



# The effects of therapeutic horseback riding on the repetitive behaviors of children with autism spectrum disorders

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## ABSTRACT

The purpose of the present research was to study the effect of therapeutic horseback riding on repetitive behaviors of children with autism spectrum disorders. It was quasi experimental with one group Pre and Post Test design. The samples were 6 children with autism spectrum disorders selected through available method in a special education center for autistic children in Shiraz, Iran. All the participants had pre-test and then therapeutic horseback riding intervention for one month (consisting of two 45 minute session of riding per week) and finally post-test was administered. Bodfish et al (2002) revised repetitive behaviors scale was used to assess children's repetitive behaviors. Paired-samples T Test was utilized to analyze the data. The results showed that therapeutic horseback riding decreases the repetitive behaviors of children with autism spectrum disorders significantly. It can be concluded that therapeutic horseback riding has a positive effect on repetitive behaviors improvement.

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## Introduction

Individuals with autism spectrum disorders have faced with fundamental delay in their communicational skills and social interaction and show restricted, repetitive and stereotyped behavioral patterns (American Psychiatric Association, 2000). Some researchers describe these restricted, repetitive and stereotyped behavioral patterns as stereotyped behaviors (i.e. Digennaro Reed et al,2012; Hodgetts et al, 2011; Gardeneir et al,2004; Pierce & Courchesne,2001)and some as repetitive behaviors (i.e. Honey et al,2012; Boyd et al ,2009; Cuccaro et al , 2007; Gabriels et al,2005; Bodfish et al, 2000).

In this research, repetitive behaviors are used to explain restricted, repetitive and stereotyped behavioral patterns because of the harmony between research title and measures used in. Repetitive behaviors in children with autism spectrum disorders appear in the form of self- injury (e.g., she/he bites his/her hands, arm and wrist), echolalia (e.g. ,she/he repeats a monotonous subject in his/her social interaction), ritualistic behaviors(e.g. ,she/he must sit in a special place in the car),compulsion(e.g. she/he checks doors, windows and cupboards, etc repetitively) and motor behaviors(i.e. she/he is hand flapping)( Bodfish, et al ,2000). Repetitive behavior is one of the three criteria of DSM-IV-TR(Diagnostic and Statistical Manual of Mental Disorders)in autism spectrum disorders (American Psychiatric Association,2000). In fact, repetitive behaviors have been one of the basic characteristics of autism spectrum disorders from Connor on (Watt et al, 2008). Turner (1999) divides repetitive behaviors in two groups of lower-level and higher-level. Lower-level repetitive behaviors is specified with repetitive movement such as stereotyped movement, repetitive manipulation of objects and all kinds of repetitive self-injurious behaviors. Higher-level repetitive behaviors contain dependency

to objects, insisting on monotony, repetitive speech and limited interests.

Repetitive behaviors not only makes problem in acquiring new skills but also hampers the function of previously learned skills (Morrison & Rosales-Ruiz, 1997). Repetitive behaviors are following with a plenty of negative outcomes such as stigmatization (Jones et al, 1990) and deficit in social interaction (Wolery et al, 1985). They have negative effects on individuals' functioning ability through interference in learning and daily social behaviors (Brekke, 2008) and hamper their daily functioning (Ahearn et al, 2007). These behaviors decrease attention and prevent doing appropriate assignments (Campbell, 2003). In fact, undesirable repetitive events in social environment lead to autism spectrum disorders children's frustration and aggression in interaction with peers and authorities (Elliot et al, 1994) and prevent their desirable response to environment (Levinson & Reid, 1993). As it is seen, these behaviors are undesirable and create problems in social and learning situations for children with autism spectrum disorders. Therefore, the decrease of repetitive behaviors is very important and essential.

