



The Impact of Horse-Assisted Therapy on Socio-Emotional Behaviors in Children with Autism

Ana Maria Zagrai (Măierean) ^{a,b}, Gabriel Cotor ^c,
Dragoș Corneliu Cotor ^a, Gavrilă Zagrai ^{a,d*},
Aureliana Grama ^d, Eniko Cupșa ^b and Aurel Damian ^a

^a Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca-400372, Calea Manastur 3-5, Cluj-Napoca, Romania.

^b School Center for Inclusive Education (C.S.E.I.) "Lacrima" Bistrița, Romania.

^c Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine Bucharest-050097, Splaiul Independentei 105, Bucharest, Romania.

^d Saint Sylvester Secondary School, Bucharest-20764, Oltarului 11, Romania.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: <https://doi.org/10.9734/jocamr/2024/v25i9570>

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/122413>

Original Research Article

Received: 19/06/2024
Accepted: 21/08/2024
Published: 28/08/2024

ABSTRACT

Animal-assisted therapy for children with autism (ASD) is a form of complementary therapy, integrating methods from various other types of therapy. AAT, or animal-assisted therapy, is a series of interventions that are based on the behavioral traits of animals, especially dogs and

*Corresponding author: E-mail: gavrilazag@yahoo.com;

Cite as: (Măierean), Ana Maria Zagrai, Gabriel Cotor, Dragoș Corneliu Cotor, Gavrilă Zagrai, Aureliana Grama, Eniko Cupșa, and Aurel Damian. 2024. "The Impact of Horse-Assisted Therapy on Socio-Emotional Behaviors in Children With Autism". *Journal of Complementary and Alternative Medical Research* 25 (9):43-58. <https://doi.org/10.9734/jocamr/2024/v25i9570>.

horses, which are the most common in this context. These interventions can be integrated into conventional treatments such as behavioral therapy, play therapy, music therapy, occupational therapy, speech therapy, and art therapy, depending on the individual needs of patients. The objective of this study was to examine the effects of an already existing Equine Assisted Therapy (EAT) program on social communication skills, executive functions and motor skills in children diagnosed with autism spectrum disorders. The research adopted an observational design to analyze how often certain behaviors occur in the presence or absence of horses in a group intervention program. This research included 16 children diagnosed with autism spectrum disorder (ASD), aged between 9 and 14 years (12 boys and 4 girls), who were selected from an School Center for Inclusive Education. The conclusions drawn from our results showed that the horse-assisted therapy, implemented in our experiment, recorded a notable improvement in all the behavioral parameters analyzed. Improvements were observed in Attention in Activity (21.2%), Communication (18.3%) and Compliance (9.1%) during activities, Physical Movements, with a difference of 34.1%, Affective State (23.33%), Visual Control (45%), Functional Skills and Response to Command (46.66%), Social Attention (33.5%) and Dynamic Motor Skills (35.55%) during activities. And the biggest difference was observed in Vocalizations, with a difference of 53%. Our results strongly support the fact that complementary therapy of autism spectrum disorders with the help of horses is an effective form of intervention, which can bring substantial improvements in therapeutic outcomes.

Keywords: Children with autism; equine therapy; complementary therapy; assisted therapy of horses.

1. INTRODUCTION

Autism spectrum disorders (ASD) is a heterogeneous group of neurodevelopmental alterations, characterized by persistent deficits in social communication, social interaction, and by restrictive, repetitive patterns of behavior, interests, or activities (American Psychiatric Association [1]).

Social deficiencies are a main problem in the case of people with autism, and the integration of an animal as a complementary method for children with ASD is supported by the idea that an animal can function as a social mediator, contributing to the development of their social skills [2,3]. Favorable outcomes achieved by EAT for people with ASD include positive influences on mood, reduction of problematic behaviors such as irritability, lethargy, stereotyping, hyperactivity, and aggression [4-6]. Improvements in physical, emotional, and social functioning, improved executive functioning, and improved postural stability are also observed [7-9].

The theory behind animal-assisted intervention (AIA) for children with ASD comes from human-animal interaction studies. In particular, research has shown that interacting with animals can be beneficial both physically and mentally (O'Haire, 2017)[9]. Dog-assisted therapy offers an attractive option for children with ASD, as the presence of therapy dogs enhances their social

interactions [10-12]. Social interaction is related to the intensity of physical activity in children with ASD [13-15].

Equine Assisted Therapy (EAT), is an alternative treatment that offers certain activities with equines, to build a therapeutic interaction and communication between the rider and horse [3, 15]. ASD can have positive effects on multiple impairments in children with ASD, including physical, emotional, social, cognitive, behavioral, and educational functioning [16,17]. There is also evidence for improved motor functioning and sensory processing in children with ASD [18-20]. Furthermore, it has been reported that EAT can positively alter children's mental well-being, self-efficacy, and self-esteem, and thus significantly influence the quality of life of children with ASD [21,22].

An essential feature of ASD is the difficulty of social interactions and communication, which can lead to isolation and withdrawal tendencies, having a direct effect on personality and social development. Thus, it is essential that an EAT program emphasizes the development of social and communication skills, as this is crucial for increasing and improving the quality of life of children with ASD [23-25]. TAE can create an engaging multisensory environment and therapeutic interactions through collaborative activities between children and horses, which have a positive impact on the social and communication skills of the little ones [26].

Gabriels et al.[27], proved that Equine-assisted therapy, therapeutic riding, and hippotherapy could improve sensory sensitivities, increase social motivation, and reduce stereotypical behaviors in children with ASD. Ward et al [18] explained that social communication and sensory processing skills in children with ASD were improved during the intervention period with Equines. Llambias et al. (2016)[16] reported a significant increase in social engagement among children with ASD, who participated in equine-assisted therapy, and increased their social awareness and communication skills.

Mapes and Rosén [28], focused specifically on ASD in the context of autism spectrum disorder (ASD) in children. They found that the APR can be helpful in encouraging various outcomes. They involve more effective social communication, self-regulation capacity, standard of living, behaviors, physical functioning, and the fundamental symptoms frequently associated with ASD.

In 2016 Wiese et al.,[29] a systematic review of the APR for ASD was published, focusing particularly on outcomes in the behavioral and social domains.

A particular focus on outcomes in the behavioural and social domains.

In a comprehensive analysis of the mapping by Peters and Wood [30] on Dog-Assisted Therapy (CAT) in people with Autism Spectrum Disorder (ASD), the authors observed that the provision of Equine Assisted Therapy (EAT) is highly diversified and studied the features and outcomes of the intervention according to the classification of the program as equine-assisted "therapy" or "activity".

According to the review by O'Haire [9] Peters and Wood (2017)[30] noted that better social interaction, along with effective communication, is the most promising outcome of horse-assisted activities for people with ASD, in parallel with improved motor control, which is one of the best outcomes achieved in equine-assisted therapy.

