

Effectiveness of Sensory Integration on Interaction of Students with Autism Spectrum Disorder

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Abstract: The present study was conducted with the aim of determining the effectiveness of sensory integration on social communication of students with autism spectrum disorder. The study's sample was selected via convenience sampling by picking 10 children from among preschool and first grade students aged 7-12 years old in Tehran Region 6's Peyk-e-Honar Exceptional School. In this study, SCQ questionnaire was used to verify affliction with autism spectrum disorder and GARS-1 scale was used to measure respective variables. The method used in this study was quasi-experimental and data analysis was done using repeated measures analysis and Multivariate Analysis of Covariance (MANCOVA) and Analysis of Covariance (ANCOVA). Results showed that using sensory integration has a positive significant effect on emotional expression, non-verbal language, communication with others and communication with objects and the ambience. Also, disparity between post-test and pre-test total score of social communication showed that this intervening method has a positive and significant effect on this variable. Investigating this method 2 months after conducting the therapy shows the stability and significance of the method.

Key words: Autism spectrum disorder, social communication, sensory integration, MANCOVA, ANCOVA

INTRODUCTION

Sensory integration is one of the methods derived from neuroscience. Neuroscience applications over the recent decades has been very broad and extensive and the 1990s decade has been entitled decade of the brain by the American neuroscience society. Conducted studies suggest that current findings represent only a small fraction of the role played by neuroscience in treating various human disorders and in fact, much further and more valuable information will be obtained in this regard in the future which will probably transform the forthcoming century into the century of neuroscience (Samadi, 2013).

Sensory processing or sensory integration refers to functions of the sensory system regarding all the information we receive from our setting (motion, tactility, olfaction, taste and audition) and organize and act accordingly. Sensory integration is the basis of learning which allows us to get insight into this world. When we match new information with our similar experiences, we learn and therefore, we can get proper information (Delaney, 2008).

Sensory integration is a method for treating children with problems in processing sensory drives or in other words those who have sensory integration disorder. This method is especially focused on improving the child's

sensory integration ability and it is necessary that the afflicted child be treated in some positive way (Hodowitz, 2011).

As a general description of sensory integration it could be suggested that an individual in babyhood uses very preliminary and stable practices. His/her sensory activities in this period are smell, taste, touch, perception of physical state and interaction with gravity which is a method for perceiving the ambience and living. When a person grow up these systems (i.e., tactility, body's muscular system, physical movements, countering the gravity and vestibular system) must transform into autonomous systems releasing nerve system so as to become coherent and enable higher cortex performance which is necessary for learning and conducting cognitive activities (Samadi and McKangi, 2011).

The term autism deals with people in whom a set of growth disorders concerning central neural system is observed. These mental disorders affect one's ability to communicate with others as well as one's responses to the outer ambience. The autistic individual is interested in repeated behaviors or repetition of his/her mental patterns (Naseh, 2009).

In most people with autism spectrum disorders who suffer from mental problems, sensory skills never reach an autonomous and automatic stage. Therefore, in each practice of these basic skills focus should be on them and energy required for other activities should be used on

them. In short, sensory integration is a process occurring automatically and in people with growth problems this process does not take place automatically and requires intervention and support. As an individual without an integrated system of senses, the autistic individual shows different reactions to ambient drives.

Autistic individuals show a considerable delay in terms of social growth, especially interpersonal communications. These people have especially significant difficulty in establishing social and typical communication with individuals, thus, a natural process like making friends turns into a difficult and impossible job. Interpreting the nonverbal aspect of social communication and perceiving others' views and their feelings via facial expressions and understanding body language is difficult for them and they are unable to understand it (Samadi and McKangi, 2011). To make those with autism spectrum disorder compatible with daily life and increase their life quality, many efforts have been made.

Many of these individuals have many communication problems and without constant support and care from others they cannot have a normal life. Therapeutic interventions mostly have three major forms:

- Medication to reduce problematic behaviors such as isolation, aggression or self-harm
- Behavioral therapy to improve communication and interaction skills, etc.
- Inclusion strategy to help patients for living in the society, owing to the nature of autism spectrum as there are many difficulties in treatment and care of patients (Ganji, 2013)

Despite efforts of many physicians and practitioners, these treating methods have shown little effect on treatment of autistic people. Therefore, necessity of employing other techniques is greatly felt for treating autism spectrum disorder. With progresses made in neuroscience theory and considering positive effects shown by methods produced there of, necessity of using these therapeutic techniques along with more popular ones is sensed.

