

**Research Article**

## **THE EFFECTIVENESS OF SENSORY INTEGRATION PRACTICES ON THE REDUCTION OF STEREOTYPED BEHAVIORS IN CHILDREN WITH SEVERE VISUAL DISORDER**

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### **ABSTRACT**

**Objective:** The purpose of present study is to investigate the effectiveness of sensory integration practices on the reduction of stereotyped behaviors in the blind children base on Ayres theory. This research is practical and semi-experimental study. The population of study is all blind children with mild and normal mental disability that were under training in Tehran and Alborz rehabilitation centers. 20 students from rehabilitation centers were selected and randomly assigned into two control and experimental groups. Experimental group was under the training of sensory integration practices individually base on Ayres theory for six months, three day per weeks, the duration of each session was an hour. Gilliam's autism scale which is one of the stereotype behavior subscales was used for data collection. Acquired results were analyzed with covariance analysis. The results showed that the stereotype behaviors variable statistically have significant reduction at posttest level of experimental group ( $p > 0/05$ ). **Conclusions:** Findings show that sensory integration practices base on Ayres model is effective on reduction of stereotype behavior of blind children.

**Keywords:** *Sensory Integration, Stereotype Behaviors, Blindness*

### **INTRODUCTION**

Outbreak of stereotype behavior is one of the major diagnostic signs of autism (American Psychiatric Association). These behaviors are repeated interest and motional or verbal sequencing that apparently have fix performing pattern and have no excitatory or compatibility performance (Baumeister & Forehand, 1973). These behaviors are seen in the blind people (Fazzi, 1999), mental retarded individuals (Baroff and Olley, 1999) Schizophrenia ones (Morrens), Obsessive compulsion disorder (Bejerot) Tourette, syndrome (Thelen, 1979) and are not only in the autism children. Bishop *et al.*, (2007) found that repetitive use of tools and having no common interest, having complex habits and playing with fingers and hands are seen in about %50 of two years blind children. In the most blind children and those with severe visual impairment that have been born with sight impairment or their symptoms are seen before 6 months of age, signs disorders such as slow reaction of pupils, eyes aimless moving, signs of oculus- digital such as eyelids pressing, inserting finger into the eyes and eye rubbing are seen that these signs can be considered same as stereotype behaviors in autistic children. According to the researches results, stereotype behaviors lonely are not danger for individual health but such behaviors create significant disorders that are related to the process of learning (Koegel and Covert, 1972), social skills acquisition (Jones *et al.*, 1990), adjustable performance (Matson *et al.*, 1997) sleep problem (Schreck & Smith 2004) increase stress at family (Bishop *et al.*, 2007) revealing masochism behaviors (Kennedy, 2002). Although there is no clear reason for such behaviors but Story *et al.*, (1984) suggest two reasons, first these behaviors naturally have more deep, tactile and sensory stimulation compare to the amount which typically generated by adaptive behaviors. These behaviors provide more stimulation for nerve system which receives low sensory stimulation due to functional deficit. The necessity to determine effective strategy and method for reduction and treating these behaviors by researchers can feel clearly. The main methods which have been suggested for treating and reducing of stereotype and self-injury

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behaviors include Consequence-Based Interventions, psychopharmacological – Based Interventions and Antecedent-Based Interventions such as participating in sensory-motor activities. Ayres's sensory integration theory is one of sensory method. Sensory integration is a neurological process that individual interpret environmental sensory perceptions and for more use unified these perceptions. An individual will lost his/her ability to response an appropriate environmental adaptive reactions whenever this process which is responsible for selecting, comparing, interpreting and analyzing of sensory inputs face problem. Ayres believe that based on the hierarchical model, central nervous system has been formed by arranged vertically levels that brain hemisphere has been placed at top and the brain stem and spinal cord are located in the middle and downer level of this hierarchy respectively so control process is upward. According to this view, lower levels relay sensory information before sending them to the cortex thus cerebral cortex for receiving sensory information need the proper function of lower levels. This issue was proved by the researches that later were done by the positron emission tomography (PET) method (Parham and Maylux, 2005).

Ayres argued that functions such as control of the situation, balancing and tactile perception, sensory - motor base are used for higher functions such as academic ability, self-regulation of behavior, interaction and complex motor skills and also Ayres emphasis on unifying role of balancing and tactile senses and deep sense stimulation for hearing and sight (Zakaria and Panahi, 2000).