A systematic review by Kendall et al. [31], focusing on the psychological outcomes of various population groups, demonstrated that the evidence on the effectiveness of EAT is most convincing for children, particularly in terms of behavioural improvement, social interactions, and family cohesion. The review also highlighted that group programs that emphasize physical

skills and horseback riding, at the expense of psychosocial processes, can help improve social skills, behavior, well-being, self-regulation, and quality of life. The authors concluded that although the overall benefits seen from using EAT are preliminary, there is "promising support" for the effectiveness of these interventions in children and adolescents who have difficulties in the areas of language, communication, social functioning, behaviour, emotional regulation and learning. All these aspects are common among people with ASD.

The main objective of the study was to investigate the effect of an existing EAT program on social communication skills ("all forms of social relationships in which individuals and groups willingly participate"), executive functions, and motor skills in children diagnosed with ASD. Unlike previous studies that have mainly explored changes over time, this study was designed to explore what level of interaction with equines, if any, was associated with differences observed in behavior and other abilities during that interaction. To this end, the following hypotheses have been formulated: 1. What psychological and social benefits does horse therapy bring when used with children and young people with autism? 2. What impact does horse therapy have on an autistic child?

2. MATERIALS AND METHODS

The study involved 16 children (12 boys and 4 girls) who were selected from a School Center for Inclusive Education (C.S.E.I.). The ages of the children involved in the study ranged from 9 to 14 years old, all included in conventional therapies and school assistance (primary/elementary education, the first stage of compulsory education) throughout the study. These children are diagnosed with: psychomotor delay; deficient general and specific motor skills; unfixed laterality; spatio-temporal disorientation; non-development of articulate verbal language; affective instability. All of them are assimilated to autism spectrum disorders (ASD), based on specialized psychiatric and psychological examinations. . Autism spectrum disorder is characterised by persistent deficits in the ability to initiate and to sustain reciprocal social interaction and social communication, and by a range of restricted, repetitive, and inflexible patterns of behaviour, interests or activities that are clearly atypical or excessive for the individual's age and sociocultural context. (International Classification of Diseases 11th

Revision – World Health Organization; <http://id.who.int/icd/entity/437815624>.[32, 33].

The families of these children were notified about the development of this experiment within the C.S.E.I. and expressed their agreement, in writing, for the children's participation in our approach.

EAT sessions can be very demanding for children, as they consist of highly structured activities (e.g. horseback riding, grooming) that involve participants for about an hour. They thus require attention and the ability to focus on tasks. For these reasons, we chose to include only verbal children, older than 9 years old. Exclusion criteria: severe motor/neurodevelopmental problems, verified allergies, and fear response towards horses. Participants were randomly assigned to one of two groups (simple randomization):

- Batch 1 (n=8), consisting of children undergoing Equine Assisted Therapy (EAT);
- Batch 2 (n=8), consisting of children who were not subjected to Equine Assisted Therapy (EAT);

The EAT sessions took place at the equestrian, entertainment, recreation center and were used to treat children with autism spectrum disorders through equine-assisted therapy.

To ensure that the therapeutic sessions are carried out homogeneously and appropriately, before the start of the study, all riding instructors participated in preliminary meetings with the researchers and received both written and video materials (a properly prepared DVD) describing the session to be conducted.

The therapeutic sessions included the patient, the horse, a riding instructor, a psychotherapist, a psychopedagogue, an expert veterinarian who ensured the welfare of the animals throughout the study, and also included fences, boxes, arenas, ropes, bridle, and gripping areas, all designed to manage the horses and their behavior.

In our experiment we used 5 riding horses (4 females and 1 neutered male), of the Lipizzaner breed, loved for its gentle, docile, but still temperamental, agile character, famous for its intelligence and great learning capacity. The 5 horses were aged between 4-8

years old. The sample of animals was uniform in terms of maintenance status. The animal feed consisted of: hay ad libitum, oats 6 kg/per animal/day and bran 1.5 kg/per animal/day. These animals were kept in a riding school in Ilfov County, where, in addition to other activities specific to horseback riding, entertainment and recreation, they were used to treat children with autism spectrum disorders through equine-assisted therapy.

The horse's welfare was ensured and guaranteed by the veterinarian specialized in equestrian rehabilitation throughout the study, taking into account health care, living conditions, working, hours and equipment requirements.

2.1 Experimental Design

In the pre-intervention phase of the study, a questionnaire was administered to parents and teachers of children with ASD to measure their children's social behavior, communication, sedentary behavior, and behavioral problems.

The EAT meetings were held twice a week over the course of three months, totaling 24 sessions for each child. The EAT sessions were structured in small groups of three to four children. The protocol of the sessions held during the 3 months is detailed in (Table 1). Each session lasted approximately 50-60 minutes, comprising an initial 15-minute floor stage dedicated to care and 10 minutes of bridle horse walking, followed by 15-20 minutes of riding, and ending with a final 10-minute ground phase.

The care phase was designed to teach children the fundamental rules of safety and improve their knowledge of horses, including their morphology and behavior. Emphasis was also placed on aspects such as the harness, riding saddle, latches, and practical elements of horse management, such as the correct way to care for them and the proper identification and use of the necessary tools. At this stage, the children were stimulated to listen to the psychotherapist's advice and communicate with the horse both through words and gestures.

The children were helped with visual materials (pictures, colorful drawings, and posters on the walls) illustrating both the horses' grooming tools and behaviors (e.g., facial expression), which were maintained in the stables throughout the entire study. Horseback riding activities were included from the fourth meeting and consisted of riding sessions (sessions 4-5) and saddle riding (starting from session 6).

Table 1. Protocol of equine-assisted therapy sessions during the 3 months

Sessions	Activity	Method of approach	Work tools	Objectives	Duration
1- 24	Horse care	Group meetings located in the stable	Care tools, harness, weaver, brushes, etc. Visual aids (images, posters and cards)	Getting to know the child about the morphology and behavior of horses, horse harnesses Main security rules Use of care tools, use of care techniques. Improvements in attention and memory Horse Management	15 min.
4-5	Circular riding without a saddle.	Individual or group sessions,	Vaulted circumference, saddle, bridle.	Assembly, disassembly of equipment. Learning the basics of horseback riding (walking, trotting). Improved balance and coordination on the horse Socializing with the group (group games)	20-25 min.
6-24	Saddle riding	horse handling	Cups, flags, balls, and cones (as landmarks while riding)		
1- 24	Ending	Individual sessions held in the stable	Water, feed Visual aids (images, posters and cards)	Feeding the horse. Socializing: saying goodbye to the horse ("thank you" and "goodbye") and the group	10 min.