After basic and primary concepts of sensory integration and its application were first proposed in 1960s, this view and the method taken thereof managed to be used as one of the most robust methods in therapy and educational interventions and rehabilitation of people with autism spectrum, hyperactivity, attention deficit and a number of other disorders.

As in patients with autism spectrum disorder information processing is impaired in the hierarchical level of the neural system and it seems that sensory information are not centrally processed in an integrated way, rehabilitation measures such as sensory integration can reduce some symptoms and prepare the neural

system for learning and organization of proper behavior matching current age and conditions. Studies regarding neuroscience and sensory integration started from observation and data recording and has currently achieved experimental stages, however, further theoretical knowledge still seems to be needed in this field.

The present study considers whether using the interferential technique of sensory integration can influence social communication of children with autism spectrum disorder. Thus, it discusses the effectiveness of using sensory integration on social integration of students with autism spectrum disorder and based on this aim, proposes the following hypotheses.

As the main hypothesis, it considers that using sensory integration influences social communication of students with autism spectrum disorder. Following that and based on social communication questions of GARS-1 test, questions are divided into four important components in social communication and then the following hypotheses are proposed:

- Using sensory integration influences emotional expression of students with autism spectrum disorder
- Using sensory integration influences proper application of nonverbal language of students with autism spectrum disorder
- Using sensory integration influences establishment of effective communication with others in students with autism spectrum disorder
- Using sensory integration is effective in establishing proper communication with objects and ambience in students with autism spectrum disorder

MATERIALS AND METHODS

Statistical population of the current study consists of first grade and preschool students with autism spectrum disorder over the age of 7-12 who are studying in Tehran Region 6's Peyk-e-Honar Exceptional School. Size of the sample used is 10 which is selected with convenience sampling. The method used for conducting the study was quasi-experimental pre-test, post-test and bimestrial post hoc of an intervention group. The study was conducted for a duration of 10 weeks and in 15 therapeutic sessions.

The direct variable is students with autism spectrum disorder and related dependent variables include the following criteria:

- Social communication
- Emotional expression
- Nonverbal language
- Communication with other people
- Communication with objects and the ambience

For data analysis the following methods were used.

Descriptive statistics: Mean, standard deviation, standard error of the mean, correlation coefficient.

Inferential statistics: Repeated measures analysis and Multivariate Analysis of Covariance (MANCOVA) and Analysis of Covariance (ANCOVA) assuming in-group homogeneity with Levene's test and Bartlett's test of sphericity and Shapiro-Wilk test for investigating normality of data distribution. Study tools include:

- Social Communication Questionnaire (SCQ)
- GARS-1 test
- Equipment required to perform sensory integration (swing, therapy balls, ball pond, trampoline, parallel, etc.)

Social communication questionnaire: Social communication questionnaire is a screening test comprised of 40 questions which are answered by the parents. This test has been prepared based on autism symptoms in three areas of social growth, communication and behaviors of the child.

Cut score in this exam has been considered to be 15 and more and is practical for screening children aged 4 and beyond with mental age of 2 and beyond. In questions 20-40 parents are queried about the child's behaviors over the ages of 4-5 years and his/her behaviors in that age are questioned (Samadi and McKangi, 2011).

Gilliam Autism Rating Scale-1 (GARS-1): GARS Scale is a checklist that helps identify autistic individuals. Reliability of internal consistency of this scale is 96% alpha. GARS has a high reliability. Mean-consistency is higher than 0.80 which is very high. GARS includes the following properties:

- The 42 items have been identified that describe behaviors in measurable and observable form
- The 14 items that deal with family information about first 3 years of a child's life
- Items are based on popular definitions of autism
- This has been tested among 1094 normalized subjects with autistic symptoms in 46 states from Columbia, Puerto Rico and Canada
- This scale can be completed by parents at school or home
- Validity and reliability of this tool covers stated goals
- Scaled behaviors are used as a criterion for measurement
- GARS scale is suitable for people aged 3-22
- This scale can be completed within 5-10 min
- Completing this scale is easy for parents, teachers and those who are familiar with these behaviors as well as an examiner who has observation opportunity
- Scales are standard and percentages have been prepared

A table has been prepared to identify authenticity and extent: the subscales of stereotypic behaviors, communication and social communication have the answers of never, rarely, sometimes and often which receive the scores of and respectively (Hamitan and Khalili, 2012).