In this regard, various methods and interventions have been created and used in World. One of the therapeutic methods is "Therapeutic Horseback Riding". Horseback riding is a kind of intervention which refers to the use of horse in the treatment of individuals with emotional, cognitive and physical disabilities. Historical evidences indicate that horseback riding was used in the treatment of irremediable individuals in ancient Greece. Thus, the use of horseback riding as a therapeutic intervention was utilized in Europe in 18 and 19 centuries for the first time (DePauw, 1986). Therapeutic horseback riding was used for the first time in Denmark in 1952 by Lis-Hartel. In fact, Hartel rehabilitated himself through therapeutic horseback riding and

then became the winner of Olympic Medal with his horse (King, 2007). Afterward, the use of this therapeutic method was broadened in 1960 and was utilized in Norway, England, America and Canada to improve physical, psychological, social and cognitive functioning of individuals with intellectual disabilities. Then, North American Riding for Disabilities Association was established in 1969 for the standard use of this therapeutic method and compiled for the preparation of trainers and effective and secure riding programs (Engel, 1997). Different researches have studied the efficacy of therapeutic horseback riding on repetitive behaviors of children with autism spectrum disorders and emphasized its positive results. Gabriel's et al (2012) studied the impact of therapeutic horseback riding on 42, 6-16 year children with autism spectrum disorders (16 in control group and 26 in experimental one) for 10 sessions. All the participants were assessed due to peevishness, stereotyped behaviors, hyperactivity, coping behaviors and motor skills before and after the interventional programs. The results showed that the experimental group has been significantly improved in peevishness domain, stereotyped behaviors, hyperactivity, coping behaviors, verbal language skills, motor skills, motor scheduling skills and verbal action. It is noticeable that the follow-up results indicate the significant improvement of these behaviors.

In a research, Freire and Grande (2005) studied the influence of therapeutic horseback riding on an autism child's behavior. It was a case study research on a 5 year autism child. The interventional program was 12 months in every week with one hour and a half each session. The results revealed child's fear has been improved, his/her reaction to frustration became better, his/her desirable behaviors have been improved without a need to external motivation, discloses his/her emotion and the group activity and cooperation has been improved.

Bass et al (2009) have studied the impact of therapeutic horseback riding on autism children. In their research, 34 children with autism (19 children in an experimental group and 15 in the control group) took part in therapeutic horseback riding for one 60 minute session per week, over a period of 12 weeks. The findings reveal that therapeutic horseback riding leads to decrease of inattention and distraction. Also, they point that these children's sensory skills and social responses have been improved.

To emphasize the recent findings, Stickney (2010), in his research, investigated the effect of therapeutic horseback riding on the development of cognitive, physical, emotional, behavioral and social skills of children with autism spectrum disorders. The research method was qualitative. Therefore, the researchers have studied the influence of therapeutic horseback riding with 5 trainers and assistant trainers of children with autism spectrum disorders with focus group method and also with two employers and 15 parents of children with autism spectrum disorders participated in therapeutic horseback riding sessions through interview and came to this conclusion that therapeutic horseback riding develops children's cognitive, physical, emotional, behavioral and social skills. The most important effect can be the increase of physical skills, the improvement of concentration and attention, changing undesirable behaviors, reinforces self-concept, the increase of social interaction and relationship.

In Iran, it seems there are no researches about the effect of therapeutic horseback riding on repetitive behaviors of children with autism spectrum disorders. Therefore, this research is an attempt to study the effect of therapeutic horseback riding on

repetitive behaviors of children with autism spectrum disorders in order to fill the research gaps and takes the steps to use it to improve repetitive behaviors of children with autism spectrum disorders in Iran.

## Research Method

### Participants

6 children diagnosed with ASD who participated in the study were recruited from the MehrMihan Autism Center in Shiraz, Iran. All participants met criteria for DSM-IV-TR (American Psychiatric Association, 2000). Demographics characteristics of participants are presented in table 1.

**Table 1: participants' characteristics based on age, gender, father's and mother's academic level**

child	age	gender	father' s academic level	mother's academic level
1	9	F	undergraduate	undergraduate
2	8	F	under diploma	undergraduate
3	12	M	under diploma	undergraduate
4	10	F	under diploma	under diploma
5	6	F	under diploma	under diploma
6	6	F	undergraduate	undergraduate

As it is observed in table 1, the participants were 5 girls and one boy (average age of 8.5 and standard deviation of 2.35). Moreover, the father's academic level of two children was undergraduate whereas mother's academic level of 4 children was undergraduate and two were under diploma (i.e. they don't have diploma certification). Parents had to consent to pre-testing, 8 sessions of therapeutic horseback riding, and one post testing session. Measurements were given to parents before the intervention sessions were initiated. Post-test assessment took place at the completion of the 8 week intervention.

