not possible. Also there is low probability of match students with dyslexia based on social-class and family conditions.

One of the limitations of this study was selection of only male students in the study. In Iran boys and girls go to gender specific schools and educational units. Therefore inclusion of boys and girls in this experimental research was beyond the resources of the researcher. On the other hand, in some previous studies it has been reported that the number of boys with dyslexia are three times more than the number of girls (Danesh, 2005; Rahimian Boogar and Sadeghi, 2007; Sedaghati, et al., 2010). Thus in this study only boys were included in the sample.

This study was administered at the Specific Learning Disability Centers (SLDC) for Children with dyslexia in Tehran city. The researcher decided to conduct the present study in Teheran, because, intervention and diagnostic activities are more organized in Tehran. On the other hand, it was not economic or possible to include another city and sample in the study as this is the case in most of experimental studies. Therefore, the results of the current study are limited to the current sample and the location and cannot be generalized to other populations.

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