Barkson and Mason (1963) believed that likely tactile, vestibular and motor systems basically are involved. When the number of movements and displacements of blind children increase, their stereotype behaviors are reduce so this factor show that the sensory input modifications will reduce the number of self stimulation and stereotype behaviors. Following we will mentioned some of motor-sensory methods which are effective in the reduction of stimulating, stereotype and self-injury behaviors. Roberts and King in a single case longitudinal study about autistic children showed that sensory integration practices decrease the severity of self stimulating and self harming behaviors.

Gardner (2005) showed the effectiveness of sensory integration practice on reduction of autistic symptoms such as stereotyped behaviors. Kopacz (2010) in a study proved the effectiveness of sensory integration practice on fixation of target behaviors durability. Smith and Press in their study showed the positive effect of sensory integration practices on reduction of self stimulating and self-injury behaviors in autistic children. Also Mason 1990 stresses on the healing impact of sensory integration method on reduction of self stimulating and self-injury behaviors.

Base on this issue that drug therapy have different side effects, negative attitude of family about psychiatric medications and also the cost and long duration, other interventions such as applied behavior analysis and non-invasive therapeutic methods base on antecedent interventions like sensory-motor practices can be useful for reducing stereotyped behaviors (Allison and MacDonald, 1991) and (Kern *et al.*, 1982) and (Levinson and Reid, 1993). Although the number of researches that have been done in the context of sensory-based intervention are not much and most of studies have been done in low number samples especially in the autistic children. According to the results of previous studies and the need to reduce these behaviors which prevent individual's proper interaction with the environment and causes family and children confusion, the purpose and hypothesis of the present study are formulated: sensory integration practices is effective on the reduction of stereotype behaviors in the autistic children.

## **MATERIALS AND METHODS**

### **Research Methods**

This research is practical and semi-experimental study that has been done with control group in the pretest-posttest form.

The population of the study is all 3-14 years old blind children in Tehran and Alborz city that attend rehabilitation centers, the schools of retarded children and private occupational therapy offices in the Shahriyar, ShahreQods, Malard and Alborz. The criteria for accepting children are regulations of rehabilitation centers and definitive diagnostic criteria are children's file and their ability to do sensory integration practices.

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Mentioned children are classified from mild to upward mental retarded children and the range of their blindness severity is from complete blind to partially blind. Mentioned cities are relatively homogenous in terms of cultural and economic conditions.

Samples were selected base on available sampling method. 20 children with blindness diagnosis according to the family interest have been selected and assigned randomly into two experimental and control groups (The mean of their age were 8 years and three months and its minimum 5 years and its maximum 13 years). Then the sensory integration intervention was done for experimental group for 6 month and 3 sessions per week which the duration of each session was an hour. Robert and King suggest three sessions per weeks for four month. Finally the results were analyzed.

For group's evaluation, the stereotyped behaviors questionnaire of blinds was filled by direct observation and caregiver reports. This questionnaire was prepared by the researchers and implemented on 140 blind people in Isfahan province. Its reliability was 0/91 using Cronbach's alpha which is acceptable amount and its validity base on blindness literature, stereotype behaviors, expert's opinion poll and its correlation with stereotype behaviors subscale of Gilliam's autism assessment scale was 0/86 (SharifiDaramadi and Taghavizade, 2013). The questionnaire contains 10 multiple questions in the Likert scale from 1 = never, two = rarely, three = sometimes, four = often. Total score higher than 28 is consider as high stereotypes behaviors.

The intervention method of sensory integration practice was implemented on experimental group for 6 months 3 sessions per week. Sessions program as 12 sets include tactile sensory, deep and vestibular and motor stimulation base on Ayres model which are presented in the below, in the each session one set was implemented on the experimental group and during this period control group just receive common teaching programs of centers that include basic concept training and self-help skill training.

After treatment period, Gilliam's stereotype behavior test was implanted as posttest on experimental and control groups. To avoid the bias, cases were substitute between design performer and at the end were control by researcher.

## RESULTS AND DISCUSSION

### Findings

In this part we first calculate mean and standard deviation for experimental and control group then count covariance analysis.

**Table 1: The scores of stereotyped behaviors in blind children in pre-test and post-test stage**

| Group<br>Variable | experimental |                       | control |                      |
|-------------------|--------------|-----------------------|---------|----------------------|
|                   | Mean         | Standard<br>Deviation | Mean    | Standard Deviation t |
| Pretest           | 11:40        | 4.35                  | 11:00   | 4.96 0.19            |
| Posttest          | 7.50         | 2.71                  | 12.6    | 7.16                 |

Table 1 show the mean and standard deviation of experimental and control groups in the pre-test and post-test stage for stereotyped behaviors. Based on this information there is no significant difference between the mean of experimental and control groups, but the post test score mean of experimental group has been reduce after the treatment intervention which it is sing of sensory integration practices effectiveness on reduction of stereotype behaviors.

