

The impact of high intensity versus low intensity behavioral therapy in establishment of functional routines in Egyptian autistic children

Yehia A. Aboras, Rania M. Abdou, Heba E. Gaber

Department of Otorhinolaryngology, Faculty of Medicine, Alexandria University, Alexandria, Egypt

Correspondence to Heba E. Gaber, BSc, MSc, MD, 4 Elnasr Street, Smouha, Alexandria, 21500, Egypt.
Tel: +20 100 950 9337;
e-mail: h_gaber00@alexmed.edu.eg

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Objective

To compare the effect of high-intensity versus low-intensity treatment in the establishment of functional routines in autistic children.

Patients and methods

This quasi-experimental study was conducted on 25 children of 2–6 years of age of both sexes at the Unit of Phoniatrics, Department of Otorhinolaryngology, Alexandria Main University Hospitals. An informed consent was taken from all patients in this part of the study. All cases included in the study underwent thorough history taking, comprehensive neurological examination, and diagnosis of autism based on *Diagnostic and Statistical Manual of Mental Disorders*, fifth ed., Childhood Autism Rating Scale, and Autism diagnostic interview-revised. The children were trained for 1 year using the STAR program. The children were divided into two groups: group I included 15 children who were trained 5 days per week, and group II included 10 children who were trained 3 days per week owing to family commitments.

Results

There was significant improvement in both groups in all lessons when comparing pretherapy and post-therapy results; however, group I showed significant degree of improvement when compared with group II in specific items.

Conclusion

Early intervention for autistic children helps in improving their prognosis and yields better results. The need to apply the treatment on daily basis is highly recommended.

Keywords:

autism, functional routines, high-intensity treatment

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Introduction

Autism spectrum disorders (ASDs) are a category of disorders characterized by ‘severe and pervasive impairment in several areas of development,’ including social interaction and communication skills [1].

One of the treatment approaches is applied behavior analysis that uses procedures derived from the principles of operant behavior to meaningfully improve socially significant behavior [2].

The STAR program adopts applied behavior analysis, and it is composed of three strategies: discrete trial training, pivotal response training, and functional routines instruction.

Functional routines are predictable events that involve a chain of behaviors. Routines are generally associated with a functional outcome for the child, which usually serves as the reinforcer for typical development of children [3,4].

Aim

The aim is to compare the effect of high-intensity versus low-intensity treatment in the establishment of functional routines in autistic children.

Patients and methods

This study was conducted at the Unit of Phoniatrics, Department of Otorhinolaryngology, Alexandria Main University Hospitals.

Inclusion criteria

Delayed language children and fulfilling criteria for autism with age range 2–6 years (no certain autism degree or certain IQ was required).

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Exclusion criteria

Children with sensory deprivation (visual or hearing impairment), children with mental retardation, children with attention-deficit hyperactive disorder, and children with Down's syndrome or cerebral palsy were included.

Methods

This was a quasi-experimental study and was applied on 25 children of 2–6 years of age of both sexes from January 2014 to January 2016.

All cases included in the study underwent thorough history taking including information on the medical history, perinatal history, developmental milestones, family history, and comprehensive neurological examination. Diagnosis of autism was based on *Diagnostic and Statistical Manual of Mental Disorders*, fifth ed., [5] and Childhood Autism Rating Scale (CARS) as well as [6] Autism diagnostic interview-revised (ADI-R) [7].

The children were trained for 1 year. The children were divided into two groups: group I included 15 children who were trained 5 days per week, and group II included 10 children who were trained 3 days per week owing to family commitments.

An informed consent was taken from all patients in this part of the study. Confidentiality of the records was maintained.

Group I was trained for 5 days per week (25 h), and their daily schedule was as follows:

- (1) 9:00: arrival and rest room use.
- (2) 9:10: transition between locations.
- (3) 9:15: discrete trial training (DTT).
- (4) 10:00: snack time.
- (5) 10:30: pivotal response training (PRT).
- (6) 11:15: center time.
- (7) 11:30: sensory room.
- (8) 12:00: DTT.
- (9) 12:45: center time.
- (10) 13:00: PRT.
- (11) 13:45: rest room use.
- (12) 14:00: departure.