The activities have been designed so that children learn the fundamentals of horseback riding, such as position, getting on and off the horse, walking, and truffling, while participating in group activities (slalom, cup games, ball and cone games, etc.), which contribute to the development of motor skills and executive functions. The riding classes included lessons on how to drive a horse, how to manage the reins, and how to steer the horse through various obstacles. At the end of each riding session, another 10-minute segment on the field was provided, intended to conclude the activities. During this time, the children were helped to get off the horses and feed them, being encouraged to interact with them through expressions such as "thank you" and "goodbye". Also, socialization activities were carried out with the research team.

The way the sessions were conducted was structured, but mainly followed the children's own pace, with an emphasis on their free initiative and guidance. Each psychotherapist,

psychopedagogue, veterinarian and riding instructor strengthened the children's social initiative and provided time and space for spontaneous interaction with the horse. Finally, in the post-interaction phase, the aforementioned questionnaire was administered again to measure the social skills and social stereotypes examined by the children.

A coding sheet was created to meet the needs of the study to detect the frequency of behavior and social reactions exhibited by each child. Specifically, physical proximity, touch and eye contact, with the work team, the horse and social reactions, spontaneous and self-initiated behavior, aggressive behavior and stereotyped behavior of each child were investigated in each session. For each, the frequency of the behavior was rated on a Likert scale from 0 to 7 (0 = did not occur, 7 = occurred very frequently).

A research diary, used as a qualitative methodology tool, provides valuable data that

supports researchers in deepening their understanding of essential phenomena [34]. In our study, we analyzed the students' social and communication skills, as well as their behavioral difficulties and stereotyped reactions in relation to the psychotherapist, the psychopedagogue, the veterinarian, the riding instructor, and the horse. All were stimulated to write down what was happening in each individual session and how they perceived the events.

This method was applied to guide the observations of the research team, without having the purpose of restricting them. One benefit of a research journal is that it is written in the author's own words, usually after a period of reflection, and is almost ready for analysis, without requiring additional transcription, as is the case with interviews or observations [34].

From: Effectiveness of a standardized equine-assisted therapy program for children with autism spectrum disorder Borgi et. al. [35].

Table 2. Interpretation of the pet intervention checklist (MOPI)

Skills	Definition
Attention in the activity	It refers to attention and concentration, as well as the time spent on task (time-on-task) for a certain activity; in other words, the time dedicated to an activity until the beneficiary is distracted.
Physical movements	Fine and gross motor skills (intentional, load-oriented movements, etc.).
Communication	It refers to verbalization and observing the client's intention to communicate.
Compliant	ability to complete certain tasks.

Table 3. Interpreting the behavioral aspects targeted in the experiment

BEHAVIORAL SKILLS	DEFINITION
Communication (socializing) skills	
Affective state	
Positive	The corners of the lips raised, the incisors visible (smile).
Negative	The corners of the lowered lips, invisible incisors.
Neutral	Expressionless face.
Eye contact	
Eye contact present	Face visible, the child has eye contact with adults.
Eye contact not present	Face invisible, the child has no eye contact with adults.
Vocalization	
Positive vocalization	A sudden, loud vocalization that indicates excitement or happiness. It is not considered a word.
Negative vocalization	A sudden, loud, and/or harsh vocalization (e.g., screaming). It is not considered a word.
Functional execution skills	
Positive order response	Adequate response to adult requests (e.g. the child answers the question "What's your name?")
Negative command response	Inadequate response to requests from adults (e.g., screams).
Social attention	
Positive social attention	The child focuses on a person who is talking or performing actions (for example, directs the body towards an adult who is talking). The child looks at the adult when his name is spoken. It can overlap with eye contact.
Negative social attention	The child does not focus on a person who is talking. The child does not respond to adult calls.
Motor skills	
Static abilities	The child remains stationary for the entire observation period.
Dynamic skills	The child engages in behaviors such as walking, running, dancing, or crawling.

During the 24 sessions of the experiment, children underwent behavioral surveillance, according to the Pet Intervention Checklist (MOPI) [35], which is a four-item observational measure that assesses participants' involvement in an AAI, through attention, physical movement, verbal communication, and compliance. It uses a seven-point Likert scale, where (1) indicating no evidence, (7) is for strong evidence of behavior, and includes a short section for qualitative comments about the participant (see Table 2). It was concluded by drawing up ethograms, after each intervention session for each participant. The interpretation of the ethograms was made in accordance with the data in Table 3.

The way in which the monitoring of the participating children was carried out was chosen randomly and defined before the start of each session. After information about one child was gathered, monitoring of the next child was initiated, until all 8 children were assessed. After the entire sample was supervised, a second phase of observation began, in which the participants were arranged in another random order. This model was maintained throughout the intervention.

The team involved in this project was diversified and included volunteers, both humans and horses. It was composed of specialists in the therapeutic field, such as psychologists, psychopedagogues, psychotherapists and speech therapists, along with professionals in animal-assisted therapy, including veterinarians. Other experts who are striving to highlight the

benefits of human-animal interaction, as well as to promote therapy and activities involving animals, have also contributed.

The families of these children were notified about this experiment and expressed their written agreement for the children's participation in this endeavor.

The experimental procedures imagined did not affect the level of animal welfare.

2.2. Statistical Analysis

The data obtained were statistically analyzed, calculating the Mean and Standard Deviation (SD), using the Microsoft Excel application. At the same time, the statistical significance of the differences between the batches was calculated using the t-test (Student), using the Microsoft Excel application.

3. RESULTS AND DISCUSSION

The analysis of the data obtained by using the Pet Intervention Checklist (MOPI) in the two experimental batches created for the conduct of our experiment is presented in Table 4.

The results regarding the attention of the children who participated in the activity in our experiment showed a significant difference between the two groups ($P < 0.05$). A decrease of 28.9% was observed in Batch 1 (children who received EAT) compared to Batch 2 (children who did not receive EAT)(See Fig. 1).

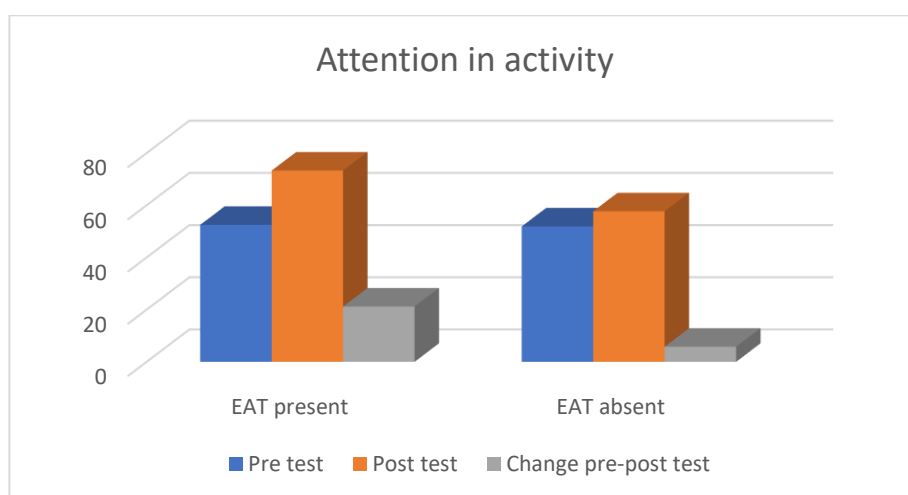


Fig. 1. Percentage share of Attention in the activity (taken in the study), in the case of the two experimental groups

There was a significant difference between the two groups ($P < 0.05$) in terms of the results obtained regarding the amount of physical movements of the children who took part in the experiment. In the case of group 1 (children who received EAT), the reduction was 40.74%, approximately ten times higher than in the case of group 2 (children who did not receive EAT) (See Fig. 2).