RESULTS AND DISCUSSION

Descriptive characteristics of the variable of social communication: Considering Table 1 and Fig. 1 comparing the mean of pre-test scores of social communication in the group denotes that there are

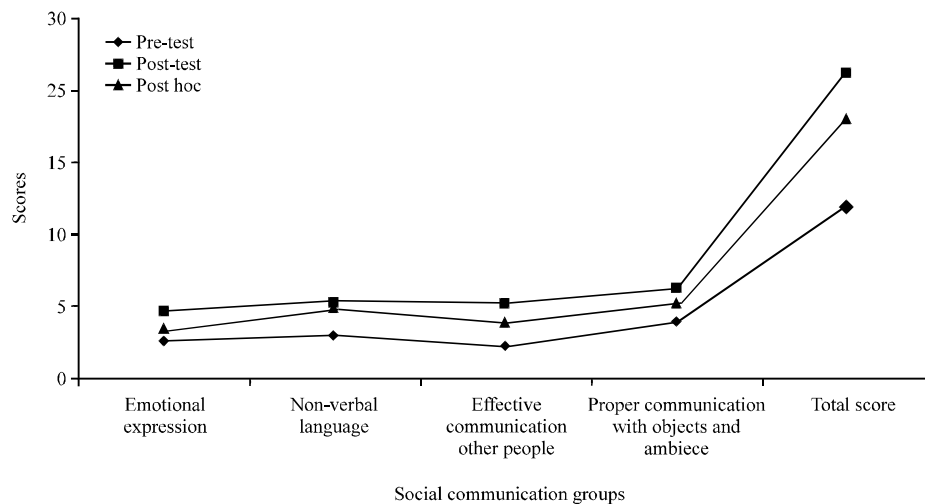


Fig. 1: Comparison of social communication scores for the group under study in three phases

Table 1: Descriptive characteristics of social communication in the group studied (three temporal phases of the test)

Variables	Pre-test		Post-test		Post hoc	
	Mean	SD	Mean	SD	Mean	SD
Emotional expression	3.3000	2.79086	5.8000	2.29976	4.3000	2.31181
Appropriate use of nonverbal language	3.6000	2.22111	6.1000	2.28279	6.0000	3.12694
Establishing effective communication with others	2.8000	1.93218	6.3000	2.05751	5.1000	2.92309
Establishing effective communication with objects and ambience	4.8000	2.89828	7.5000	2.32140	6.6000	3.27278
Total score	14.5000	8.36992	25.7000	7.87471	22.0000	9.58007

Table 2: Considering normality of distribution of study variables using Kolmogorov-Smirnov test

Variables	Kolmogorov-Smirnov	
	Values	Significance level
Emotional expression	0.629	0.823
Proper use of nonverbal language	0.746	0.635
Establishing proper communication with others	0.508	0.959
Proper communication with objects and the ambience	0.557	0.916
Total score	0.459	0.984

Table 3: Mauchly's test for investigating sphericity hypothesis

In-group test variables	Mauchly test			
	Mauchly's w	Chi-one	Degree of freedom	Level of significance
Social communication	0.772	2.066	2	0.356

considerable changes in the variable of social communication and its subscales in post-test and post hoc phases compared with the pre-test phase.

To consider normality of scores, if number of participants is 40 or less, Kolmogorov-Smirnov and Shapiro-Wilk tests are used. Based on the results obtained from Kolmogorov-Smirnov test, since acquired values are not significant in the 0.05 level, conditions of in-group variances equality and normal data distribution are satisfied Table 2.

Principal hypothesis: Using sensory integration method influences social communication of students with autism spectrum disorder.