Group II was trained 3 days per week (9 h), and their daily schedule was as follows:

- (1) 10:00: arrival and rest room use.
- (2) 10:05: transition between locations.
- (3) 10:10: DTT.

- (4) 10:45: center time.
- (5) 11:00: snack time.
- (6) 11:30: PRT.
- (7) 12:15: center time.
- (8) 12:30: sensory room.
- (9) 12:50: rest room use.
- (10) 13:00: departure.

Results

Data were fed to the computer and analyzed using IBM SPSS software package, version 20.0 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, SD, and median. Significance of the obtained results was judged at the 5% level.

Demographic data

The sex distribution was as follows: in group I, 80% were male and 20% were female, and in group II, 70% were male and 30% were female. Age distribution in group I was 13.3% in between 2 and 3 years of age, 60% between 3 and 4 years of age, and 26.7% between 4 and 6 years of age, whereas in group II was 20% between 2 and 3 years of age, 70% between 3 and 4 years of age, and 10% between 4 and 6 years of age.

Childhood Autism Rating Scale

Table 1 shows statistically highly significant improvement in CARS scores in both groups after therapy, but there was insignificant difference in the degree of improvement between both groups regarding CARS scores before and after therapy.

Autism diagnostic interview-revised

Table 2 shows statistically highly significant improvement in all domains of ADI-R (social interaction, communication, and behavior) in both groups after therapy, except for verbal communication in group II, which showed insignificant improvement. There was insignificant difference in the degree of improvement between both groups regarding ADI-R scores before and after therapy, except for behavioral domain, which showed significant improvement in group I compared with group II.

The cutoff scores for ADI-R are social interaction (9), communication nonverbal (7), communication verbal (8), and behavior (2).

Table 1 Comparison between the two studied groups regarding Childhood Autism Rating Scale before and after therapy

	Group I (n=15) [n (%)]		Group II (n=10) [n (%)]		P ₁	P ₂
	Before therapy	After therapy	Before therapy	After therapy		
Childhood Autism Rating Scale						
<30	4 (26.7)	12 (80.0)	3 (30.0)	4 (40.0)	^{MC} P=1.000	^{FE} P=0.087
Mild (30–35)	9 (60.0)	3 (20.0)	5 (50.0)	6 (60.0)		
Moderate (36–42)	2 (13.3)	0 (0.0)	2 (20.0)	0 (0.0)		
Severe (>42)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)		
P [#]	0.004***		0.083			
Minimum–maximum	26.0–38.0	20.0–32.0	28.0–37.0	21.0–33.0		
Mean±SD	31.40±3.11	26.60±3.48	31.90±2.96	28.10±3.96	^t P=0.692	^t P=0.328
Median	31.0	26.0	31.50	30.0		
P [@]	0.001****		0.001****			

^{MC}P: P value for Monte Carlo for χ^2 -test for comparing between the two groups. ^{FE}P: P value for Fisher Exact for χ^2 -test for comparing between the two groups. ^tP: P values for Student's t-test for comparing between the two groups. [#]P: P values for Marginal Homogeneity test for comparing between pretherapy and post-therapy. [@]P: P values for paired t-test for comparing between pretherapy and post-therapy. P₁: for comparing between groups I and II before therapy. P₂: for comparing between groups I and II after therapy. ***P≤0.005, statistically highly significant. ****P≤0.001, statistically highly significant.

Table 2 Comparison between the two studied groups regarding (Autism diagnostic interview-revised) before and after therapy