Significant differences were observed between the two groups participating in the experiment regarding communication ($P < 0.05$). A reduction

of 26.33% was observed in group 1 (children who received EAT) compared to group 2 (children who did not receive EAT). (see Fig. 3).

When the Compliance of the children who participated in the experiment was examined, a significant difference was found between the two groups ($P < 0.05$). A 9.1% increase in the compliance of children in batch 1 (children who received EAT), compared to those in batch 2 (children who did not receive EAT). (see Fig. 4).

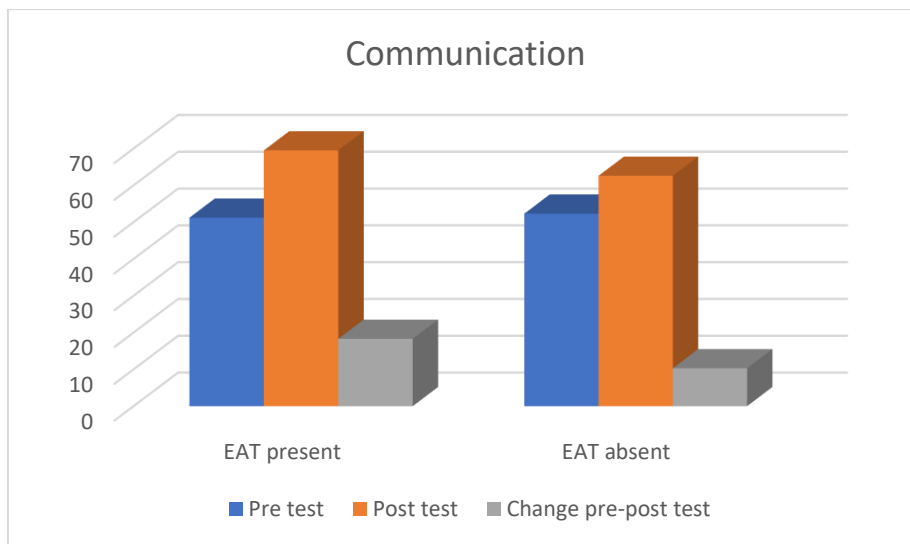


Fig. 2. The percentage weight of the physical movements taken in the study, in the case of the two experimental groups

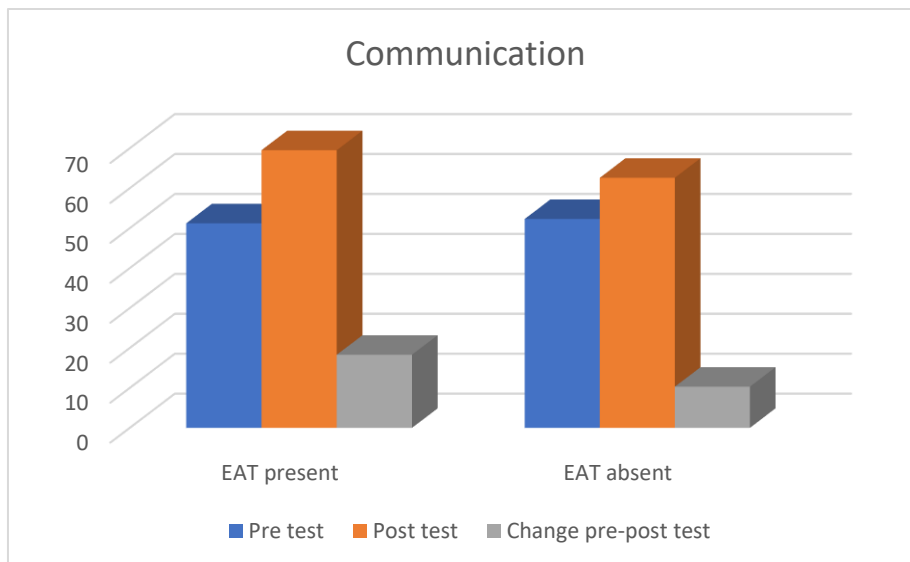


Fig. 3. The percentage weight of the Communication taken in the study, in the case of the two experimental groups

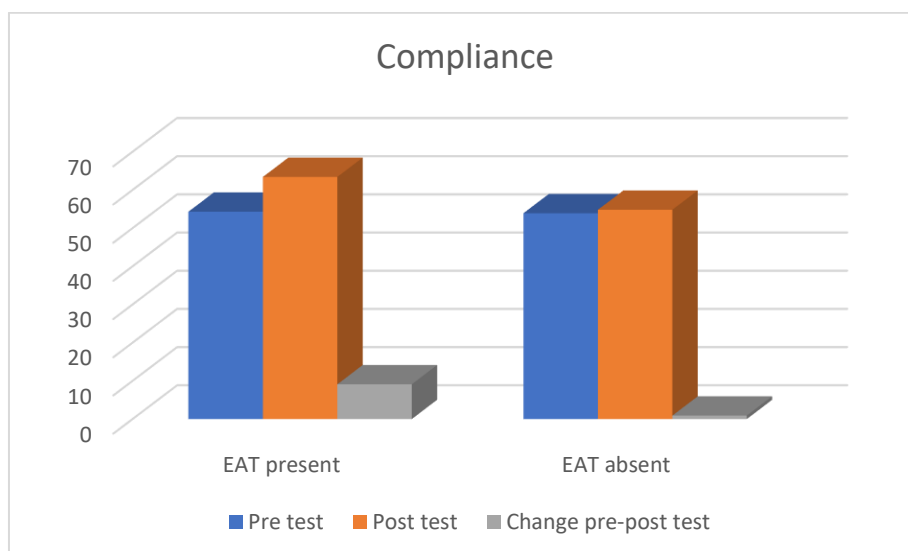


Fig. 4. The percentage weight of the Compliance taken in the study, in the case of the two experimental lots

Results on the effectiveness of EAT as a complementary intervention for children with ASD, assessed by the MOPI method, are presented in Table 4. Here, significant differences ($P < 0.05$) were observed between the two experimental groups. Improvements were observed in terms of Attention in activity (21.2%), Communication (18.3%) and Compliance (9.1%) during activities. The largest difference was observed in Physical Movements, with a difference of 34.1%.