### Research Measure: Repetitive Behaviors Scale-Revised (RBS-R)

Repetitive Behaviors Scale-Revised was prepared by Bodfish et al (2000). It has 43 items in a 4-point Likert scale (never=1, sometimes=1, often=2, always=3) and contains six subscales; stereotyped behavior, self-injurious behavior, compulsive behavior, ritualistic behavior, sameness behavior and restricted behavior. Lam and Aman(2007) reported RBS-R reliability for the subscales from 0.78 to 0.91 through internal consistency (Cronbach alpha). They also reported its validity as 0.57- 0.73 through internal correlation. The reliability for the whole scale was 0.92 by Cronbach alpha coefficient. Also, the construct validity between the whole scale and all the subscales was 0.68-0.98.

### The intervention of therapeutic horseback riding

The intervention of therapeutic horseback riding was administered for all the studied children for two 45-min sessions per week over a one month period. The area of horseback riding was approximately the equivalent size of a football field where the observers' area was separated with a fence and the stable of horses was in the riding area. Two experienced trainers were used and parents and teachers assisted the trainers. The intervention of therapeutic horseback riding was done through these stages:

#### Familiarity stage

In this stage, a child with autism becomes familiar with the horse, in the way that she/he is trained to learn how to sit on the horse appropriately, how to get on and off the horse, all the body organs of the horse are introduced and the child is required to touch its body and name them. When the child was sitting on the horse, the trainer was talking about horse voice and food. It must be noticed that it takes 5 minutes in each session and the

purposes are to reinforce communicational and social skills, reinforce senses and the ability to balance.

### Practices

In this stage, the child practices how to get on and off the horse, how to get the snaffle bite (A snaffle bit is the most common type of bit used while riding horses. It consists of a bit mouthpiece with a ring on either side and acts with direct pressure) of the horse, move the horse, stop the horse and pet the horse. It is noticeable that the training of this stage was modeled by the riding trainer step by step. It takes 10 minutes and the goals are to reinforce communication and social skills, senses and the ability to balance and the child's mastery of the necessary skills for horseback riding.

### Riding skills

At this stage, the two horses were used for each child to sit on (the saddle was used). The children knew each other. The two children ride simultaneously on separate horses and the trainer get the snaffle bit and move the horse. Then, the child's parents get on the horse with the child and move the horse slowly and increase the speed gradually. It is noticeable that, in this stage, attempts are made to sit the child on the horse appropriately. The child was asked to touch the horse's mane. The child was asked to touch the horse's body with him/her feet. Parents were encouraging their child to look at the people was outside of the horse ride area, waved to them and express his/her emotions. Also they want the child pay attention to another horse that was moving and the other child who was sitting on it. Parents were encouraging their child to look at the other child and waved to him and interpret the emotions of other child. Moreover, all the activities carried out by parents, by trainer was also repeated. Actually, the trainer gets on the horse with the child and ride faster than the parents. It takes 15 minutes and the goals were to reinforce communication and social skills, senses and the ability to balance.

### End of riding stage

In the last stage, children are trained to clean and care for the horse. The trainer does these activities step by step both verbally and practically and the child repeats them. Actually during the last part of the program, participants took part in grooming activities. Children learned how to properly groom and care for their horse by learning to identify grooming tools (curry comb, hoof pick, body brush, mane/tail comb, face brush, etc.) and bathing tools (sponge, water, shampoo, bucket, sweat scraper, etc.). At this stage, the child's verbal and nonverbal communication was reinforced by trainer. It takes 15 minutes.

### Results

**Research hypothesis:** Horseback riding is effective on the repetitive behaviors of children with autism spectrum disorders.

To study this hypothesis, Paired-samples T Test was used. The results of total scores in children repetitive behaviors and its subscales are in table 2.

As it is seen in table 2, the total mean scores of repetitive behaviors in children with autism spectrum disorders in post-test was lower than pre-test. The results of Paired-samples T Test shows there is a significant difference between total score mean of repetitive behaviors in children with autism spectrum disorders in pre-test and post-test ( $t=60.70$ ,  $df=5$ ,  $p<0.001$ ). This suggests that therapeutic horseback riding has decreased repetitive behaviors of children with autism spectrum disorders in post-test.