Autism diagnostic interview	Group I (n=15)		Group II (n=10)		P ₁	P ₂
	Before therapy	After therapy	Before therapy	After therapy		
Social						
Minimum–maximum	6.0–24.0	0.0–16.0	7.0–26.0	2.0–20.0	^U P=0.597	^U P=0.802
Mean±SD	15.20±5.36	9.73±5.01	16.30±6.20	10.30±5.79		
Median	14.0	10.0	16.0	11.0		
Z _P	0.001****		0.008**			
Nonverbal communication						
Minimum–maximum	5.0–14.0	1.0–12.0	10.0–14.0	3.0–13.0	^U P=0.323	^U P=0.758
Mean±SD	11.27±2.71	7.4±3.04	12.50±1.35	7.2±3.16		
Median	12.0	7.0	12.50	7.0		
Z _P	0.001****		0.005***			
Verbal communication						
Minimum–maximum	0.0–0.0	0.0–5.0	0.0–0.0	0.0–6.0	^U P=1.000	^U P=0.267
Mean±SD	0.0±0.0	1.13±1.81	0.0±0.0	0.60±1.90		
Median	0.0	0.0	0.0	0.0		
Z _P	0.041*		0.317			
Behavior						
Minimum–maximum	1.0–5.0	0.0–3.0	0.0–6.0	0.0–3.0	^U P=0.547	^U P=0.042*
Mean±SD	2.53±0.99	1.47±0.92	3.0±2.0	0.70±0.92		
Median	2.0	2.0	3.0	0.50		
Z _P	0.006**		0.007**			

^UP: P values for Mann–Whitney test for comparing between the two groups. Z_P: P values for Wilcoxon signed ranks test for comparing between before and after therapy. P₁: For comparing between groups I and II before therapy. P₂: For comparing between groups I and II after therapy. *P≤0.05, statistically significant. **P≤0.01, statistically highly significant. ***P≤0.005, statistically highly significant. ****P≤0.001, statistically highly significant.

Functional routines

The results of functional routines are as follows:

- (1) Arrival: 86.7% of children in group I and 80% of children in group II achieved it.
- (2) Departure: 80% of children in both groups achieved it.
- (3) Transition between activities: 60% of children in group I and 50% of children in group II achieved it.
- (4) Hand washing: in group I, improvement from 6.7 to 86.7% after therapy. In group II, 50% of children in group II achieved it.
- (5) Snack: all children in group I (one child already had this task before therapy) and 90% of children in group II achieved it.
- (6) Rest room use: in group I, improvement from 13.3 to 60%. In group II, 10% of children in group II achieved it.

- (7) Going on a walk: 86.7% of children in group I and 90% of children in group II achieved it.
- (8) Circle: 66.7% of children in group I and 10% of children in group II achieved it.
- (9) Centers: this lesson was applicable on eight children in group I and one child in group II, and all of them achieved it.
- (10) Work with teacher: all children in group I and 50% of children in group II achieved it.
- (11) Simple art activity: this lesson was applicable on eight children in group I and one child in group II, and all of them achieved it.
- (12) There was a significant improvement in both groups in all lessons when comparing pretherapy and post-therapy results; however, group I showed significant degree of improvement when compared with group II in the following lessons: hand washing, rest room use, circle time, and work with teacher, as well as the average of functional routines (Table 3).

Discussion

The present study showed that the sex distribution in both groups was 76% male and 24% female. These findings go with a recent review covering 34 epidemiological surveys, and it showed male : female ratios among children with ASD is within a ratio of 4 : 1 [8]. This male predominance in ASD could be explained by a theory known as the 'extreme male brain' theory, combined with the androgen theory of autism. It suggests that behaviors seen in ASD are an exaggeration of typical male personality traits and that exposure to high levels of prenatal testosterone may be one risk factor among other contributing factors [9,10].

Regarding the age distribution, most children were between the ages of 3 and 4 years when presenting to evaluation in the unit of phoniatrics. This could be explained by the fact that many people, including pediatricians, family doctors, teachers, and parents, may undermine the signs of ASD at first, believing that children will 'catch up' with their peers. Early intervention can reduce or prevent the more severe disabilities associated with ASD [11].

Regarding CARS, there was significant improvement in both groups after therapy. These findings are similar to the findings in another study by Perry *et al.* [12] who evaluated the effectiveness of a government-funded early intensive behavioral intervention program for children with ASD and found that ~71% of 332 children who received treatment achieved some gains.

