

**THE EFFECT OF SENSORY MOTOR INTEGRATION
METHOD IN INCREASING LEARNING IN THE
CHILDREN WITH NONVERBAL LEARNING
DISABILITIES**

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Abstract

Those children who suffer from Nonverbal learning disability experience more problems in movement coordination , due to defects in several areas such as: visual ,spatial, sensory ,conceptual ,psychological ,motor organization and Nonverbal direction,(Forrest,2007).Due to multiple and complex defects and overlaps with many of children disabilities such as :hyperactivity ,autism, Asperger ,and math learning disorder, Nonverbal learning disability still doesn't have any operational definition in diagnostic and statical manual of mental disorders.In addition , these children are more likely to creat secondary behavioral problems such as :anxiety, mental and behavioral obsession,or depression.(Whithney,2002).Therefore ,children with Nonverbal learning disability need fast and effective intervention associated with treatment methods.In this paper, considering sensory-motor activities and their relation with the individual's levels of learning in one hand ,and on the other paying attention to the obvious problems associated with visual , spatial and dynamic perceptions in the children with Non verbal learning disability, we have examined the effectiveness of integration methods related to

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sensory-motor behavioral on the motor behaviors of children with Non verbal learning disability. The current research method is an experimental design with one element and repeated measurements. Statistical universe of this study includes male and female students who are studying in second to sixth grade of elementary school and live in Rasht. The number of our Statistical universe is 11346 and we have 16 children with Nonverbal learning disability. Devices of clinical perceptions are : Wechsler intelligence for children –revised (WISC-R). Iranian mathematics test –Keymat. sufficient and insufficient reading Test .Visul –motor Test , and clinical tests in order to evaluate physical-motor perception ,motor growth measure of Linklon and Purdue pegboard .Findings are treatment methods based on sensory-motor integration , and they have been effective in all the types of Non verbal learning problems (visual –spatial perception. mutual motor skills .fine motor skills .strong motor skills .handicap motor skill).

Keyword:

NONVERBAL LEARNING DISABILITY, NLD, SENSORY MOTOR INTEGRATION, PRIMARY SCHOOL, LD, LEARNING DISORDER.

INTRODUCTION

One of the areas related to learning disability is Non verbal disability.

A child with Non verbal learning disability is facing abnormal motor behavior ,defect in visual-spatial skill and information organization skill and therefore defect in attention , learning and behavioral problems ,due to mal functionality in the nerve cells located in right hemisphere.(Rourke,1989).

Although this child is capable in speaking area ,he or she has problems with complex activities and motor samples which need coordination.

Controlling the weak physical and handicap state ,low muscle contraction and disability in fine motors is lower than average. (Bonifacci,2009).

Children with Non verbal learning disability are susceptible to abnormal motor and they have obvious problems in acquiring strong motor skills which are necessary for doing appropriate tasks and self-helping such as :wearing ,jumping ,gumpin grope ,and riding bikes .(Molenaar,2008).

Considering abnormal motor in children with learning disability ,it is very important to pay attention to the learning process of the child's motor skill from the beginning days of the birthday until death .

Similarly ,Humphrey believes that motor skills are necessary in order to more control on living environment and create appropriate reactions to environmental needs .

Hulme and Loard(1986),Bax(1989), and Whitmore(1987) believe that abnormal motor is associated with behavioral problems and learning disability .

According to heterogeneous groups of children with low motor ability, which mostly named abnormal motor, different treatment approaches are presented.

In order to treating motor disorders ,Polatajko ,et,al (2004)designate processing and functional approaches which are sensory-motor synthetic methods of two processing and functional approaches.

In this method ,dynamic sensory-motor associations between neurotic system ,body and environment through activity is considered which result in establishing conceptual practical knowledge in a person and finally lead to association between sensory and motor experiences . (Oregan and Noe,2001;Noe ,2004).

In Noe's recent theory(2008-2009) , sensory processing is equal with sensory-motor practice or is the same as practicing exploratory skills that a child fulfills in childhood and in this way he can easily connects with the materials in his environment and it makes him recognize all of them.

In fact, the way of perceptual connection and association with the world is considered in this approach.

