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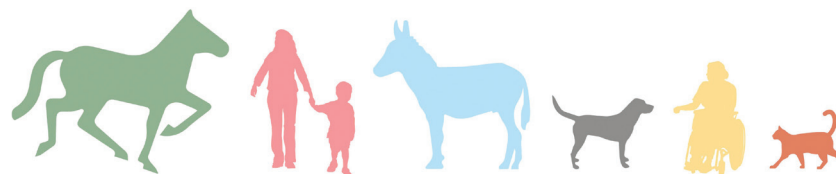
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Effects and Nursing Considerations for Equine-Assisted Activities and Therapies for Children with Autism Spectrum Disorders: A Literature Review

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Keywords: autism spectrum disorder, child, children with developmental disability, equine therapy, animal-assisted activities and therapies

Abstract This literature review aimed to analyze the effects and nursing challenges associated with equine-assisted activities and therapies (EAATs) for children with autism spectrum disorders (ASD). The study utilized the PubMed, CINAHL, and MEDLINE databases to identify 24 relevant articles. The effective contents were classified into two major categories: effects on interpersonal relationships, and effects attributable to the physical and emotional aspects of the lives of the children. The medical staff involved were mainly occupational therapists, followed by physical therapists and speech-language pathologists. The included studies also mention the involvement of trained equine therapists and volunteers, but not the involvement of nurses.

Considering the unique characteristics of EAATs in various settings and the individual needs of the recipients of the therapy, this study highlights the importance of tailoring therapy to individual needs. Nurses should be aware of the potential benefits of EAATs in improving the overall well-being of children with ASD and should consider collaborating with other health care professionals to provide comprehensive care.

Background

Effects of Equine Therapy for Children with Autism Spectrum Disorder

Autism spectrum disorder (ASD) is a condition characterized by persistent deficits in social communication and interaction across various contexts including

social reciprocity, nonverbal communication, and relationship development (American Psychiatric Association, 2022). Children with ASD often face challenges in their daily lives and require medical and welfare services. Animal-assisted therapy, including equine therapy (ET), has gained popularity as a therapeutic activity in the United States and

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Europe since the 2000s. Researchers have examined the effects of animal-assisted interventions on reducing irritability and increasing communication in individuals with ASD (Kawamura & Sakamoto, 2022).

In recent years, scholars have applied animal-mediated therapy to children and individuals with disabilities. Activities with horses are known as therapeutic horseback riding (THR), ET, equine-assisted activities and therapies (EAATs), or hippotherapy (HT). Wood et al. (2021) proposed optimal terminology for equine-assisted services in the United States. They classified equine-assisted services into 12 distinct service categories and five distinct therapy modalities: counseling, occupational therapy (OT), physical therapy, psychotherapy, and speech-language pathology. Their research also noted that licensed therapy professionals may collaborate with equine professionals or other assistants for risk management and various other purposes. In a study by Umbarger (2007), animal-assisted interventions, such as EAATs, were considered a promising alternative to more traditional forms of therapy, although further investigation is needed to validate EAATs for the ASD population. EAATs are unique in that they use horses as a part of the treatment, making it difficult to establish uniform experimental conditions; consequently, there is less research conducted on EAATs than other medical fields. Shkedi (2021) reported that “when the human-horse bond is fostered through EAAT programs, it has a remarkable effect upon a person’s emotions and thoughts and encompasses the need for new mental and physical fitness.” However, achieving a human-horse connection in any equine activity or therapy session is not straightforward, as one must consider the unique attributes of both humans and horses.

The number of scientific research reports on EAATs overseas began to increase in the 2000s and has been increasing every year, and the same trend is being observed in Japan. The Professional Association of Therapeutic Horsemanship International (2022) includes THR, equine-assisted learning, equine-assisted therapy (EAT), equine-facilitated psychotherapy, and HT as EAATs (Anderson & Meints, 2016).

Scholars have reported improvements in various domains after EAATs such as socialization, engagement, maladaptive behavior, and shorter reaction time in a problem-solving situation (Kern et al., 2011; Trzmiel et al., 2019). Peters and Wood (2017) reported quantified results of equine-assisted activities (EAAs) from research articles. They reported that the most commonly coded specific measured outcome in 25 EAA studies was behavior (11 studies, 44%) and the next most commonly measured outcomes were interpersonal interactions (10 studies, 40%), which included development of social skills and improved relationships with family and friends; and communication (9 studies, 36%), which included receptive and expressive communication. Koca and Ataseven (2016) stated: “Hippotherapy, a form of physical, occupation, and speech therapy, uses the characteristic movements of horses to provide carefully graded motor and sensory input.”