As for ADI-R, the present study showed significant improvement in all domains of ADI-R (social interaction, communication, and behavior) in both groups after therapy. In addition, the behavioral domain showed significant improvement in group I compared with group II after therapy. These findings are supported by other studies that showed outcomes ranging from partial to nearly complete remediation of symptoms (the most optimistic figures suggest an ~50% complete recovery with intensive early intervention), with progress sometimes defined in terms of gains on standardized pre-post test scores and sometimes in terms of behavioral outcomes [13,14].

Group I is considered to have had high-intensity treatment and group II had low-intensity treatment. In the present study, group I had a significant degree of improvement when compared with group II regarding functional routines.

These findings are consistent with the findings found in many studies as Reed, Osborne, and Corness [15] that compared outcomes for children who received low-intensity (mean 12 h/week) behavioral intervention with those of children who received higher intensity (mean 30 h/week) behavioral intervention. Despite the effectiveness of intensive behavioral treatment, it is difficult to implement in clinical practice, and several barriers were reported by parents regarding the implementation of such intensive treatment. One of the primary concerns is the availability of professionals (e.g. recruiting and maintaining a suitable team) and obtaining funding of the treatment. Therefore, children with ASD may not have the chance to start intensive treatment, and less intensive treatment could be an accessible option [16].

Regarding functional routines, both groups showed significant improvement in all lessons (except for centers and simple art activity in group II) after therapy. Group I showed significant degree of improvement when compared with group II in the following lessons: hand washing, rest room use, circle time, and work with teacher as well as the average of functional routines. These findings are supported by other studies that documented children with autism learn more easily, express more interest, and have fewer behavior problems if there is predictability to their daily routines. Children with autism demonstrate more independence in participation at school when the classroom routines are implemented consistently. In addition, parents have also found that applying

Table 3 Comparison between the two studied groups regarding functional routines before and after therapy