Also, the results of the repetitive behaviors subscales in children with autism spectrum disorders reveal that the score

mean of stereotyped behaviors of children with autism spectrum disorders in post-test was lower than pre-test. The results of Paired-samples T Test showed there is a significant difference between the score of stereotyped behaviors of children with autism spectrum disorders in pre-test and post-test ( $t=7.05$ ,  $df=5$ ,  $p<0.001$ ). This suggests that therapeutic horseback riding has reduced stereotyped behaviors of children with autism spectrum disorders in post-test.

**Table 2: The results of Paired-samples T Test for mean comparing f pre-test and post-test in the repetitive behaviors of children with autism spectrum disorders**

subscale	pre-test scores	post-test scores	mean difference	t	df	sig.
stereotyped behavior	12.16	9.33	2.83	7.05	5	0.001
self-injurious behavior	10.00	7.66	2.33	11.06	5	0.001
compulsive behavior	12.46	9.16	3.50	8.17	5	0.001
ritualistic behavior	9.16	8.83	0.33	1.00	5	0.36
sameness behavior	18.83	12.66	6.16	5.16	5	0.001
restricted behaviors	6.66	4.66	2.00	2.44	5	0.058
total score of repetitive behaviors	69.50	57.33	12.17	60.70	5	0.001

Moreover, the table indicates that the score mean of autism spectrum disorders children's self-injurious behavior was lower in post-test to pre-test and the results of Paired-samples T Test showed there is a significant difference between the score mean of children with autism spectrum disorders' self-injurious behavior in pre-test and post-test ( $t=11.06$ ,  $df=5$ ,  $p<0.01$ ). This suggests that therapeutic horseback riding has diminished autism spectrum disorders children's self-injurious behavior in post-test.

Also, the score mean of autism spectrum disorders children's compulsive behavior was lower in post-test and the results of Paired-samples T Test showed there is a significant difference between the score mean of children with autism spectrum disorders's compulsive behavior in pre-test and post-test ( $t=8.17$ ,  $df=5$ ,  $p<0.001$ ). This suggests that therapeutic horseback riding has declined autism spectrum disorders children's compulsive behavior in post-test.

In addition, the score mean of autism spectrum disorders children's sameness behavior was lower in post-test to pre-test and the results of Paired-samples T Test showed there is a significant difference between the score mean of children with autism spectrum disorders's compulsive behavior in pre-test and post-test ( $t=5.16$ ,  $df=5$ ,  $p<0.001$ ). This suggests that therapeutic horseback riding has decreased autism spectrum disorders children's sameness behavior in post-test.

It is considerable that although autism spectrum disorders children's restricted behavior in post-test is lower than pre-test, the results of Paired-samples T Test show there is not any significant difference between the score mean of children with autism spectrum disorders' restricted behavior in pre-test and post-test ( $t=2.44$ ,  $df=5$ ,  $p>0.05$ ). This suggests that therapeutic horseback riding has reduced restricted behavior in children with autism spectrum disorders in post-test but it is not statistically significant.

Meanwhile, there was not seen any significant differences in ritualistic behaviors. In fact, although the score mean of

autism spectrum disorders children's ritualistic behaviors had detailed decrease in post-test than pre-test, the results of Paired-samples T Test show there is not any significant difference between the score mean of children with autism spectrum disorders' ritualistic behavior ( $t=1.00$ ,  $df=5$ ,  $p>0.05$ ). This suggests that therapeutic horseback riding is not statistically significant on the decrease of ritualistic behavior in children with autism spectrum disorders.

### Discussion and Conclusion

The purpose of the present research was to study the effect of therapeutic horseback riding on repetitive behaviors of children with autism spectrum disorders. The research findings revealed that therapeutic horseback riding could significantly decrease the repetitive behaviors of children with autism spectrum disorders. Moreover, the results showed therapeutic horseback riding could significantly reduce subscales of stereotyped behavior, self-injurious behavior, compulsive behavior and sameness behavior of repetitive behaviors of children with autism spectrum disorders but score difference in participants' pre-test and post-test was not statistically meaningful in the subscale of ritualistic behaviors and restricted behaviors. These findings were consistent with Bass et al (2009), Stickney (2010) and Gabriels et al (2012) and Freire and Grande (2005). Other researches confirm the efficacy of therapeutic horseback riding on repetitive behaviors of children with autism spectrum disorders.