The majority of researchers have acknowledged the effectiveness of EAATs in physical, social, and communication aspects. Nevertheless, there is a lack of sufficient research regarding the specific impacts of ET on individual children with ASD. Trzmiel et al. (2019) emphasized the need for longitudinal studies, standardized EAAT protocols, large representative sample groups, and the establishment of homogeneous tools to measure therapeutic progress and outcomes, especially with regard to social functioning.

EAATs in Japan

The prevalence of developmental disabilities in Japan has significantly increased, with a sevenfold rise over the past 20 years. Based on reports, 8.8% of children in regular classes experience significant learning and behavioral difficulties, and the number of children receiving support through day classes has also increased sixfold in the last decade (Ministry of Education, Culture, Sports, Science and Technology, Japan, 2022). Approximately 140,000 children with developmental disabilities use after-school day services and other forms of support (Ministry of Health, Labor and Welfare, Japan, 2022). Children with

developmental disabilities are more likely to attract attention or feel out of place due to their unique characteristics, which can result in secondary disorders such as depression and low self-esteem (Kugimiya, 2016). Therefore, it is crucial to provide medical support that includes an understanding of their traits while respecting their individuality. Long-term care is essential for these children to lead an active life in society with their unique traits. Support for communication, which can easily cause stress, is crucial.

Previous studies of EAATs for children in Japan reported that ET improved maintenance of the riding posture with a straight back (Ishii et al., 2017), an activity that helps children calmly engage in horseback riding activities (Kawazoe et al., 2010). Miwa et al. (2015) proposed that horseback riding activities for children with pervasive developmental disorders had a relationship with their behavior at home. On the other hand, Takisaka (2011) reported that an effective training method had not been established due to the lack of trainers, therapists, and horses that were properly nurtured for therapy. In Japan, the Japanese Therapeutic Riding Research Society was established in May 2006 and horseback riding has been gradually used as a form of support for people with certain physical impairments (Japan Therapeutic Riding Association, 2021). Despite this, very few support centers for children's development use EAATs, highlighting the need to provide evidence to establish effective therapeutic activities and support teams.

EAATs are dynamic activities that involve physical and psychological aspects, and their impact on participants' lives is predicted to be significant; however, few studies have been conducted in Japan. This review encompasses research from not only Japan but also worldwide; however, the connections to the Japanese context are elaborated upon in the Discussion section. It is important to identify the effects of EAATs based on the literature on therapeutic riding (TR) and to explore the challenges facing related health professions, including nurses. Nurses are care providers who are responsible for caring for people with support needs in their daily living. In the context of providing care for children with ASD living

in the community in Japan, nursing is an essential profession and nurses are a mandatory presence in medical facilities designated as daycare centers. Additionally, nurses are professionals who specialize in assessing and addressing both physical and mental symptoms in daily life. While the presence of nurses is not mandatory in welfare services, we believe that they can make a valuable contribution to caring for and treating the symptoms of their patients to help maintain their desired quality of life. Thus, the present study aims to identify the role of nurses in EAATs for providing long-term support.

Purpose

This literature review aims to identify the effects of ET for children with ASD on the basis of research trends and to identify the professions involved in this field. Furthermore, it aims to examine the challenges related to the future of nursing in EAT.

Definition of Terms

EAATs refers to therapies that involve the use of horses and can take various forms, such as HT, ET, and THR. For the purposes of this review, EAATs are considered to encompass various therapies that incorporate horses.

Methods

Study Design: Literature Review

We conducted a literature review by searching the PubMed, CINAHL, and MEDLINE databases using the keywords “psychiatric,” “hippotherapy,” “equine,” “autism spectrum disorders,” and “horse riding.” The exclusion criteria were literature reviews, personal experience/narrative, animal-assisted therapy other than horses, literary/historical surveys, and subjects without ASD.

The study identified 24 studies published between April 2011 and April 2021.