In a study about the association between fine motor skills ,Stoeger,Zigler and Martzog(2008),examined children with the level of academic success and focusing them on two

groups include gifted primary student with academic success and without academic success, and they conclude that defects in fine motor skills are important factors in the identification of gifted underachievers in primary school .

Moreover, in his research ,Bundy found that boys with sensory motor processing disorder participate in social games out of the home and play of preschoolers .

In this regard ,sensory integration theory considers game as an intermediate for intervention.(Bundy and Murray,2009).

By considering this hypothesis that in sensory integration which increases creating compatible behaviors in individuals, since in many interactions,people need great levels of sensory-motor integration and coordinating with this system to fulfill rapid changes in social environments and acquire necessary effectiveness(Bundy,2009),those children who have weakness in basical growth skills such as:movement,perception,language, and thinking would experience many problems i ndifferent levels ,because these skills are the base of educational learning.

In this paper, considering sensory-motor activities and their relation with the individual's levels of learning in one hand ,and on the other paying attention to the obvious problems associated with visual , spatial and dynamic perceptions in the children with Non verbal learning disability, we have examined the effectiveness of integration methods related to sensory-motor behaviorals on the motor behaviors of children with Non verbal learning disability.

Importance and necessity of research

Most of the theories associated with human growth emphasize on the importance of sensory-motor experience in the child growth.

Piyaxi,1952/1936 emphasize on the importance of primary sensory-motor learning as the componants of cognitional and perceptional evolution in the further years,and from the nerve psychological point of view ,Heb(1949)emphasize on the importance of primary sensory-motor learning as an important part of creating brain cells which are responsible for brain's functions .(Lerner,2009).

Also,Ayress(1989) confirms the effectiveness of sensory-motor phases of child growth in his academic skills.

Obviously,the motor growth of child is effective in his mental growth,and the level of child's learning is associated with his level of activities.

Verner-Riner (2008), specified that performing perceptual motor practice leads to growth and evolution of the physical image and self concept within the child.

The more child acquire developments, the more he tries for doing new activities, and in this way he/she increases the cognitive level and perceptual ability.

The study of Bundy, Shia and Miller about the association of sensory processing dysfunction with play, also confirm this issue.

In a study performed by White, Mulligan, Merrill and Wright (2007) under the name of an examination of the relationships between motor and process skills and scores on the sensory profile, a meaningful relationship between sensory-motor process skills and level of daily life of individual provided and it is observed that children with abnormal scores on the sensory profile has more functional problems.

When experts diagnose that the fundamental reason of a behavior in school is sensory integration defect, Case-Smith (2007) believes that the results of treatment are successful.

Since children with Nonverbal disability have weaknesses in basic ability areas (motor psychological coordination, perception and exploratory behaviors), they also have problems in triple levels of mental growth. (Rourke, 1989; Harnadek and Rourke, 1994).

In the first level we consider defect in the "perception" of information which the child receives through his senses.

In the second level, it is necessary to link all the information received through senses, here we consider "attention" and according to the structure of these relationships in brain, some outputs for classification and integration of informational cells is determined that establishes the third level in the concept of "memory".

Children with Non verbal learning disability, despite normal or more than normal intelligence, will experience a lot of failures due to weakness in sensomotor perception.

They have very low self confidence, and often they have symptoms such as: high anxiety, depression, attention disorder and obsession which also add to academic problems of the child. (Palumbo, Smith Roley, 2006).

Literature review

Casey,Rourke,Picard (1999),in southwestern of Canada have examined this issue that how change the features of Non verbal disability in the middle of childhood and the beginning of adolescence.

They found that children with Nonverbal disability face problems in the complex activities which need problem solving capabilities.

In their research , White,Moffitt,and Silva (2008) found that children with math difficulties are substantially different with children who have reading disability and also are different with healthy children in areas such as :motor,visualintegration and visual-spatial skills.

Wright (2008)reports that in comparison with control group children ,there are some problems and defects in the work memory and mental image of children with Non verbal learning disability.

In a study about the association between fine motor skills ,Stoeger,Zigler and Martzog(2008),examined children with the level of academic success and focusing them on two groups include gifted primary student with academic success and without academic success, and they conclude that defects in fine motor skills are important factors in the identification of gifted underachievers in primary school .

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Research methodology

This study has quasi experimental method . these designs have the ability of controlling some internal measures .