Stickney (2010) knows the horse unique movement and sensory stimulation, facilitator and supportive environment, the increase of children's motivation for cooperation, the structural practices and activities necessary in horseback riding class, as the causes of undesirable behaviors decrease and the increase and improvement of desirable behaviors of children with autism spectrum disorder in the effect of therapeutic horseback riding. In this regard, All and Loving (1999) explain that horseback riding leads to improve sensory-motor processing and then leads to more regular sensory-motor experiences and helps individuals with autism spectrum disorders to function better in cognitive, physical, affective and social areas. Moreover, it improves successful dominant on horseback riding skills, self-efficacy, self-concept, self-esteem and self-control of the participants (Macauley & Gutierrez, 2004) and as a result of self-efficacy and self-controlling, autism spectrum disorders children's repetitive behaviors decrease.

As a whole, repetitive behaviors lead to anxiety when the individual is settled in social behaviors. In addition, repetitive behaviors create fear and prevent cooperation in group situations and interaction with others and, as a result, prevent to acquire desirable social and communicational skills (Powers et al, 1992).

The effect of therapeutic horseback riding in the decrease of these problems is this point that horseback riding motivates the autism spectrum disorders child and increases his/her cooperation and involvement. Also, As a kind of sport decreases secretion of body stressful hormones which affects negatively on the brain development and, finally, influences on the brain functioning through the improvement of neurons relationships (Hout & Bragonje, 2010). All these factors decrease children's problems in social situations and have positive effect on the decrease of the repetitive behaviors of children with autism spectrum disorders.

Overall, repetitive behaviors prevent child's desirable response to the environment (Fedak, 2012) and make problem in his/her understanding and attention to external stimuli (Lovaas

et al, 1987) and daily activities (Campbell, 2003). The effect of therapeutic horseback riding to decrease mentioned problems is in the way that it improves child understands of himself/herself and his/her environment. In other words, therapeutic horseback riding facilitates sensory integration and helps information processing and responses to environment (Bass et al, 2009) and decreases repetitive behaviors.

As we know, therapeutic horseback riding is a kind of sport and consists of relief and calmness effect (Reid and Collier, 2002) and helps decrease repetitive behaviors of children with autism spectrum disorders (Rosenthal-Malek & Mitchell, 1997). Therefore, it can be inferred that horseback riding, as a kind of sport, decreases repetitive behaviors of children with autism spectrum disorders.

Furthermore, as it was mentioned before, in the intervention of therapeutic horseback riding, children are encouraged to disclose their emotions freely and interpret other children's emotion which leads to improve affective understanding and behaviors.

To approve this idea, Funahashi and Carterette (1985) explained autism spectrum disorders children, through therapeutic horseback riding, learn to disclose their feeling and emotion and reciprocal emotion disclosure has been warmly accepted from parents, riding trainers, academic trainers and those presented in therapeutic horseback riding.

These emotional and cognitive changes in children with autism spectrum disorders lead to affective understanding of these children and decrease their frustration and aggression to their peers and authorities. Here, Keino et al (2009) believe that therapeutic horseback riding improves emotional and cognitive assessment of children with autism spectrum disorders from new stimuli. As a result, these children consider new stimuli not threatening and not dangerous and, thus, they make emotional and cognitive mutual relationship with their parents and others.

As a whole, therapeutic horseback riding decreases autism spectrum disorders children's negative emotions such as fear, anger, distrust and unhappiness through a secure and warm environment and, instead, activate brain functioning such as unpleasant emotions, common attention, imitation and empathy feeling in autism spectrum disorders children's mind and leads to their social, communicational and behavioral skills development (Keino et al, 2009) and also positive responses instead of undesirable behaviors.

It is suggested to future researchers to study the therapeutic horseback riding on cognitive skills, social skills, motor skills and sensory integration of children with autism spectrum disorders.

Also, they can study the effect of therapeutic horseback riding on social, cognitive, motor and behavioral skills of other disabled children. Moreover, it is suggested to parents, specialists, teachers and trainers to utilize therapeutic horseback riding to improve the repetitive behaviors of children with autism spectrum disorder.

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