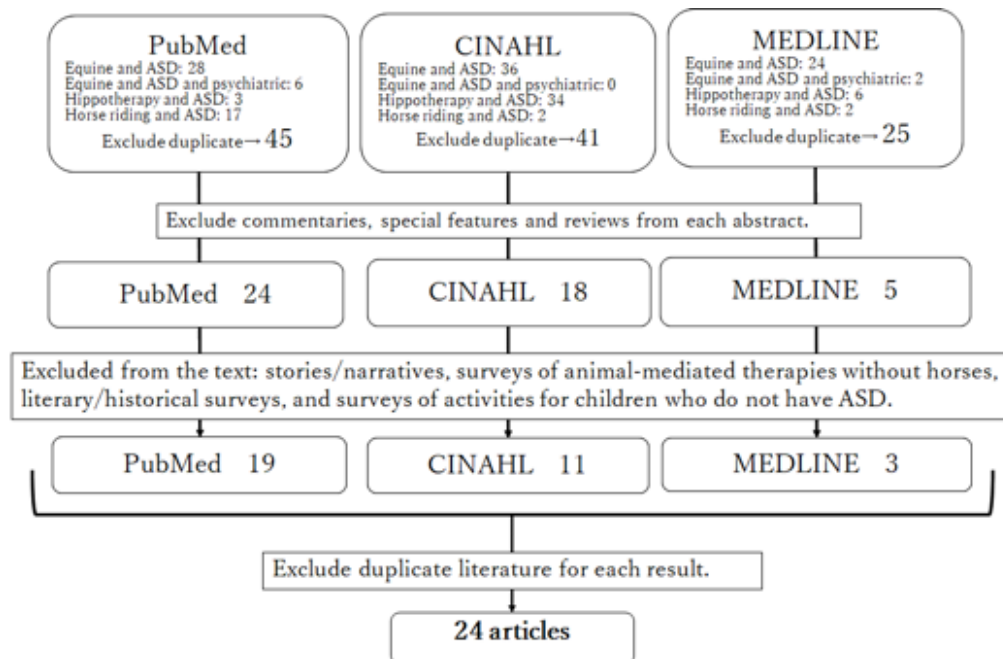


Figure 1. Process for selecting the included articles.

Results

The keywords “psychiatry,” “hippotherapy,” “equine,” “horse riding,” and “ASD” were used to search the PubMed, CINAHL, and MEDLINE databases for articles published between April 2011 and April 2021. A total of 111 studies were initially identified. After exclusion criteria and removing duplicates, 24 articles were included in the analysis, as described in the Methods section.

Out of the 24 studies, 8 were qualitative, 16 were quantitative, and 5 were a combination of qualitative and quantitative designs (Table 1). Among the 24 studies, a variety of expressions were used to describe ET: OT in an equine environment (OTEE), HT, THR, horse-assisted therapy, EAATs, equine-assisted intervention (EAI), horse riding intervention, EAA, EAT, and equine-assisted OT. Furthermore, in [ID1], [ID6], and [ID7], the implementation of OT in the presence of horses was described.

We classified the contents of the articles into eight categories, which were further classified into two major categories: effects on interpersonal

relationships and effects attributable to the physical and emotional aspects of the lives of children with ASD. Table 2 presents a list of the categories and their detailed contents.

Effects on Interpersonal Relationships

The study integrated eight categories of effects in this area that are described below:

Improved Interpersonal Relationships. Children showed significant improvements in following instructions from their parents and communities. One study [ID12] reported that a parent of children diagnosed with ASD noted that their children had improved social interactions and conversations as a social benefit of EAI. Similarly, children with ASD showed increased ability to follow directions at the end of the THR intervention [ID21].

Increased Communication. The results indicate an increase in verbal and nonverbal communication among children. The mothers of the

Table 1. Contents and Abstracts of 24 Articles

ID	Authors (Year)	Type of Research QN/QL ^{*1}	Type of Therapy ^{*2}	Subjects	Duration of Therapy/ Intervention for Child (Children)	Summary of the Effects on Therapy/ Intervention
1	Peters, B., et al. (2021)	QN	OTEE HORSE PLAY	24 children with ASD (6~13 years, IQ \geq 55, SCQ \geq 15, weight \geq 200 pounds), who have not done horseback riding for over 2 hours within the last 6 months.	10 weeks	Participants demonstrated improvements in social communication ($p = 0.10$, $d = -0.39$), social motivation ($p = 0.03$, $d = -0.51$), irritability ($p = 0.04$, $d = 0.49$), and hyperactivity ($p = 0.11$, $d = -0.37$) after participating in the interventions.
2	Potvin-Bélanger, A., et al. (2021)	QN, QL	HT	Parents of 26 children (2~18 years, motor impairment or a neurodevelopmental disorder, and among them, there were 12 participants diagnosed with ASD).	10 sessions	The survey asked parents to prioritize life habit categories and evaluate hippotherapy's impact on children's life habits. A positive impact was perceived in 10 out of 12 life habit categories (communication, education, housing, interpersonal relationships, mobility, nutrition, personal care and health, physical fitness and psychological well-being, recreation, responsibility).
3	Scotland-Coogan, D., et al. (2021)	QL	HT	11 caregivers of 12 children (7~15 years, multiple diagnosis; two children were diagnosed with ASD).	N/A	Thematic analyses of semi-structured interviews identified four themes: caregiver concerns for their child's life (concerns for child's care, initial thoughts of hippotherapy, effects of gaps in treatment), the benefits of HT (physical improvements, achievement of developmental related tasks, enjoyment of therapy, short time to see improvement), improvements in quality of life (improved confidence, increased independence, normalizing recreation), and the use of other therapies (other forms of therapy, purpose of therapy, at-home therapeutic activities).