Before the implementation of covariance analysis we investigate diffraction and covariance's pre assumption that is dependent variable of regression slope homogeneity.

After observing the pre assumptions of co-variance analysis, as you can see at the table 2 significant level is larger than 0/05 and also as you can see F measure for regression slope homogeneity in the stereotype behaviors variable of blind children is small number (0/62), so we observed the assumption of regression slope homogeneity.

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The significance level of table (3) is 0/01 that is smaller than 0/05, so stereotype behavior variable in the blind children after implementation of sensory integration practice has significant difference with this variable at pretest stage. Since the effect size of this variable is positive (0/533), thus we can conclude that the implementation of sensory integration practice was effective in stereotype behaviors of blind children nearly 53 percent.

**Table 2: Covariance analysis of stereotyped behaviors in blind children**

| The Statistical index of variance sources | Total squares | Degree of freedom | Mean square | F     | Effect size |
|---|---------------|-------------------|-------------|-------|-------------|
| Intervention effect                       | 630.11        | 1                 | 630.11      | 17:29 | 0.494       |
| Error                                     | 622.16        | 17                | 36.31       |       |             |
| Total                                     | 10632.0       | 20                |             |       |             |

\*\*  $P < 0/01$

**Discussion and Conclusion**

Present study has been done with the purpose of investigation the effectiveness of sensory integration practice on reduction of stereotype behaviors in the blind children base on Ayres model. The results show that the intervention of sensory integration practice is effective on reduction of stereotype behaviors in the experimental group. As you saw research assumption was confirmed with 0/01 significant level and 0/494 effect size. About the impact of this intervention on blind children, just one case was in same path with researches that were implemented on autistic children. Linderman *et al.*, (1999) investigate the effectiveness of occupational therapy intervention with the sensory integration basis on two children with autistic disorder, so their findings approved the positive effectiveness of sensory integration intervention. Fazioglu *et al.*, (2008) in their research investigate the effectiveness of the sensory integration program on sensory problem of 30 autistic children (7 to 11 years old). Children first were evaluated and then after passing the treatment period were evaluated again by sensory evaluation form, so the results of their survey showed that there are significant differences between experimental and control group, thus these findings revealed the positive effectiveness of sensory integration program on autistic children.

Wels and Smith (1983) in their research also repeat the sensory integration practices and sensory stimulation of Berayth *et al.*, on the examinees for reducing self-injury behaviors. Comparison between base lines of study before and after intervention shows that the sensory integration practice was effective in the reduction of self-injury behaviors.

The other research which was done in occupational therapy department of Tomas Jefferson University investigates the effectiveness of sensory integration method on children's development pervasive disorder. The research shows that the sensory integration intervention has more effect in the children and parent's life and this intervention improves sensory, motor and perceptual process of autistic children. Sensory integration intervention also reduces self stimulating and self-injury behaviors of autistic children and also improves social relation and verbal communication skills in the autistic children (Harrison and Hery, 2004).

Dehghan (2006) showed that sensory stimulation affect eye contact and one syllable verbal requests perception with nonverbal hints. Zayer (2007) showed that the sensory integration method with group implementation ability can improve social relation, verbal communication, imitation skill and sensation integration in the autistic children.

In addition to the mentioned researches, the survey which has been done by Baker *et al.*, (1979) focused on three blind children for six months and after the implementation of sensory integration practice the results show that children have improvement in the mobility, daily activities, handwriting and compatible

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behavior. The general assumptions about the occurrence of stereotyped behaviors in children with visual impairment are three perspectives: First, increasing general level of sensory and emotional stimulation and motor discharge (Borlingham, 1967; Corsan 1979). Second, the habits are form of self-regulation with face excessive stimulation (Knight, 1972). And third: the habits are the results of social privations.

According to the present researchers ideas, first and second perspectives highlighted the role of sensory disorders and also base on behavior control theories that stated behaviors are controlled by the central nervous system (quoted by Kalat, 2008) we can conclude the appropriate sensory stimulation functions and integration can reduce stereotype and self-injury behaviors in the children of experimental group base on central nervous system and brain theory of Ayres.