According to Table 3, since Mauchly's test result is significant, it could be concluded that sphericity hypothesis does not apply and therefore, we can use in-group test results by correcting degrees of freedom and by using Huynh-Feldt correction (Table 4).

As understood from Table 4 the value of the F statistical indicator with the value of 99.797, time factor in the significance level of $\alpha = 0.05$ is significant. This means that with a probability of 95% it could be concluded that change in different phases of the test is significant. Results of post hoc test in various phases of test in the group under study show that mean in pre-test phase is significantly different from that in the post-test phase,

Table 4: Results of the four characteristics concerning repeated measurements about the effect of using sensory integration method on social communication of students with autism spectrum disorder

Source of changes	Indicators				
	Sum of squares	Degree of freedom	Mean squares	F-values	Level of significance
Effect of time					
Assumed sphericity	651.267	2.000	325.633	99.797	0.00
Greenhouse-Geisser	651.267	1.629	399.742	99.797	0.00
Huynh-Feldt	651.267	1.939	335.872	99.797	0.00
Higher band	651.267	1.000	651.267	99.797	0.00
Error					
Assumed sphericity	58.733	18.000	3.263		
Greenhouse-Geisser	58.733	14.663	4.006		
Huynh-Feldt	58.733	17.451	3.366		
Higher band	58.733	9.000	6.526		

Table 5: Results of Bonferroni's post hoc test concerning the effect of results of repeated measures analysis on social communication of students with autism spectrum disorder

I	J	Mean difference (I-J)		Level of significance
		SD		
Pre-test	Post-test	-11.200	0.680	0.000
	Post hoc	-7.500	0.980	0.000
Post-test	Pre-test	11.200	0.680	0.000
	Post hoc	3.700	0.731	0.001
Post hoc	Pre-test	7.500	0.980	0.000
	Post-test	-3.700	0.731	0.001

therefore, using sensory integration method influences social communication of students with autism spectrum disorder.

Also, results of the post hoc test show that the mean for variable scores in the post hoc phase is higher than that in pre-test phase which shows stability of the effect of using sensory integration on social communication of students suffering from autism spectrum disorder (Table 5).

Peripheral hypotheses

First hypothesis: Using sensory integration method influences emotional expression of students with autism spectrum disorder.

According to Table 6 as the result of Mauchly's test is not significant, it could be concluded that sphericity hypothesis applies and therefore, we can use the results of in-group tests without adjusting degrees of freedom (Table 7).

Table 6: Mauchly's test for investigating sphericity 1st hypothesis

In-group test variables	Mauchly test			
	Mauchly's w	Chi-one	Degree of freedom	Level of significance
Emotional expression	0.687	0.006	2	0.222

Table 7: Results of four characteristics of F as to repeated measures analysis on the effect of using sensory integration method on emotional expression of students with autism spectrum disorder

Source of changes	Indicator				
	Sum of squares	Degree of freedom	Mean squares	F-values	Level of significance
Time effect					
Assumed sphericity	31.667	2.000	15.833	27.581	0.00
Greenhouse-Geisser	31.667	1.523	20.793	27.581	0.00
Huynh-Feldt	31.667	1.769	17.897	27.581	0.00
Higher band	31.667	1.000	31.667	27.581	0.00
Error					
Assumed sphericity	10.333	18.000	0.574		
Greenhouse-Geisser	10.333	13.707	0.754		
Huynh-Feldt	10.333	15.925	0.649		
Higher band	10.333	9.000	1.148		

Table 8: Results of Bonferroni's post hoc test on repeated measures analysis for the effect of using sensory integration method on emotional expression of students with autism spectrum disorder

I	J	Mean difference (I-J)	SD	Level of significance
Pre-test	Post-test	-2.500	0.307	0.000
	Post hoc	-1.000	0.422	0.042
Post-test	Pre-test	2.500	0.307	0.000
	Post hoc	1.500	0.269	0.000
Post hoc	Pre-test	1.000	0.422	0.042
	Post-test	-1.500	0.269	0.000

As it is resulted from the Table 7 with statistical indicator of F being 27.581, time factor in significance level of $\alpha = 0.05$ is significant. That is, with a probability of 95% it could be suggested that variation in different phases of the test is significant. Results of post hoc test in different phases of test in the subject group shows that mean of pre-test phase is significantly different from that of post-test phase, thus, using sensory integration influences emotional expression of students suffering from autism spectrum disorder.