(continued)

Table 1. (Continued)

ID	Authors (Year)	Type of Research QN/QL ^{*1}	Type of Therapy ^{*2}	Subjects	Duration of Therapy/ Intervention for Child (Children)	Summary of the Effects on Therapy/ Intervention
4	Zhao, M., et al. (2021)	QN	THR	61 children with ASD (6~12 years). Intervention group, 31; Control group, 30	16 weeks	The research participants were divided into an intervention group of 31 individuals and a control group of 30 individuals. The THR program had a positive influence on overall social skills and communication, as evidenced by the SSIS and ABLLS-R scores compared to children in the control group participating in a 16-week program.
5	Zoccante, L., et al. (2021)	QN	EAAT	15 children with ASD (7~15 years, 13 males and 2 females; seven had a Level 1 ASD, six had a Level 2 ASD, and two had a Level 3 ASD).	20 weeks	Through 20 weekly sessions, EAATs were associated with significantly higher adaptive behavior and coordination scores (social interaction, emotions-relation) ($P \leq 0.01$), as well as a significant increase in the complexity of positive behavioral support (behavior, gross motor skills, fine motor skills) ($p \leq 0.001$).
6	Kalmbach, D., et al. (2020)	QN, QL	OTEE	Five parents of four children with ASD (8~13 years, male) (mothers of three children and the mother and father of a child)	10 weeks	In a qualitative study, improvements in occupational performance, social communication, and self-regulation were found. Three major themes were presented: (1) parental perspective on the child's experience of occupational therapy in an equine environment, (2) parental perspectives of the intervention's relationship to the child's everyday life and the family's everyday life, (3) parental perspectives on dissatisfaction and concerns.

(continued)

Table 1. (Continued)

ID	Authors (Year)	Type of Research QN/QL ^{*1}	Type of Therapy ^{*2}	Subjects	Duration of Therapy/ Intervention for Child (Children)	Summary of the Effects on Therapy/ Intervention
7	Peters, B. et al. (2020)	QN, QL	OTEE	Six children with ASD (age 6–13 years), confirmed ASD (SCQ ≥ 15 and ADOS), NVIQ ≥ 55 (Leiter-3), combined irritability and hyperactivity score ≥ 11 (ABC-C), meet PATH Intl.'s physical, mental, and emotional standards	10 weeks	Six participants completed the therapy, and five participants completed the post-testing. After 10 weeks of sessions, the equine intervention group showed significant improvements in social motivation and social communication, as well as a decrease in irritability and hyperactivity among some of the children.
8	Pan, Z., et al. (2019)	QN	THR	16 children with ASD (6–16 years, with SCQ and meeting the empirically derived cutoffs for ASD or ADOS-2)	10 weeks	Eight participants who attended the 10-week THR program showed significant improvements in hyperactivity ($es = -1.39, p = 0.04$), social awareness ($es = -1.74, p = 0.01$) and social communication ($es = -1.46, p = 0.03$) behaviors compared to the eight children in the control group.
9	Steen, S., et al. (2019)	QN, QL	EAI	One female child with ASD (8 years)	5 weeks	Video observations, interviews with parents, and screening instruments were conducted before and after five weeks of ET sessions. All instruments indicated an improvement in the participant's social and communication skills.
10	Gabriels, R. L., et al. (2018)	QN	THR	64 children with ASD (6–16 years, nonverbal intelligence quotient standard score of 85 or >85 measured by the Liter-R). The THR group ($n = 36$), and the control group ($n = 28$)	10 weeks	Participants were divided into a THR group ($n = 36$) and a control group ($n = 28$). After six months of intervention, the THR group showed sustained significant improvements in social and communication behaviors, as well as the number of words spoken.