In addition the researchers of this study base on statistical analysis and their clinical experiences observed significant reduction in the stereotype and self-injury behaviors of blind children, these findings showed that in practice this method base on time interval and using non-invasive methods are much better than other interventions.

The result of this study is not in same path with some studies, for example Webright *et al.*, (1981) in their research showed that sensory integration practice such as vestibular stimulation that has been done by seat cradle - lace bed, hitting, massaging and skin touching have no effect on reduction of self-injury behaviors of autistic children. Perhaps this lack of success occurred due to time limitation because the majority of authors have emphasized on the time that is more than four months.

Present study show that no-invasive intervention (sensory integration practice) effect on the reduction of stereotype behaviors of blind children, this study is unique and distinguished research because of research method and using more examinees but some limitation can be seen such sample quantity, limit geographical area and lack of following results. So we suggest that in the future research, more samples and expanded geographical area, comprehensive tools with clinical interview by experienced individuals should be used for autistic children

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Effectiveness of sensory integration treatment on reducing stereotypical behaviors in children with autism

### Attachments

Sensory integration practice program

Program 1: Put the baby in sitting or lying position on the rotating board and let him/her to rotate him/her self. (Vestibular-Deep) In the prone position, tell him/her to pick up the cereal seed on the rug. (Tactile) Hit the hanging tools with the rolling pin (Bi lateral activity –upper limb–deep sensory stimulation)

Program 2: Four crawl into a tunnel (bowing and deep sensory reinforce). While standing on a balance board, catch a ball (balance). Play a drawstring (muscle tone, deep sensory). Chasing colored balls (for blind examinee chasing light source or bright object) that is moved around the cross paths (eye tracking or the using remaining vision)

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Program 3: Walking around a rubber tire. (Balancing) firstly lying in the supine position then in the prone position. Walk under a desk without touching footboard, (visual spatial perception) jump on the trampoline (vestibular-deep). Hitting the ball with the foot (unilateral action)

Program 4: walking downward and upward in the maze (visual spatial perception -tactile)

Sitting on a rectangular swing that move around circular path (vestibular-deep)

The number 5: kneeling on the a wheeled or balance board that go back and forth (vestibular-deep)

Crawling under a big pillows (tactile) throwing and catching a ball (muscle tone- coordination of hands by the eyes or ears) playing in the pool (deep)

Profile 6: Walking with specific pattern on distinctive maze spots (motor program) rotating around a circle (vestibular) lie the child in a prone position and then touches both sides of the child's spine with a little pressure of two fingers. Touch the child from neck to the lower spine (pressure touch) heat and cold (put the hands or feet inside the containers with different temperatures) (tactile and heat and cold distinction) or getting out of tunnel without using hands (motor programming)

Program 7: Getting out of tunnel without using hands (motor programming)

Bending and passing under a rope (visual partial perception) by grasping a hang tour rotating around circle. (Deep-vestibular) knocking: hitting on the child's skin gently with finger (tactile) playing in the ball pool (deep and tactile)

Program 8: Throwing the baby gently in order to stimulate protective responses. Tell children that you want to let him fall. (Protective response by opening the limbs) child lie in the prone or supine position, in a woolen blanket (tactile-deep) the child should pick up the ball with both hands or hold the ball with the both feet and pass it to the coach (bilateral motor reinforce) child lie in the prone or supine position, in a woolen blanket (tactile-deep)

Program 9: pushing a ball that is held by the coach (deep-bilateral activity) knocking on the child skin gently (tactile) throwing yourself on big pillow and roll out (tactile) chasing the light of torch or bright object (eye tracking or using remaining vision)

Program 10: walking on the balance board or standing on it while the coach move it to the both sides (Balance) climbing a vertical ladder (tactile-deep). Child lie in the prone or supine position, sitting or kneeling on the wheeled board while coming down from mild slope (vestibular-deep) heat and cold (putting the hands or feet inside the containers with different temperatures) (tactile and heat and cold distinction)

11: lying in the prone position on the swing, child should held his/her weight with his/her hands and press (protective response by opening limb- deep) use all activities that are carried out on the ground or items that their surface has carpet covering (tactile) pressure on the child's spine cord (tactile) chasing the light source (visual)

12: Let the child lie the on the a big ball then move the ball in order the child's hands touch the ground (protective responses whit hand opening –balance- deep) jumping up and down on Trampoline (balance) crawling in the tunnel (deep) heat and cold (put hands or feet inside the containers with different temperatures) (tactile and heat and cold distinction)

Source: Occupational therapy for children with special need.