The analysis of the measurements made with the help of the ethograms made during the conduct of our experiment are centralized in Table 5.

Regarding the affective status of the children involved in this experiment, we observed a notable distinction between the two groups ($P < 0.05$). In Batch 1, i.e. those children who

benefited from Equine Assisted Therapy (EAT), no less than 58.33% positive reactions were recorded. This represents a considerable increase, 23.33% more than the percentage of positive reactions observed in Lot 2, which includes children who did not receive the same therapy. (See Fig..5).

In our analysis of the eye contact of the children involved in the experiment, we discovered something really interesting: a notable difference between the two study groups ($P < 0.05$). When we looked at Batch 1, made up of children who benefited from Equine Assisted Therapy (EAT), we noticed that 67.5% of the observations revealed eye contact and, surprisingly, this was 45% higher than in Batch 2, where the children did not receive Equine Assisted Therapy (EAT). (See Fig. 6).

Table 4. Analysis of effectiveness in the intervention of horses compared to the control group (MOPI)

Test measure	Experimental batch (n=8)			The control lot (n=8)		
	Pre-test Media \pm SD	Post test Media \pm SD	Pre-post test modification	Pre-test Media \pm SD	Post test Media \pm SD	Pre-post test modification
Attention in the activity	52,5 \pm 5,1	73,3 \pm 5,1	21,2 \pm 3,8*	51,9 \pm 4,9	57,7 \pm 4,7	5,8 \pm 1,2*
Physical movements	49,6 \pm 4,8	83,7 \pm 4,6	34,1 \pm 2,9*	55,8 \pm 3,6	60,2 \pm 3,4	4,4 \pm 0,9
Communication	51,2 \pm 4,6	69,5 \pm 3,9	18,3 \pm 2,5*	52,3 \pm 3,2	62,6 \pm 3,2	10,3 \pm 1,2*
Compliance	54,3 \pm 4,3	63,4 \pm 4,2	9,1 \pm 1,5*	53,9 \pm 4,1	54,8 \pm 3,9	0,9 \pm 0,1

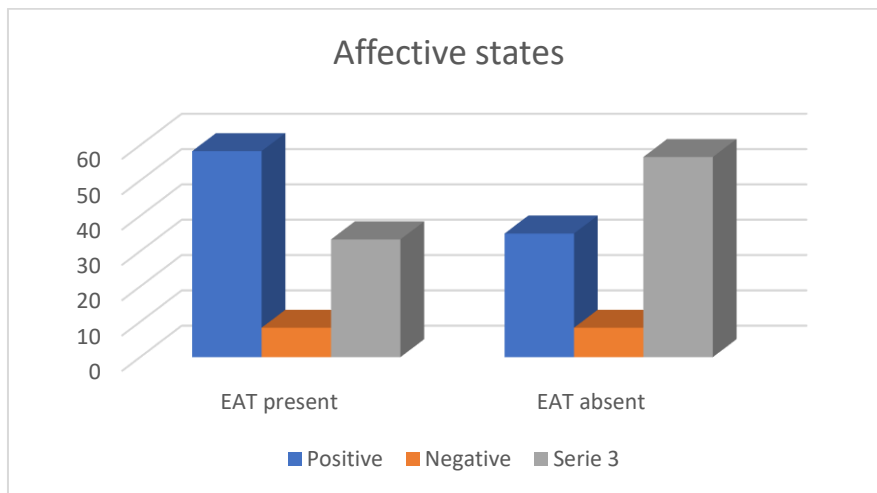


Fig. 5. Percentage weight of the categories of affective states taken in the study, in the case of the two experimental groups

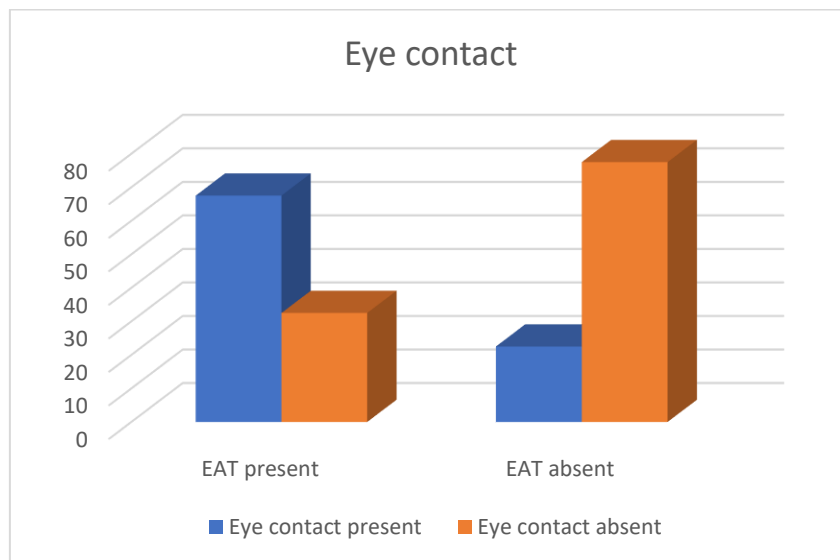


Fig. 6. Percentage weight of observations regarding eye contact, in the case of the two experimental batches

When we analyzed the vocalizations of the children involved in the experiment, we found a remarkable variation between the two groups ($P < 0.05$). In Lot 1, that is, that group of children who had Equine Assisted Therapy (EAT), we noticed that their positive expressions were in an impressive number, reaching a proportion of 76.2%. This result turns out to be 53% higher compared to Batch 2, where children did not benefit from this therapy. (See Fig. 7).

Regarding the functional skills of execution and response to command of the children involved in this experiment, we observed a considerable difference between the two groups ($P < 0.05$). In

Lot 1, i.e. those children who benefited from Equine Assisted Therapy (EAT), the share of observations that show a favorable reaction to the order is 76.2% positive reactions. This represents a considerable increase, 46.66% more than the percentage of positive reactions observed in Lot 2, which includes children who did not receive the same therapy. (See fig.8).

In our analysis of children's social attention in the experiment, we observed a notable difference between the two study groups ($P < 0.05$). When we looked at Batch 1, made up of children who benefited from Equine Assisted Therapy (EAT),

we noticed that 66% of the observations revealed a positive response to the requirements, with a difference of 33.5% higher than the similar findings in the case of children who did not receive Equine Assisted Therapy (EAT). (See Fig. 9).