In this method ,often there are more than one sample group.And their ability in controlling variables is rather than their ability in correlation plan .

Academic system in education don't allow researcher to transfer randomly or to manipulate the variables.

In these designs , although the researcher dosent have the ability of controlling all the conditions , at least he is able to control one of the following factors :

- 1- when does independent variable perform and which group is used as the experimetal part?
- 2- when does observation or measurement occur?(Human ,2000,P 500)

Instruments

Clinical observation check list : In order to examine the performance of the child during the motor change phases and academic performance (reading,writing,and math) which fulfills through half organized intervie with parents and observing the child state.

2- health certificate of the children

Wechsler intelligence for children –revised : According to standard tables , from the sum of balanced scores of verbal and Non verbal parts, verbal and practical intelligence quotient(IQ) of an individual will obtain from the sum of balanced scores of total IQ.

Motor test of Purdue pegbound : this test is a personal instrument for evaluating the speed of fingers in each of hands ,evaluating the better hand,strong motor of fingers ,hands and arms.the corrlation of retest in performing an attempt, is calucated from 63 % to 76%with the average of 68%.(Lafayette institute ,2002).

The set of clinical tests : In order to physical motor measurement ,Wilson et,al (1992)represent finger perception Test ,touching perception,and three dimentional perception as a reliable instrument for physical motor measurement.

Statistical sample and Statistical universe

Underconsideration universe of this study includes male and female students with Non verbal learning disability who are studying in the academic year of 2012-2013 in Rasht.

Underconsideration sample group of this study includes 30 children with learning disability which determined through evaluating academic performance and teacher's reports.

Then, randomly these students are divided into two groups .

In this study the measure of primary testable items is suffering from special learning disability ,not to have sensory motor defects ,not to have sensory disorder,substantial brain defects,and neurologic disease (entire lack of visual,hearing and touching senses).

Sampling method of this study is non probability method(judging type)and it will be according to input measures of Non verbal learning disorder.

Data analysis methods

A) In order to descriptive representation of data we have used descriptive statistical methods includes: abundance,percentage,mean calculation ,draw table and....

B) In calculating deduction statistics of this paper we have used appropriate methods such as : correlation test,unique variance, multi variable variance analysis.

Main variables

In this study the sensory motor integration methods are used as an independent variable.

the sensory motor integration methods include activities in four treatment phase in order to improve touching and balance ,strong motor activities,fine motor activities, and mutual motor coordination activities of brain.

Abnormal motor is dependent variable of our current study. Abnormal motor in this study includes scores which the child obtains through Linklon Ozersky test about strong,fine balance motor skills and mutual motor coordination .

In the current paper ,visual –spatial perception is dependent variable which is considered through one checklist.

In the current paper ,visual –spatial perception belongs to the score which is obtained through the number of errors in Bender-gashtalt test.

In this study ,Non verbal learning disability is considered as an independent variable which is studied through a checklist.

In this study , the identification of Non verbal learning disability is according to the background of motor and academic growth of child throgh designed evaluation form based on growth change hemisphere of children with Non verbal learning disability.

Findings

Main goal 1 : Evaluation of the impact of sensorimotor integration on increasing motor skills

Score average,standard deviation, minimal and maximal differences between gross scores

Maximal difference	Minimal differnce	Stndard deviation	Mean	Phases
57	29	10/172	37/86	1
65	37	9/253	48/57	2
72	57	5/593	64/43	3
95	64	10/668	75/14	4
102	76	11/356	86/57	5

It has reported that the data related to effect of internal group on the gross scorewithin the measurement test are meaningful .