(continued)

Table 1. (Continued)

ID	Authors (Year)	Type of Research QN/QL ^{*1}	Type of Therapy ^{*2}	Subjects	Duration of Therapy/ Intervention for Child (Children)	Summary of the Effects on Therapy/ Intervention
11	Malcolm, R., et al. (2018)	QL	HAT	Nine staff, and parents, etc.	N/A	Three key explanations emerged for the therapeutic success: the sensory and embodied experiences of riding the horse, the specific movements and rhythms of the horse, and the horse's unique personality.
12	Tan, V. X., et al. (2018)	QL	EAI	Six parents of six children with ASD (~18 years; male, one; female, five)	8 months ~ 6 years	Five children had EAI programs led by a trained mental health professional, including a mix of ground and mounted horse activities tailored to their preferences. One child had a fully mounted EAI program. Using IPA, four main themes emerged: (1) improved self-concept and emotional well-being, (2) enhanced self-regulatory ability, (3) social benefits, and (4) unexpected outcomes. Parents perceived EAI as providing multiple psychosocial benefits for their children.
13	Harris, A., et al. (2017)	QN	HRI	26 children with ASD (6-9 years, 22 males and four females). Intervention group, 12; control group, 14	7 weeks	There was a significant reduction in the severity of ASD symptoms and hyperactivity from pre-test to post-test ($F[1, 22] = 8.084, p = 0.009, r = 0.518$) for the 7-week intervention group only.
14	Anderson, S., et al. (2016)	QN	EAA	15 children with ASD (5-16 years, 11 males, four females) represented 27% of participants with ASD, 20% with ASD and ADHD, and 53% with ASD and related conditions	6 weeks	The TR intervention increased empathizing ($F[1,11] = 5.19, p = 0.04, n2p = 0.320$) and reduced maladaptive behaviors ($F[1, 11] = 5.65, p = 0.037, n2p = 0.039$), but did not affect specific adaptive behaviors.

(continued)

Table 1. (Continued)

ID	Authors (Year)	Type of Research QN/QL ^{*1}	Type of Therapy ^{*2}	Subjects	Duration of Therapy/ Intervention for Child (Children)	Summary of the Effects on Therapy/ Intervention
15	Borgi, M., et al. (2016)	QN	EAT	28 male children with ASD (DSM-IV-TR and/or ICD-10) (6~12 years), IQ>70 on the WISC-III. EAT group, 15; control group, 13.	25 sessions (6 months)	Results indicated an improvement in social functioning in the group attending EAT, and a milder effect on motor abilities was also observed at the end of the program. Additionally, improved executive functioning was observed in the participants.
16	Llambias, C., et al. (2016)	QN, QL	EAOT	Seven children with ASD (4~8 years, three girls, four boys)	N/A	The study showed improvements in engagement. Visual analysis suggested a strong or positive effect compared with baseline, as noted by parents and teachers. Five children's mothers reported that their children were talking more, with more initiation of communication, new words, or longer sentences.
17	Chen, C., et al. (2015)	QL	ET	Four children (two children with ASD [one male, one female], two children with typical development [one male, one female; 28~36 months, without physical disabilities])	N/A	Resting frontal EEG alpha asymmetry was recorded while participants were grooming the horse. Young children with ASD had a higher positive asymmetry score than young children with typical development during the baseline. This study demonstrated that the ET resulted in higher left frontal asymmetry in typical children and a change from left frontal asymmetry to right frontal asymmetry in young children with ASD.
18	Gabriels, R. L. et al. (2015)	QN	THR	116 children with ASD (6~16 years; THR 58, BA control 58), stratified by nonverbal IQ standard scores (≤ 85 or > 85)	10 weeks	Significant improvements were observed in the Therapeutic Horseback Riding (THR) group on a measure of social cognition and social communication, as well as the total number of words and new words spoken during a standardized language sample after 10 weeks of THR intervention.

(continued)

Table 1. (Continued)