Also, results of post hoc test show that mean of variable scores in post hoc phase is more than that in pre-test phase, showing stability of the effect of using sensory integration on sensory integration in students suffering from autism spectrum disorder (Table 8).

Second hypothesis: Using sensory integration method influences proper use of nonverbal language in students with autism spectrum disorder. According to Table 9 since Mauchly's test is not significant, it could be suggested that sphericity hypothesis applies and therefore we can use in-group tests without adjusting degrees of freedom.

Table 9: Mauchly's test for investigating sphericity 2nd hypothesis

In-group test variable	Mauchly test			
	Mauchly's w	Chi-one	Degree of freedom	Level of significance
Proper use of nonverbal language	0.609	3.964	2	0.138

Table 10: Results of four indicators of F regarding repeated measures analysis on the effect of using sensory integration method on proper use of nonverbal language in students with autism spectrum disorder

Source of changes	Indicator				
	Sum of squares	Degree of freedom	Mean squares	F-values	Level of significance
Time effect					
Assumed sphericity	40.067	2.000	20.33	15.956	0.00
Greenhouse-Geisser	40.067	1.438	27.861	15.956	0.01
Huynh-Feldt	40.067	1.637	24.471	15.956	0.00
Higher band	40.067	1.000	40.067	15.956	0.03
Error					
Assumed sphericity	22.600	18.000	1.256		
Greenhouse-Geisser	22.600	12.943	1.746		
Huynh-Feldt	22.600	14.736	1.534		
Higher band	22.600	9.000	2.511		

Table 11: Results of Bonferroni's post hoc test on the results of repeated measures analysis for the effect of using sensory integration method on proper use of nonverbal language in students with autism spectrum disorder

I	J	Mean difference (I-J)	SD	Level of significance
Pre-test	Post-test	-2.500	0.307	0.000
	Post hoc	-2.400	0.581	0.003
Post-test	Pre-test	2.500	0.307	0.864
	Post hoc	0.100	0.567	0.030
Post hoc	Pre-test	2.400	0.581	0.003
	Post-test	-0.100	0.567	0.864

As observed in Table 10 with the statistical indicator F with the being 15.956, time factor is significant in the significance level of $\alpha = 0.05$ that is with a probability of 95% it could be suggested that variation in different test phases is significant. Results of post hoc test in different test phases of the subject group shows that mean for pre-test phase is significantly different from that for post-test phase, therefore, using sensory integration influences proper use of nonverbal language in students suffering from autism spectrum disorder.

Also, results of post hoc test show that mean for variable scores in post hoc test is more than that in the pre-test phase, showing stability and durability of the effect of using sensory integration on proper use of nonverbal language in students suffering from autism spectrum disorder (Table 11).

Third hypothesis: Using sensory integration method influences effective communication with others in students with autism spectrum disorder.

Table 12: Mauchly's test for investigating sphericity 3rd hypothesis

In-group test variables	Mauchly test			
	Mauchly's w	Chi-one	Degree of freedom	Level of significance
Effective intervention	0.334	8.769	2	0.012

Table 13: Results of four indicators of F on repeated measures analysis for the effect of using sensory integration method on effective communication with others in students with autism spectrum disorder

Source of changes	Indicator				
	Sum of squares	Degree of freedom	Mean squares	F-values	Level of significance
Time effect					
Assumed sphericity	63.267	2.000	31.633	42.493	0.00
Greenhouse-Geisser	63.267	1.201	52.696	42.493	0.00
Huynh-Feldt	63.267	1.283	49.315	42.493	0.00
Higher band	63.267	1.000	63.267	42.493	0.00
Error					
Assumed sphericity	13.400	18.000	0.744		
Greenhouse-Geisser	13.400	10.805	1.240		
Huynh-Feldt	13.400	11.546	1.161		
Higher band	13.400	9.000	2.489		

According to Table 12 as Mauchly's test is significant, it could be suggested that sphericity hypothesis does not apply and therefore, we can use in-group tests by adjusting degrees of freedom as well as Huynh-Feldt correction.