	Group I (n=15) [n (%)]		Group II (n=10) [n (%)]		P	Total (n=25) [n (%)]		
	Before therapy	After therapy	Before therapy	After therapy		Before therapy	After therapy	
Arrival								
0	10 (66.7)	0 (0.0)	6 (60.0)	0 (0.0)	$MC P=0.728$	16 (64.0)	0 (0.0)	
1	1 (6.7)	0 (0.0)	2 (20.0)	0 (0.0)		3 (12.0)	0 (0.0)	
2	0 (0.0)	0 (0.0)	1 (10.0)	0 (0.0)		1 (4.0)	0 (0.0)	
3	0 (0.0)	0 (0.0)	1 (10.0)	0 (0.0)		1 (4.0)	0 (0.0)	
4	4 (26.7)	0 (0.0)	0 (0.0)	0 (0.0)		4 (16.0)	0 (0.0)	
5	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)		0 (0.0)	1 (4.0)	
6	0 (0.0)	2 (13.3)	0 (0.0)	1 (10.0)		0 (0.0)	3 (12.0)	
8	0 (0.0)	13 (86.7)	0 (0.0)	8 (80.0)		0 (0.0)	21 (84.0)	
Minimum–maximum	0.0–4.0	6.0–8.0	0.0–3.0	5.0–8.0		$UP=0.602$	0.0–4.0	5.0–8.0
Mean±SD	1.13±1.81	7.73±0.70	0.70±1.06	7.50±1.08	0.96±1.54		7.64±0.86	
Median	0.0	8.0	0.0	8.0	0.0		8.0	
ZP	0.001****		0.004***		0.001****			
Departure								
0	10 (66.7)	0 (0.0)	8 (80.0)	0 (0.0)	$MC P=0.847$	18 (72.0)	0 (0.0)	
2	1 (6.7)	0 (0.0)	1 (10.0)	0 (0.0)		2 (8.0)	0 (0.0)	
4	4 (26.7)	0 (0.0)	1 (10.0)	1 (10.0)		5 (20.0)	1 (4.0)	
6	0 (0.0)	2 (13.3)	0 (0.0)	1 (10.0)		0 (0.0)	3 (12.0)	
7	0 (0.0)	1 (6.7)	0 (0.0)	0 (0.0)		0 (0.0)	1 (4.0)	
8	0 (0.0)	12 (80.0)	0 (0.0)	8 (80.0)		0 (0.0)	20 (80.0)	
Minimum–maximum	0.0–4.0	6.0–8.0	0.0–4.0	4.0–8.0		$UP=0.874$	0.0–4.0	4.0–8.0
Mean±SD	1.20±1.82	7.67±0.72	0.60±1.35	7.40±1.35			0.96±1.65	7.56±1.0
Median	0.0	8.0	0.0	8.0			0.0	8.0
ZP	0.001****		0.004***		0.001****			
Transition between activities								
0	15 (100.0)	0 (0.0)	10 (100.0)	0 (0.0)	$MC P=0.078$	25 (100.0)	0 (0.0)	
2	0 (0.0)	0 (0.0)	0 (0.0)	3 (30.0)		0 (0.0)	3 (12.0)	
3	0 (0.0)	2 (13.3)	0 (0.0)	0 (0.0)		0 (0.0)	2 (8.0)	
4	0 (0.0)	4 (26.7)	0 (0.0)	1 (10.0)		0 (0.0)	5 (20.0)	
5	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)		0 (0.0)	1 (4.0)	
6	0 (0.0)	9 (60.0)	0 (0.0)	5 (50.0)		0 (0.0)	14 (56.0)	
Minimum–maximum	0.0–0.0	3.0–6.0	0.0–0.0	2.0–6.0		$UP=0.443$	0.0–0.0	2.0–6.0
Mean±SD	0.0±0.0	5.07±1.22	0.0±0.0	4.50±1.84			0.0±0.0	4.84±1.49
Median	0.0	6.0	0.0	5.50			0.0	6.0
ZP	0.001****		0.004***		0.001****			
Going on a walk								
0	9 (60.0)	0 (0.0)	9 (90.0)	0 (0.0)	$MC P=0.305$	18 (72.0)	0 (0.0)	
1	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)		1 (4.0)	0 (0.0)	
2	2 (13.3)	0 (0.0)	1 (10.0)	0 (0.0)		3 (12.0)	0 (0.0)	
3	3 (20.0)	2 (13.3)	0 (0.0)	0 (0.0)		3 (12.0)	2 (8.0)	
4	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)		0 (0.0)	1 (4.0)	
6	0 (0.0)	13 (86.7)	0 (0.0)	9 (90.0)		0 (0.0)	22 (88.0)	
Minimum–maximum	0.0–3.0	3.0–6.0	0.0–2.0	4.0–6.0		$UP=0.731$	0.0–3.0	3.0–6.0
Mean±SD	0.93±1.28	5.60±1.06	0.20±0.63	5.80±0.63			0.64±1.11	5.68±0.90
Median	0.0	6.0	0.0	6.0			0.0	6.0
ZP	0.001****		0.003***		0.001****			
Circle								
0	12 (80.0)	0 (0.0)	10 (100.0)	0 (0.0)	$MC P=0.010^{**}$	22 (88.0)	0 (0.0)	
2	2 (13.3)	0 (0.0)	0 (0.0)	2 (20.0)		2 (8.0)	2 (8.0)	
3	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)		1 (4.0)	0 (0.0)	
4	0 (0.0)	1 (6.7)	0 (0.0)	1 (10.0)		0 (0.0)	2 (8.0)	
5	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)		0 (0.0)	1 (4.0)	
6	0 (0.0)	4 (26.7)	0 (0.0)	5 (50.0)		0 (0.0)	9 (36.0)	
8	0 (0.0)	10 (66.7)	0 (0.0)	1 (10.0)		0 (0.0)	11 (44.0)	
Minimum–maximum	0.0–3.0	4.0–8.0	0.0–0.0	2.0–8.0		$UP=0.004^{***}$	0.0–3.0	2.0–8.0
Mean±SD	0.47±0.99	7.20±1.26	0.0±0.0	5.10±1.91			0.28±0.79	6.36±1.85

(Continued)

Table 3 (Continued)