ID	Authors (Year)	Type of Research QN/QL ^{*1}	Type of Therapy ^{*2}	Subjects	Duration of Therapy/ Intervention for Child (Children)	Summary of the Effects on Therapy/ Intervention
19	Steiner, H., et al. (2015)	QN	THR	26 children with ASD (10–13 years). THR group, 13 (six boys, seven girls), and control group, 13 (six boys, seven girls)	1 month of THR, 3 months break, 1 month of THR	Significant differences before and after therapy were found in the length of gait cycle. Gait cycle became more stable in the sagittal plane. These findings suggest that horse therapy may be successfully used as an additional therapy for children with ASD.
20	Hawkins, B., et al. (2014)	QN	EAT	Two children with ASD (7 years female with ASD, and 11 years male with ASD verbal language impairment)	Three times a week for up to 5 weeks	Two children demonstrated moderate to large improvements in body coordination, strength, agility, and overall gross motor skills as a result of participating in equine-assisted therapy (EAT).
21	Holm, M. B., et al. (2014)	QN, QL	THR	Three children with ASD (6–8 years)	12 weeks	During the intervention, 70% of the targeted behaviors showed improvement when compared to baseline measures. Each set of parents identified several common behaviors that continued into the withdrawal phase: (1) increased overall verbalization, (2) increased ability to follow directions, (3) improved physical strength and coordination, and (4) increased ability to respond to the rhythm of the horse’s movements.
22	Lanning, B. A., et al. (2014)	QN	EAA	18 children with ASD EAA treatment program $n = 10$ (ages 4–15 years) and control group $n = 8$ (ages 5–14 years)	6 weeks	Parents reported significant improvements in their child’s physical functioning (change from baseline = 13.60, SE = 6.35, $p = 0.0415$), emotional functioning (change from baseline = 14.5, SE = 6.68, $p = 0.0391$), and social functioning (change from baseline = 22.50, SE = 9.57, $p = 0.0263$) following the first 6 weeks of EAA.

(continued)

Table 1. (Continued)

ID	Authors (Year)	Type of Research QN/QL ^{*1}	Type of Therapy ^{*2}	Subjects	Duration of Therapy/ Intervention for Child (Children)	Summary of the Effects on Therapy/ Intervention
23	Ajzenman, H. F., et al. (2013)	QN	HT	Six children with ASD (5~12 years)	12 weeks	Postural sway significantly decreased after 12 weeks of intervention. A significant increase in overall adaptive behaviors (self-care, low-demand leisure, etc.) was also observed.
24	Ward, S. C., et al. (2013)	QN	THR	21 children with ASD	6 weeks of THR, 6 weeks break, 4 weeks of THR	A significant increase in scores between pre-riding and week 6 was observed. This increase was followed by a significant decrease in scores at week 16. Scores remained stable during the treatment withdrawal period. Participating children showed significant improvements in their social interaction and sensory processing, as well as a decrease in the severity of symptoms following therapeutic riding.

*1: Type of Research used QN/QL as abbreviations: QN for Quantitative research, QL for Qualitative research.

*2: Type of Therapy used abbreviations as follows: OTee/OTEE: Occupational therapy in an equine environment, HT: Hippotherapy, THR: Therapeutic horseback riding, HAT: Horse-assisted therapy, EAATs: Equine-assisted activities and therapies, EAI: Equine-assisted intervention, HAT: Horse-assisted therapy, HRI: Horse riding intervention, EAA: Equine-assisted activities, EAT: Equine-assisted therapies, EAOT: Equine-assisted occupational therapy.

participants reported that their children were speaking more frequently, initiating communication more often, using new words, and producing longer sentences as a positive effect of EAAT sessions. Furthermore, all children displayed signs of enjoyment, such as smiling, laughing, and singing, while riding the horses [ID16]. Another study [ID10] demonstrated that children who participated in a 10-week session of THR showed significant initial improvements in social and communication behaviors and in the number of words and different words spoken during a standard language sample.

Increased Social Function (Cognition). Children improved their ability to perceive and interpret

social cues, which may improve responsibility and danger avoidance. The study [ID18] showed that the THR group demonstrated greater improvement in the social cognition and communication subscales of the Social Responsiveness Scale compared to a barn-activity control group (effect sizes: 0.41 [$p = .05$] and 0.63 [$p = .003$]; without horse, respectively).

Increased Interest and Social Motivation. Children's motivation and interest in engaging socially and participating in communication increased. According to [ID12], parents reported multiple domains of social benefits, such as improved social motivation, for the children. The study highlights that EAI was viewed not only as an outlet for

Table 2. Categories Related to the Effects and Professionals in EAATs

ID	Effects on Interpersonal Relationships				Effects Attributable to Children’s Life Physically and Emotionally			
	Improved Interpersonal Relationships	Increased Communication	Increased Social Function (Cognition)	Increased Interest and Social Motivation	Commitment to Physical Activity and Activities	Increased Activity in Everyday Life	Decreased Problematic Behavior	Improved Management of Children’s Emotions and Stress
1				✓				✓
2	✓	✓	✓		✓	✓		✓
3	✓	✓			✓	✓		✓
4		✓				✓		
5					✓	✓		✓
6	✓	✓	✓			✓	✓	✓
7		✓		✓			✓	✓
8		✓				✓	✓	
9	✓	✓	✓			✓	✓	✓
10		✓						
11		✓				✓		
12	✓	✓	✓	✓		✓	✓	✓
13							✓	
14						✓	✓	
15					✓	✓		
16		✓		✓				
17					✓			
18		✓	✓					
19					✓			
20					✓	✓		
21	✓	✓			✓	✓		✓
22			✓		✓			
23				✓		✓		
24						✓	✓	
Total	6	13	6	5	9	15	8	9