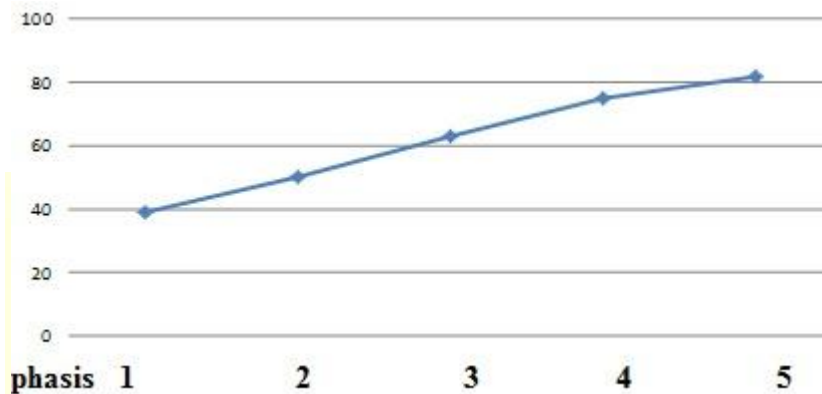
[F(5*30) = 71/07 ; MSe = 38/02 ; P< 001 data related to contrast of differences for the gross scores within occasional measurement.

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Meaningfully level	F	Squares average	Freedom scale	Total squares	Change resource	phases
0/000	59/21	803/57	1	803/57	2contrast 1	
0/001	33/28	3150/32	1	3150/32	3contrast 2	
0/000	3954	4325/14	1	4325/14	4contrast 3	

Linear diagram of gross score average of Lincoln motor test during 5 phases



Above diagram is represented increasing trend of gross scores of testable items within Lincoln-Osersky test. In comparison with other phases, diagram's slope between the second and third phases have shown more increasing.

The second main goal : evaluating the impact of sensorimotor integration on the abnormal motor Mean, standard deviation, minimal and maximal differences of scores on motor skills in pretest and post test

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The second main goal :Evaluating the impact of sensorimotor integration on the abnormal motor

Mean, standard deviation, minimal and maximal differences of scores on motor skills in pretest and post test

Maximal difference	Minimal difference	Standard deviation	mean	Motor skills
12/243	1/757	3/742	7	balance
13/740	1/117	4/504	7/429	strong
11/177	3/966	2/573	7/571	fine
6/822	0/892	2/116	3/857	mutual

Balance- motor skills :

The obtained results represent meaningful difference of post test average in comparison with pretest average on balance motor skills.

Strong motor skills :

The results show meaningful difference in strong motor skills score average before and after treatment phase.

$$[t(6) = -4/36 ; p = 0/005]$$

Fine motor skills :

According to findings of the sensorimotor integration training research, there is a meaningful impact in the improvement of fine motor skills.

$$[t(6) = 7/78 ; p = 0/001]$$

Mutual motor skills :

In comparison with the pretest average, the results show meaningful difference in the post test average of mutual motor skill.

$$[t(6) = 4/82 ; p = 0/003]$$

According to the findings of this study, "educational strategies of sensorimotor integration, substantially, lead to improve many types of motor skills and minimize abnormal motor in the child with Non verbal learning disorder.

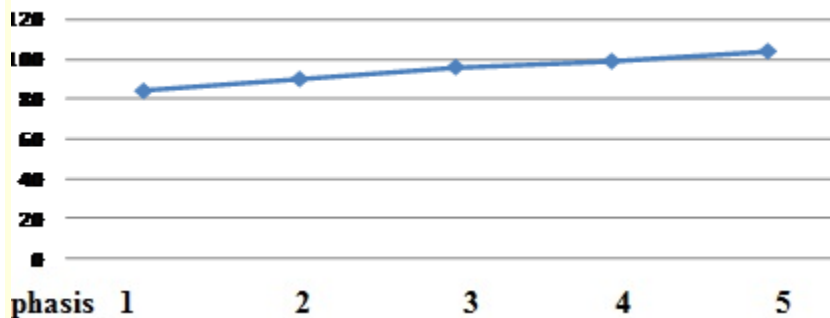
The third main goal : evaluating the impact of sensorimotor integration on the perception abilities

Mean, standard deviation, minimal and maximal difference in the score of age average

Maximal difference	Minimal difference	Standard deviation	mean	phases
93	74	6/779	85/43	1
114	70	14/762	87/71	2
105	80	9/304	94/29	3
114	80	10/440	98	4
125	93	10/967	105/43	5

In each phase of measurement ,few increasing in the average differences of age score is represented ,but in the fifth phase, this difference is more obvious.

linear diagram of the age score diagram average during 5 phases



Data related to the contrast of differences for the age scores in the measurement test

The data related to the effect of internalized group for age scores in the measurement test are meaningful .

$$[F(24;4) = 12/30 ; MSe = 36/92 ; P < 0/001 ; \eta^2 = 0/950]$$

Above diagram represented the increasing changes of age score diagram average during 5 measurement phases with slow slope ,which has had more changes during the last phase.