	Group I (n=15) [n (%)]		Group II (n=10) [n (%)]		P	Total (n=25) [n (%)]	
	Before therapy	After therapy	Before therapy	After therapy		Before therapy	After therapy
Median	0.0	8.0	0.0	6.0		0.0	6.0
Z_P	0.001****		0.004***			0.001****	
Centers							
N	8	8	1	1		9	9
0	6 (75.0)	0 (0.0)	1 (100.0)	0 (0.0)	–	7 (77.8)	0 (0.0)
2	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)		1 (11.1)	0 (0.0)
4	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)		1 (11.1)	0 (0.0)
8	0 (0.0)	8 (100.0)	0 (0.0)	1 (100.0)		0 (0.0)	9 (100.0)
Minimum–maximum	0.0–4.0	8.0–8.0	0.0–0.0	8.0–8.0		0.0–4.0	8.0–8.0
Mean±SD	0.75±1.49	8.0±0.0	0.0	8.0	$^U P=1.000$	0.67±1.41	8.0±0.0
Median	0.0	8.0	0.0	8.0		0.0	8.0
Z_P	0.008**		–			0.005***	
Work with teacher							
0	10 (66.7)	0 (0.0)	9 (90.0)	0 (0.0)	$^{MC} P=0.005***$	19 (76.0)	0 (0.0)
2	1 (6.7)	0 (0.0)	1 (10.0)	0 (0.0)		2 (8.0)	0 (0.0)
3	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)		1 (4.0)	0 (0.0)
4	3 (20.0)	0 (0.0)	0 (0.0)	3 (30.0)		3 (12.0)	3 (12.0)
6	0 (0.0)	0 (0.0)	0 (0.0)	2 (20.0)		0 (0.0)	2 (8.0)
8	0 (0.0)	15 (100.0)	0 (0.0)	5 (50.0)		0 (0.0)	20 (80.0)
Minimum–maximum	0.0–4.0	8.0–8.0	0.0–2.0	4.0–8.0		0.0–4.0	4.0–8.0
Mean±SD	1.13±1.73	8.0±0.0	0.20±0.63	6.40±1.84	$^U P=0.003***$	0.76±1.45	7.36±1.38
Median	0.0	8.0	0.0	7.0		0.0	8.0
Z_P	0.001****		0.005***			0.001****	
Simple art activity							
N	8	8	1	1		9	9
0	6 (75.0)	0 (0.0)	1 (100.0)	0 (0.0)		7 (77.8)	0 (0.0)
3	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)		1 (11.1)	0 (0.0)
4	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)		1 (11.1)	0 (0.0)
8	0 (0.0)	8 (100.0)	0 (0.0)	1 (100.0)		0 (0.0)	9 (100.0)
Minimum–maximum	0.0–4.0	8.0–8.0	0.0–0.0	8.0–8.0		0.0–4.0	8.0–8.0
Mean±SD	0.88±1.64	8.0±0.0	0.0	8.0	$^U P=1.000$	0.78±1.56	8.0±0.0
Median	0.0	8.0	0.0	8.0		0.0	8.0
Z_P	0.008**		–			0.005***	
Average of functional routines							
N	15	15	10	10			
Minimum–maximum	0.0–2.73	5.33–7.64	0.0–1.18	4.33–7.45	$^U P=0.042^*$	0.0–2.73	4.33–7.64
Mean±SD	0.86±1.15	6.94±0.80	0.42±0.43	6.11±1.16		0.68±0.95	6.61±1.02
Median	0.0	7.27	0.39	6.39		0.22	6.89
Z_P	0.001****		0.005***			0.001****	

$^{MC} P$: P value for Monte Carlo for χ^2 -test for comparing between the two groups. $^U P$: P values for Mann–Whitney test for comparing between the two groups. $^Z P$: P values for Wilcoxon signed rank test for comparing between before and after therapy. * $P \leq 0.05$, statistically significant. ** $P \leq 0.01$, statistically significant. *** $P \leq 0.005$, statistically highly significant. **** $P \leq 0.001$, statistically highly significant.

strategies to teach routines has helped their children become more independent at home [3,4].

Conclusion and recommendations

- (1) Early intervention for autistic children helps in improving their prognosis and yields much better results.
- (2) The need to apply the program on daily basis is highly recommended together with the availability of highly devoted and well-trained personnel to manage autistic children.

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Conflicts of interest

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