Table 5. The absolute and percentage frequency of the monitored behaviors, in the case of the two experimental groups

	Observations			
	TAC present		TAC absence	
	n	%	n	%
Communication skills (socialization)				
Affective state				
Positive	35	58,33*	21	35
Negative	5	8,33*	5	8,33
Neutral	20	33,34*	34	56,67
Eye contact				
Eye contact present	27	67,5*	9	22,5
Contact vizual absent	13	32,5*	31	77,5
Vocalization				
Positive vocalization	16	76,2*	9	42,85
Negative vocalization	5	23,8*	12	57,15
Functional execution skills				
Positive order response	23	76,66*	9	30
Negative command response	7	23,33*	21	70
Social attention				
Positive social attention	33	66*	13	32,5
Negative social attention	17	34*	27	67,5
Motor skills				
Static skills	15	33,33*	31	68,88
Dynamic skills	30	66,67*	14	31,12

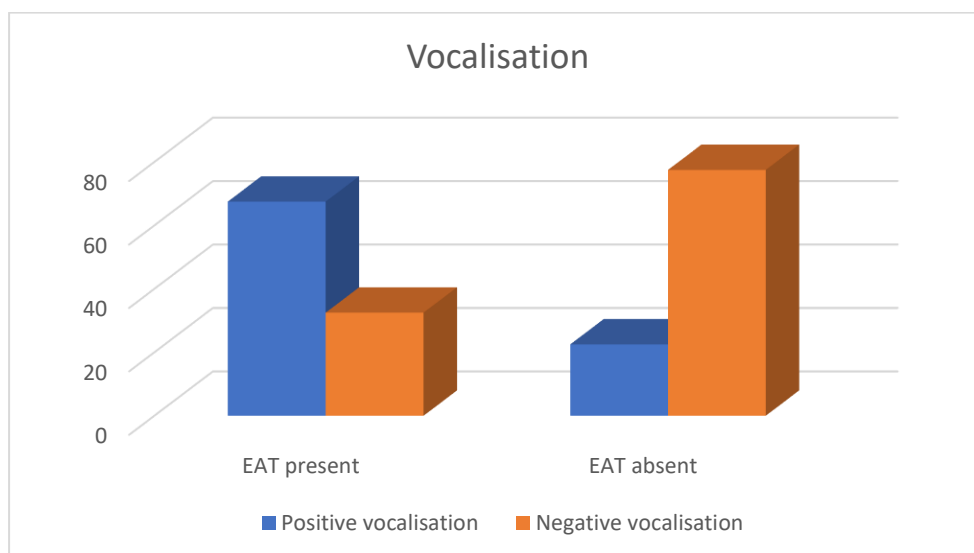


Fig. 7. Percentage weight of vocalization observations, in the case of the two experimental batches

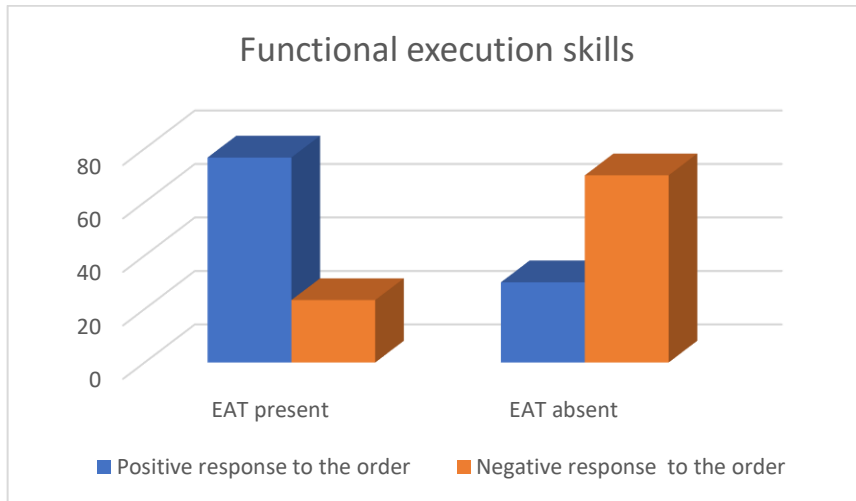


Fig. 8. Percentage weight of observations regarding Execution Skills, in the case of the two experimental batches

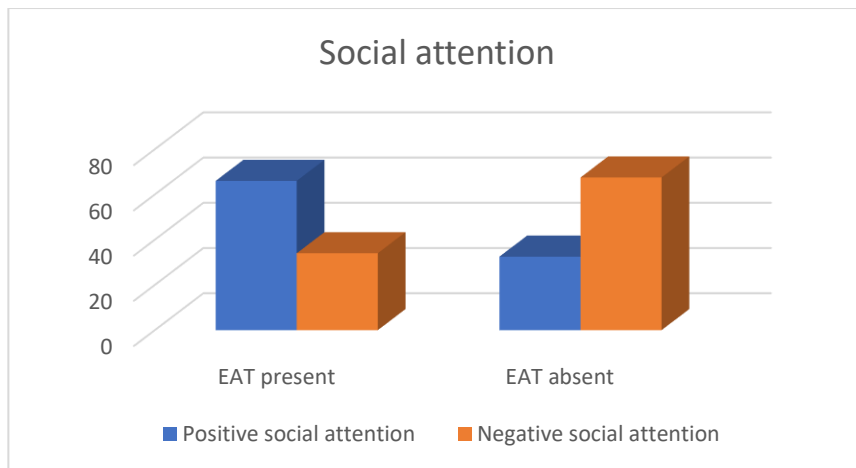


Fig. 9. Percentage weight of observations regarding social attention, in the case of the two experimental group

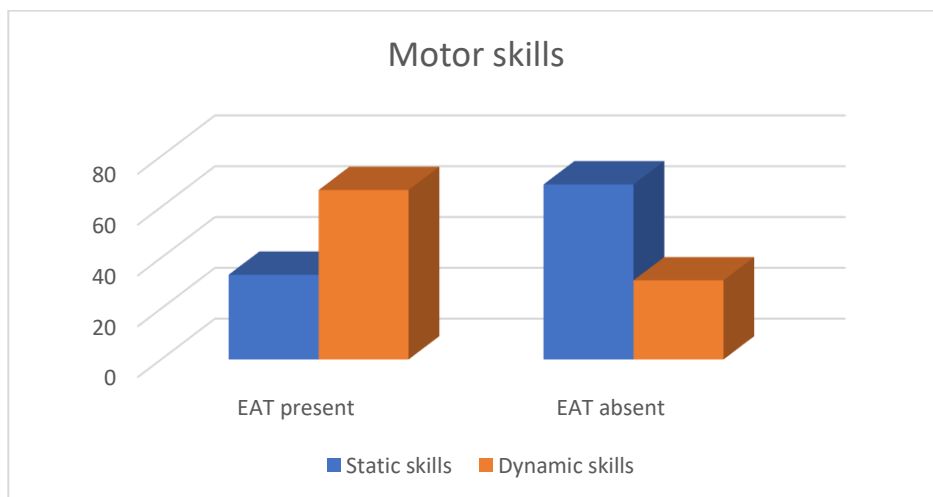


Fig. 10. Percentage weight of observations regarding motor skills, in the case of the two experimental groups

Looking at the motor skills of the children involved in the experiment, we noticed a significant discrepancy between the two groups ($P < 0.05$). In the case of group 1 children who benefited from Equine-assisted therapy, the number of findings showing dynamic abilities represents 66.67% of the total, with an increase of 35.55% compared to similar findings in the case of group 2 children who did not benefit from Equine-assisted therapy. (See Fig. 10).