As seen from Table 13 with the statistical indicator of F being 42.493, the time factor is significant in the significance level of that $\alpha = 0.05$ is with a 95% probability it could be said that change in different test phases is significant. Results of post hoc test in different test phases in the subject group also show that mean for the pre-test phase is significantly different from post-test phase, therefore, using sensory integration influences establishment of effective communication with other students suffering from autism spectrum disorder.

Additionally, results of post hoc test show that mean of variable scores in post hoc phase is more than that in pre-test phase which shows stability and durability of the effect of using sensory integration in establishing effective communication with other students suffering from autism spectrum disorder (Table 14).

Fourth hypothesis: Using sensory integration influences establishment of proper communication with objects and the ambience in students with autism spectrum disorder.

According to Table 15 as result of Mauchly's test is not significant, it could be suggested that sphericity hypothesis applies and because of this we can use results of in-group tests without adjusting degrees of freedom.

Table 14: Results of Bonferroni's post hoc test on the results of repeated measures analysis for the effect of using sensory integration method on establishing effective communication with other students with autism spectrum disorder

I	J	Mean difference (I-J)	SD	Level of significance
Pre-test	Post-test	-3.500	0.167	0.000
	Post hoc	-2.300	0.448	0.001
Post-test	Pre-test	3.500	0.167	0.000
	Post hoc	1.200	0.467	0.030
Post hoc	Pre-test	2.300	0.448	0.001
	Post-test	-1.200	0.467	0.030

Table 15: Mauchly's test for considering sphericity hypothesis

In-group test variables	Mauchly test			
	Mauchly's w	Chi-one	Degree of freedom	Level of significance
Establishing proper connection communication with objects and ambience	0.996	0.029	2	0.986

Table 16: Results of four indicators of F on repeated measures analysis for the effect of using sensory integration method on effective communication with others in students with autism spectrum disorder 4th hypothesis

Source of changes	Indicator				
	Sum of squares	Degree of freedom	Mean squares	F-values	Level of significance
Time effect					
Assumed sphericity	37.800	2.000	18.900	29.497	0.00
Greenhouse-Geisser	37.800	1.993	18.969	29.497	0.00
Huynh-Feldt	37.800	2.000	18.900	29.497	0.00
Higher band	37.800	1.000	37.800	29.497	0.00
Error					
Assumed sphericity	11.533	18.000	0.641		
Greenhouse-Geisser	11.533	17.935	1.643		
Huynh-Feldt	11.533	18.000	1.641		
Higher band	11.533	9.000	1.281		

As seen from Table 16 with the F statistical indicator being 29.497, the time factor is significant in the significance level of $\alpha = 0.05$. This means with a 95% probability it could be suggested that variation in different test phases is significant. Results of post hoc test in different test phases in the subject group also show that mean of pre-test phase is significantly different from that of post-test phases, therefore, using sensory integration influences establishment of proper communication with objects and ambience of students with autism spectrum disorder.

Also, results of post hoc test show that mean of variable scores in post hoc phase is more than that in pre-test phase which shows stability and durability of the effect of using sensory integration on establishing proper communication with objects and ambience of students with autism spectrum disorder (Table 17).

Table 17: Results of Bonferroni's post hoc test on the results of repeated measures analysis for the effect of using sensory integration method on establishing effective communication with other students with autism spectrum disorder 4th hypothesis

I	J	Mean difference (I-J)	SD	Level of significance
Pre-test	Post-test	-2.700	0.367	0.000
	Post hoc	-1.800	0.359	0.001
Post-test	Pre-test	2.700	0.367	0.000
	Post hoc	0.900	0.348	0.029
Post hoc	Pre-test	1.800	0.359	0.001
	Post-test	-0.900	0.348	0.029

In this study, using social communication part of GARS-1 scale, by doing a pre-test, post-test and post hoc after 2 months, the effect of sensory integration therapy on ten students suffering from autism spectrum disorder was considered and various effective dimensions in social communications of students were evaluated. Also, total scores of social communication before and after therapeutic intervention and after 2 months of interferential method were compared.