Occupation						
Occupational Therapist	Physical Therapist	Speech Therapist	Riding Instructors (Certificated or Trained)	Volunteer	Others	N/A
✓				✓		
✓	✓	✓				
	✓				✓	
			✓	✓		
						✓
✓						
✓						
		✓		✓	✓	
				✓	✓	
				✓		
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						✓
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			✓	✓		
			✓			
						✓
				✓		
				✓		
						✓
			✓			
			✓	✓		
✓			✓		✓	
5	2	2	7	10	5	4

forming relationships but also as an opportunity for children to learn and practice skills with horses that are important for developing social relationships from the perspectives of mothers.

Effects Attributable to the Physical and Emotional Aspects of the Life of Children

We classified the effects into four perspectives: commitment to physical activities, increased activity in everyday life, decreased problematic behavior, and improved management of emotion and stress among children.

Improved Physical and Motor Functions. Nine articles described increased physical strength, flexibility, and balance. [ID3] reported that all participating caregivers reported benefits for their child(ren) from participating in HT. These benefits included improvements in strength and flexibility, fine and gross motor skills, greater balance, sensory issues, and increased independent walking.

Increased Activity in Everyday Life. This aspect is involved in children's behavior in terms of their daily activities. According to [ID23], researchers observed significant increases in post-HT scores in participation in daily activities among children with ASD. Clinically significant moderate to large increases in participation were found for self-care, low-demand leisure, and social interaction on a daily basis. In [ID3], researchers reported that caregivers remarked on the extent to which the children with cerebral palsy and ASD were motivated to attend the HT sessions. This allowed children to do such tasks as prepare meals for themselves, brush their own teeth, assist their caregiver in getting them dressed, get themselves in their car seat, and ride a bicycle. Many children in the study were described as becoming more social.

Decreased Problematic Behavior. ET improves children's ability to adapt to various situations in daily life. One study [ID7] reported that five children with ASD demonstrated significantly less

hyperactivity during the last 5 weeks of an OTEE intervention than during baseline. Furthermore, ID14 reported a reduction of maladaptive behaviors, such as destructive habits, repetitive behaviors, and self-harm tendencies, as well as internalized, social, and externalized behaviors after EAA. Moreover, decreased aggressive behavior in children and reduced conflict with peers were observed. The parents of a child with ASD observed an increase in their child's ability to deal with her own body, emotion differentiation, and emotion regulation, such as aggression regulation and interacting with peers, after EAA sessions [ID9].

Improved Management of Children's Emotion and Stress. There were increased opportunities for self-care in daily living. Studies reported that parents perceived enjoyment as an important emotional experience for their children during OTEE [ID6]. The study [ID9] also reported that separation anxiety initially decreased until the third session, then increased in the fourth session, and was completely absent during the fifth (final) session of EAI.

The next section describes the types of professionals and staff involved in EAATs (Table 2). The findings of the studies suggest that health care professionals, such as occupational therapists, physical therapists, and speech-language pathologists, work in collaboration with riding instructors and volunteers. Moreover, a study reported that few of the activities were conducted by licensed health care professionals who were also certified riding professionals. An important point to note is that, among the articles analyzed, there was no mention of nurses participating in EAATs as certified health care professionals.

Discussion

Effects and Challenges Related to EAATs

This study identified several effects of EAATs for the treatment of children with ASD, including enhanced interpersonal relationships, increased expressive communication, and improved engagement

in physical activities and daily functioning. One possible explanation for these effects is the mutual process of relationship building between the participants and horses, which requires them to transmit and perceive intentions when interacting with one another. This process may lead participants to adapt their behavior to that of their equine partners, follow instructions, and develop trust.

EAATs also provide opportunities for verbal and nonverbal communication with staff to control the horse, which may increase children's spontaneous communicative expression.

Riding requires children to adjust their bodies to maintain stability, which improves their coordination. Furthermore, the experience of feeling the need to adapt and respond to situations through their behavior may lead to positive changes in daily living.