Results on the efficacy of EAT, as a complementary intervention for children with ASD, assessed by ethograms, after each intervention session for each participant, are presented in Table 4. Here, significant differences ($P < 0.05$) were observed between the two experimental groups. Improvements were observed in terms of Affective State (23.33%), Visual Control (45%), Functional Skills and Command Response (46.66%), Social Attention (33.5%) and Dynamic Motor Skills (35.55%) during activities. And the biggest difference was observed in Vocalizations, with a difference of 53%.

This experimental research investigated the effectiveness of EAT in reducing challenges related to autism spectrum disorder (ASD). The results indicate that EAT is linked to increased adaptive behavior and better coordination, while contributing to a gradual development of the child's abilities to react to the increased complexity of this type of positive behavioral support.

Due to the multisensory nature of different forms of animal-assisted therapy in general, it is difficult to identify which is the defining aspect in promoting positive change. Looking at the results obtained, they argue that interaction with a horse, being perceived as a satisfactory incentive, could explain higher levels of motivation and social involvement. Bass et al. [3].

The results of this study indicated a reduction and improvement in ASD characteristics, including lack of social awareness, commitment or motivation, verbal and non-verbal communication difficulties [36]. Improvements in these key areas are associated with the results obtained by Bass et al. [3] who reported improvements in motivation and social attention.

Analyzing the results obtained by us in terms of Physical Movements and Dynamic Motor

Skills is consistent with those obtained by Collacchi et al. [37] and Bass et al. [3], who state that the shape of the horse's body and rhythmic movement contribute to the multidimensional nature of EAT, and contribute to the performance of society. Interestingly, our results are consistent with the results of Hawkins et al. [38] who suggest that improved social functioning is due to improved motor skills acquired through participation in EAT, which can allow for the development of age-appropriate social skills.

Our results are consistent with those obtained by Zoccante et al. [22], indicating a positive influence on the affective status of the children involved in the experiment.

Looking at and analyzing the results obtained in terms of the Affective State, Eye Contact and Positive Vocalizations, resonate with Zonneveld et al. (2012) [36], which shows that when children bond with animals, children can bond with humans, and negative attitudes decrease. These findings are also similar to Kern et al. [39], which showed an improvement in the severity of ASD symptoms after a 6-month TAE program.

This experimental study investigated whether EAT is effective in reducing problems associated with autism spectrum disorder (ASD). The results show that EAT is associated with better behavior and improves the child's ability to respond positively to the increasing complexity of this type of positive behavioral support. Interestingly, EAT reduced parental distress and improved parental reporting on the child's mood, aggression, non-compliance, and needs

4. CONCLUSION

The conclusions of this study indicate that EAT can influence the improvement of social aspects in children with ASD. The conclusions showed that a beneficial decrease in inappropriate behavior and an increase in the capacity for empathy were observed, it also showed a significant improvement in general adaptive behaviors, specifically, there were significant improvements in communication and social interaction.

Our results strongly support the fact that the auxiliary therapy of autism spectrum disorders with the help of horses is an effective form of intervention, which can bring substantial improvements in therapeutic outcomes.

Our research entitles us to argue that further qualitative and quantitative research is needed, and that more programs are also needed to focus on the therapeutic use of animals in children's therapy.

These positive results, according to our findings, do not hinder the level of welfare of the animals used in the therapy.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

The experiment was carried out with the agreement of the School Center for Inclusive Education (C.S.E.I.). The families of these children were notified about the conduct of this experiment within the C.S.E.I. and expressed their agreement, in writing, for the children's participation in this study.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th ed.); 2013. Available:<https://doi.org/10.1176/appi.books.9780890425596>
2. Gosling CJ, Cartigny A, Mellier BC, Solanes A, Raduà J, Delorme R. Efficacy of psychosocial interventions for Autism spectrum disorder: an umbrella review. *Molecular Psychiatry*. 2022;27:3647-3656.
3. Bass M, Duchowny M, Llabre C. The effect of therapeutic horseback riding on social functioning in children with autism. *J. Autism Dev. Disord*. 2009;39:1261–1267
4. Srinivasan SM, Cavagnino DT, Bhat AN. Effects of Equine Therapy on Individuals with Autism Spectrum Disorder: A

- Systematic Review. *Rev. J. Autism Dev. Disord*. 2018;5:156–175.
5. Chen S, Zhang Y, Zhao M, Du X, Wang Y, Liu X. Effects of Therapeutic Horseback-Riding Program on Social and Communication Skills in Children with Autism Spectrum Disorder: A Systematic Review and Meta-Analysis. *Int. J. Environ. Res. Public Health*.2022;19:14449.
6. Sissons JH, Blakemore E, Shafi H, Skotny N, Lloyd DM. Calm with horses? A systematic review of animal-assisted interventions for improving social functioning in children with autism. *Autism*. 2022;26:1320–1340.
7. Lanning BA, Baier MEM, Ivey-Hatz J, Krenek N, Tubbs JD. Effects of equine assisted activities on autism spectrum disorder. *J. Autism Dev. Disord*. 2014;44:1897–1907.
8. Harris A, Williams JM. The impact of a horse riding intervention on the social functioning of children with Autism Spectrum Disorder. *Int. J. Environ. Res. Public Health* 2017;14:776.
9. O'Haire ME. Research on animal-assisted intervention and autism spectrum disorder. 2012–2015. *Appl. Dev. Sci*. 2017;21:200–216.
10. Hardy KK, Weston RN. Canine-assisted therapy for children with autism spectrum disorder: A systematic review. *Review Journal of Autism and Developmental Disorders*, 2020;7(2):197-204.
11. Hill, J., Ziviani, J., Driscoll, C., & Cawdell-Smith, J. Can canine-assisted interventions affect the social behaviours of children on the autism spectrum? A systematic review. *Review Journal of Autism and Developmental Disorders*. 2019;6(1):13–25.
12. Jozkowski AC, Cermak SA. Moderating effect of social interaction on enjoyment and perception of physical activity in young adults with autism spectrum disorders. *International Journal of Developmental Disabilities*. 2020;66(3):222–234.
13. Memari AH, Mirfazeli FS, Kordi R, Shayestehfar M, Moshayedi P, Mansournia MA. Cognitive and social functioning are connected to physical activity behavior in children with autism spectrum disorder. *Research in Autism Spectrum Disorders*. 2017;33:21–28.
14. Portela-Pino I, Bouzo-González S, Pino-Juste M. Evaluation of an equine therapy