According to existing documents, the main hypothesis is confirmed and it could be suggested that using sensory integration has a positive and significant effect on social integration of students with autism spectrum disorder. Additionally, results show stability of the effect of this interferential method after two months on social communication.

CONCLUSION

In a study conducted by Irosi and McDonald in Psychology Department of Simon Fraser University of the Canadian state of Burnaby it was found that by making operational the concept of sensory integration in the lives of autistic children, a useful way opens for better conceptualization and integration of perceptual experiences of these individuals. This study shows the effect of using sensory integration on social skills of autistic children, thus, confirming the main hypothesis of the present study.

However in the study of Shoja in which the effect of sensory and tactile drives on reducing autism symptoms of autism spectrum children was considered, the acquired result showed that using sensory integration does not have a significant effect on reducing autism symptoms and the study's hypothesis was rejected, therefore, it was inconsistent with the results of the present study, rejecting its hypotheses.

In a review in 2012, a number of scientists (Lang, Erily, Hily, Reiss Play, Liden, Strosand, Davis, Kang, Sigafs, Lancy N, Diden, Geisbers) considered

25 studies about the effect of sensory integration on education and therapy of autistic children but only 3 studies confirmed their sensory integration effect with 14 studies considering it completely useless and 8 remaining studies exhibiting intermediate results. After reviewing those three studies, it was found they had practical issues, therefore, results of these scientists' study don't endorse the hypotheses of the present study.

Nonetheless, some studies have confirmed and some have rejected the hypotheses of the present study; a great number of therapists use this therapeutic method as one of interferential methods in treating autism spectrum children.

LIMITATIONS

- This study was only conducted on boys suffering from autism spectrum disorder with the result being that the gender which deserves investigation in its own right is introduced in the results of this study
- Small size of the statistical population can affect the results of the present study
- Duration of conducting an interferential method can affect its effectiveness. This study was only run for 10 weeks and in only 15 therapeutic sessions
- In this study only students of one school were used who based on tests conducted by the Education Bureau were educable and had potency for education, so, children without this capability have been removed from this study

SUGGESTIONS

Considering the acquired results it could be suggested that:

- Performing sensory integration method has a positive and significant effect on emotional expression of students with autism spectrum disorder
- Using sensory integration has a statistically positive and significant effect on proper use of nonverbal language by students with autism spectrum disorder
- Using sensory integration method has a statistically positive and significant effect on establishing effective communication with others in students with autism spectrum disorder
- Using sensory integration method has a statistically positive and significant effect on proper communication with objects and ambience in students with autism spectrum disorder

Therefore, considering the mentioned items, all 4 peripheral hypotheses are confirmed and this effect is stable. In this study, social communication includes the following criteria:

- Emotional expression, including: proper emotional expression when being praised or loved, frightened, or when responding to others' questions and requests
- Nonverbal language including eye and physical contact with others and expression of nonverbal love
- Establishing communication with others such as proper and suitable communication with others, active presence in community and mutual communication with others
- Communication with objects and ambience such as proper use of objects and toys and ability to introduce and tolerate changes in one's ambience and behavior

Comparing the results of this study with those from similar studies in this regard suggests that some studies reject results of the present study and some rebuke that this has different reasons.

In 2004, Burbur considered the effect of sensory drives on reducing self-harming behavior as well as the effect of sensory integration drives on reducing stereotypic behaviors in autistic children. Changes developed in the subjects were statistically significant but considering that the final evaluation result shows instability of the effect of independent variable on dependent variable, this study endorses the effect of sensory integration on emotional expression and effective relationship in autism spectrum children which is in agreement with the results of the present study, confirming it but not confirming stability of this therapy.

RECOMMENDATIONS

- Parents and teachers of autism spectrum children are always eager to practically see and learn interferential methods used for these children. Making use of technology can facilitate this. For instance, preparing educational CDs in this respect can pave the way for them
- School officials are asked to encourage students to perform exercises related to sensory integration so that students can attend classes more comfortably
- This study was only performed based on social communication of autism spectrum children, so it is necessary that other studies using this interferential method be conducted for treating other problems of these individuals
- In order to have stronger theories to prove the effect of using sensory integration on brain, further studies seem to be required regarding human brain functions

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