Meaningfully level	F	Square average	Freedom scale	Total squares	Change resources	phases
0/618	0/277	36/57	1	36/57	2contrast1	
0/048	6/15	416/57	1	416/57	3contrast2	

0/003	23/69	549/14	1	549/14	4contrast3	
0/000	58/11	1386/03	1	1386/03	5contrast4	

There is a meaningful difference between real age and perceptual age of individuals in all the consideration groups.

[$F(30 \cdot 5) = 15/16$; $MSe = 46/49$; $P < 0/001$]

Conclusion

The method performed in this study is based on sensorimotor integration and considered sensorimotor defects in children with Non verbal learning disability , and performem by specialists and psychologists.

As suggested in the disscutions related to the experimental hypothesis , treatment methods were effective in using sensory,motor,and integrating them for improving abnormal motor and increasing visual spatial perception in children with Non verbal learning disorder.

The findings of the current study are consistent with those of Ayress(1989),Wilson(1998),Mailukx(2001),Shoomway,Wollacott,(2001),who found the relationships of sensorimotor integration issues, and in relation to visual spatial integration is consistent with the results of Harman,Humphrey,Goodale(1999);Bridgman,Peery,Anand(1997),and huffman ,Goodale(1998).

Since,using the sensorimotor integration methods in the treatment process of children with Non verbal learning disability could creat appropriate changes in their visual spatial perception and in their motor skills.

However,the procedure of treatment process and especially the required time of treatment in each of treating phase needed more research ,since the hetrogenity in the changes maybe as a result of insufficient time and lack of stability in the created changes.

On the other hand ,according to the impact of each phase on the other phases it should be mentioned that the order of treatment phases is identified as an important factor in the treatment process.

Among other important issues in the using sensorimotor integration treatment is the quality of interaction between the child and parents.

When the parents supported them , children progress in the test was significant, and their functional level had a good change.

However, critic mothers represented negative behavioral impacts even in the treatment session and they decreased the level of motivation.

But with a quick review of Ayress (1989) insight ,who believes that improving in the motor functions planning during treatment of motor integration is a way for better planning about cognitive and verbal functions through developing the brain capacity for organizing information and more complex functions, we can suggest that :

The impact of this treatment on the academic and behavioral skills of children with Non verbal learning disability ,which is the main reason of their coming to clinics is also important and disputable.

In a study ,Cratty (1999) showed that ,although motor problem based treatments candosent have any direct and rapid impact on the academic skills ,these skills creat self confidence , increase motivation level ,improve imagine pictures in children with learning disability,which will decrease many behavioral problems of these children,and increase their attention and concentration,decrease their family stresses and make them continue their treatment,

Likewise many of these children with normal IQ and low self confidence can not experience academic success.

What is important in the process of sensorimotor integration treatment is paying attention to the increase of motivation ,self confidence level of the child ,which improves the quality of treatment and extend these results to the academic level.

Those who experienced more motivation level in the treatment process (16 session),could extend the results of motor change into academic level.(improving handwriting, increasing academic score, and developing communication position in class).

Limitations and recommendation for further study

Since ,despite the 50 years research related to Non verbal learning disability there is no functional definition about diagnostic and statical manual of mental disordes ,clear and obvious identification of this disability was impossible ,it had many complexities ,and made the diagnostic phase of measurement longer.

On of the other diagnostic problems was unavailability to access the motor instrument and some of the under consideration instruments for diagnosing learning disability in Iran ,which led to use more traditinal instrument.

Since, the instrument of assessing academic progress is one of the important diagnostic tools related to Non verbal learning disability , producing standard tools for academic progress is necessary.

According to the research background and traits of children with learning disability ,performing researches associated with other areas such as : we can perform social perception and recognition related to other disorders of children with Non verbal disability .

Based on this ,it is suggested that in the future studies the impact of sensorimotor integration on the academic process of children with Nonverbal learning disability be considered.

And finally we suggest sensorimotor integration,as one of the substantial treatment approces of children with non verbal learning disability in clinics and treatment institutions .

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