The study also identified several challenges related to EAATs, such as the lack of standardization in intervention protocols and the need for specialized training for professionals involved in the therapy. Moreover, the cost and accessibility of EAATs may limit the availability of this type of therapy to certain populations. Furthermore, it is crucial to consider animal welfare from the perspective of fatigue, physical well-being, and stress of the horses. Horses are sentient beings with their own needs, desires, and motivations, and such considerations should always be at the heart of EAAT programs.

Interprofessional Collaboration in EAATs for Children with ASD

In this literature review, it was found that the background and severity of symptoms of the children with ASD were not clearly stated in several studies. Some studies relied on parent-reported assessments of the children's condition, which may not fully capture the individuality of the degree of effects on life and the aspects that influence it. To emphasize the effect of ASD on daily living, a comprehensive assessment that considers physical condition and daily living is necessary. Crowe and Salt (2015) emphasized the importance of assessing the needs of families and care providers for personal, social, emotional, and

practical support, including the transition to adult services.

This process requires an evaluation of the spillover effects of THR in different life settings, such as therapeutic recreation facilities, homes, and schools, and considers the condition of children. It is important to consider the possibility of incorporating nursing, childcare, and other industries into the assessment and observation perspectives, tailored to the developmental needs of children. However, this aspect has not been thoroughly addressed in the literature. Currently, physical and occupational therapists play a central role in supporting the practice of EAATs; nevertheless, the cooperation of nurses is also considered important for the continuous observation and support of children's mental changes due to their symptoms and their daily lives. Almasloukh & Fahs (2020) reported that a nurse may assist a client to enjoy seeing, riding, and grooming the horse to facilitate adaptation and enhance quality of life; thus, they reported that "educating nurses about EAAT has the potential to expand nurses' roles and the profession to meet clients' needs." However, further studies are needed to address this aspect in detail.

In Japan, developmental support is well developed up to the age of 18 years, but the support system after this age is lacking. Thus, it is necessary to consider the forms of support that should be provided to continue horseback riding and other activities after this age, as well as transition services for maintaining and continuing the positive effects of EAATs for children with ASD, even if they are no longer engaged with EAATs. Further studies are necessary.

Further Challenges in the Research on EAATs and the Aspects of Nursing

In this literature review, most of the articles focused on the social and mental/physical aspects of interpersonal relationships to understand trends and the short-term effects of occupational or physical therapists on EAATs. As EAATs involve various types of complementary treatments that require special environments and resources in different countries,

assessing the background and severity of the problematic behavior of children can be challenging due to their varying abilities and characteristics. Qualitative studies may be useful for identifying detailed effects of intervention, and many qualitative studies evaluated the satisfaction and emotions of parents as part of an indirect evaluation. To comprehensively understand various aspects of daily life, such as school, routines, and conversations, conducting further detailed and long-term research based on treatment plans is necessary.

Nursing involves a professional assessment of the support and care needed for patients' medical status, including their social life and interpersonal relationships. Although some researchers have mentioned nursing perspectives, few studies have focused on the impact of EAATs on daily life. As EAATs involve medical and social activities necessary for welfare aspects, an in-depth investigation into the impact of EAATs on daily life from a nursing perspective is essential. Recent studies suggest that EAATs may foster trust and stable relationships with others; however, the specific details of these effects have not been thoroughly addressed. We propose examining the effects not only of THR but also of the environment, as the situation and circumstances during therapy may also influence results. Furthermore, the participation of nurses is important in the riding community to understand ongoing changes in the mood and physical conditions of the children from a medical perspective, assess family needs, and evaluate the relationship between horses and children and their performance. Nurses can explore the possibility of intervening through the positive use of horseback riding during the developmental stages with the objective of improving and expanding the daily living skills of children with ASD.

Further Studies

Our findings suggest that nurses should focus on the implementation of EAATs and their impact on the lives of children and examine the effectiveness of each therapy characteristic. Moreover, it is necessary

to consider what type of team will lead to a more integrated evaluation.

Conclusions

Based on the literature review, the study has identified two major categories related to effects of EAATs on children with ASD: effects on interpersonal relationships, and effects on physical and emotional aspects. The study found evidence supporting the usefulness of EAATs in enhancing interpersonal relationships, expressive communication, physical function, engagement, and daily living. However, the effectiveness obtained may vary according to the therapy method, content of activities, environment, and characteristics of each child with ASD. Therefore, it is important to further clarify the effectiveness of different characteristics, in order to tailor therapy to the individual needs of each child. Additionally, examining the long-term effects of therapy and its impact on the lives of children is necessary for future research.

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