- program in students with Autism spectrum disorder. *Journal of Human Sport and Exercise*; 2019.
15. Llambias C, Magill-Evans J, Smith V, Warren S. Equine-Assisted Occupational Therapy: Increasing Engagement for Children with Autism Spectrum Disorder. *Am. J. Occup. Ther.* 2016;70:7006220040p1–7006220040p9.
 16. Harris A, Williams JM. The Impact of a Horse Riding Intervention on the Social Functioning of Children with Autism Spectrum Disorder. *Int. J. Environ. Res. Public Health* 2017;14:776.
 17. Gabriels RL, Pan Z, Dechant B, Agnew JA, Brim N, Mesibov G. Randomized controlled trial of therapeutic horseback riding in children and adolescents with Autism Spectrum Disorder. *J. Am. Acad. Child Adolesc. Psychiatry* 2015;54:541–549.
 18. Ward SC, Whalon K, Rusnak K, Wendell K, Paschall N. The association between therapeutic horseback riding and the social communication and sensory reactions of children with autism. *J. Autism Dev. Disord.* 2013;43:2190–2198.
 19. Trzmiel T, Purandare B, Michalak M, Zasadzka E, Pawlaczyk M. Equine assisted activities and therapies in children with autism spectrum disorder: A systematic review and a meta-analysis. *Complement. Ther. Med.* 2019;42:104–113.
 20. Kwon S, Sung IY, Ko EJ, Kim HS. Effects of therapeutic horseback riding on cognition and language in children with autism spectrum disorder or intellectual disability: A preliminary study. *Ann. Rehabil. Med.* 2019;43:279–288.
 21. Stergiou A, Tzoufi M, Ntzani E, Varvarousis D, Beris A, Ploumis A. Therapeutic effects of horseback riding interventions: A systematic review and meta-analysis. *Am. J. Phys. Med. Rehabil.* 2017;96:717–725
 22. Zoccante L, Marconi M, Ciceri ML, Gagliardoni S, Gozzi LA, Sabaini S, Di Gennaro G, Colizzi M. Effectiveness of Equine-Assisted Activities and Therapies for Improving Adaptive Behavior and Motor Function in Autism Spectrum Disorder. *Journal of Clinical Medicine.* 2021; 10(8):1726.
 23. Zhao M, Chen S, You Y, Wang Y, Zhang Y. Effects of therapeutic horseback riding program on social and communication skills in children with autism spectrum disorder: A Systematic Review and Meta-Analysis. *Int. J. Environ. Res. Public Health.* 2022;19:2656
 24. Contalbrigo L, Borgi M, De Santis M, Collacchi B, Tuozzi A, Toson M, Redaelli V, Odore R, Vercelli C, Stefani A. Equine-Assisted Interventions (EAI) for Children with Autism Spectrum Disorders (ASD): Behavioural and Physiological Indices of Stress in Domestic Horses (*Equus caballus*) during Riding Sessions. *Animals* 2021;11:1562.
 25. Srinivasan SM, Cavagnino DT, Bhat AN. Effects of Equine Therapy on Individuals with Autism Spectrum Disorder: A Systematic Review. *Rev J Autism Dev Disord.* 2018;5(2):156-175.
 26. Borgi M, Loliva D, Cerino S. și colab. Eficacitatea unui program standardizat de terapie asistată de ecvine pentru copiii cu tulburări de spectru autist. *J Autism Dev Disord.* 2016;46 :1–9.
 27. Gabriels RL, Agnew JA, Holt KD, Shoffner A, Zhaoxing P, Ruzzano S. Pilot study measuring the effects of therapeutic horseback riding on school-age children and adolescents with autism spectrum disorders. *Res Autism Spectr Disord.* 2012;6:578–88.
 28. Mapes AR, Rosén LA. Equine-assisted therapy for children with autism spectrum disorder: a comprehensive literature review. *Review Journal of Autism and Developmental Disorders.* 2016;3(4):377–386.
 29. Wiese C, Simpson R, Kumar S. The effectiveness of equine-based therapy in the treatment of social and behavioural aspects of children with autism spectrum disorder: a systematic review. *Internet Journal of Allied Health Sciences and Practice.* 2016;14(3):12.
 30. Peters BCM, Wood W. Autism and equine-assisted interventions: a systematic mapping review. *Journal of Autism and Developmental Disorders.* 2017;47(10):3220–3242.
 31. Kendall E, Maujean A, Pepping CA, Downes M, Lakhani A, Byrne J, Macfarlane K. A systematic review of the efficacy of equine-assisted interventions on psychological outcomes. *European Journal of Psychotherapy & Counselling.* 2015;17(1):57–79.
 32. "IACC Subcommittee Diagnostic Criteria - DSM-5 Planning Group | IACC"

- Available:<https://iacc.hhs.gov/about-iacc/subcommittees/resources/dsm5-diagnostic-criteria.shtml>
33. World Health Organization: International Classification of Diseases version 11 (ICD-11): Available:<https://icd.who.int/browse/2024-01/mms/en#437815624>
34. Creswell, J., (2016). Research in education: design, conduct and evaluation of quantitative and qualitative research (N. Kouvarakou, Tran.). Ion-Ellin Publications (Original work published 2005).
35. Schiro-Geist C, Heimlich K. Evaluating the Effects of Animal-Assisted Therapy on Severely Disabled Children. In Proceedings of the Delta Society Sixteenth Annual Continuing Education and Training Conference, Atlanta, GA, USA; 1997.
36. Zonneveld RT, Oosting SJ, Kijlstra A. Care farms as a short-break service for children with Autism Spectrum Disorders. NJAS Wageningen Journal of Life Sciences. 2012;59(1):35–40. DOI:10.1016/j.njas.2012.01.001.
37. Collacchi, Barbara, Noémie Pinchaud, Marta Borgi, Francesca Cirulli. Equine Assisted Activities (EAA) for Children with Autism Spectrum Disorder (ASD): Positive effects revealed using an ethological approach" applied sciences. 2023;13(13): 7417. <https://doi.org/10.3390/app13137417>
38. Hawkins BL, Ryan JB, Cory LA, Donaldson MC. Effects of equine-assisted therapy on gross motor skills of two children with autism spectrum disorder: A single study research study. Therapeutic Recreation Journal. 2014;48(2):135–149.
39. Kern JK, Fletcher CR, Garver CR, Mehta JA., Grannemann BD, Knox KR, Richardson TA, Trivedi MH. Prospective trial of equine-assisted activities in autism spectrum disorder. Alternative Therapies. 2011;17(3):14–20. Available:<http://www.ncbi.nlm.nih.gov/pubmed/22164808>

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/122413>