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### Descritores

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# Animal assisted therapy: systematic review of literature

## *Terapia assistida por animais: revisão sistemática da literatura*

### ABSTRACT

**Purpose:** to verify the applications of AAT in health by performing a systematic review of the literature. **Research strategy:** a survey was carried out in four databases with the descriptors: animal assisted therapy, horse assisted therapy, speech therapy. **Selection criteria:** article published between 2010 and 2018, in Portuguese or English, free electronic access and that mentioned the characteristics of the intervention program. **Data analysis:** criteria: casuistry, area of knowledge, program characteristic, type of research, year and language of publication, nationality, periodical and impact factor. **Results:** 43 articles published in 30 journals, 16 with impact factor, were reviewed. Clinical studies prevailed (93.02%), 37.20% were from Medicine, the population studied had different diagnoses and ages, 55.81% with adults / elderly. AAT was used preferentially for physical rehabilitation (67.44%) and the main mediator was the dog, mentioned in 72.09% of the articles. Eight (n = 8) programs with a focus on communication intervention were described. **Conclusion:** There is scientific evidence on the use of AAT published in the period studied, in Brazil and in the world. The programs were used by different health and education professionals. The AAT goals were specific to the profile of the participants, and consistent with the characteristics of the mediator animal and the site.

### RESUMO

**Objetivo:** Verificar evidências sobre aplicação da TAA na saúde realizando revisão sistemática da literatura. **Estratégia de pesquisa:** Foi realizado levantamento em quatro bases de dados com os descritores: *terapia assistida por animais (Animal Assisted Therapy)*, *terapia assistida por cavalos (Equine-Assisted Therapy)*, fonoaudiologia (*speech therapy*). **Critérios de seleção:** Artigo publicado entre 2010 e 2018, em português ou inglês, com acesso eletrônico livre e que mencionava as características do programa de intervenção. **Análise dos dados:** Critérios: casuística, área do conhecimento, característica do programa, tipo de pesquisa, ano e língua de publicação, nacionalidade, periódico e fator de impacto. **Resultados:** 43 artigos publicados em 30 periódicos, 16 com fator de impacto, foram revisados. Os estudos clínicos prevaleceram (93,02%), 37,20% eram da Medicina, a população estudada tinha diferentes diagnósticos e idades, sendo 55,81% com adultos/idosos. A TAA foi usada preferencialmente para reabilitação física (67,44%) e o principal mediador foi o cão citado em 72,09% dos artigos. Foram descritos oito (n=8) programas com foco na intervenção em comunicação. **Conclusão:** Há evidências científicas sobre o uso da TAA publicadas no período estudado, no Brasil e no mundo. Os programas eram utilizados por diferentes profissionais da saúde e educação. As metas da TAA eram específicas para o perfil dos participantes e condizentes com as características do animal mediador e do local.

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## INTRODUCTION

The inclusion of animals within the therapeutic environment has existed since the end of the seventeenth century. According to the International Association of Human-Animal Interaction Organizations (IAHAIO)<sup>(1)</sup>, the American organization responsible for analyzing human-animal interaction through practice, research and education and training of animals in their different modalities, Animal Assisted Interventions include Activity, Education and Animal-Assisted Therapy (AAT).

The AAA refers to the development of entertainment, recreation, motivation to improve quality of life, while in AAT (Animal Assisted Therapy) there is a targeted intervention, performed by a health professional with clear goals and directed to develop and/or improve social, physical, emotional and cognitive aspects of the people involved<sup>(2,3)</sup>.

Although AAT is scientifically recognized in several countries, studies in Brazil are still restricted to some areas of health, referring in large part to physical rehabilitation<sup>(4-9)</sup>, which demonstrates the importance of conducting new studies in this area<sup>(3-5,10-18)</sup>.

In order to deepen the reflection on this practice and verify the application of AAT, a systematic review of the literature was carried out, in order to summarize the existing evidence<sup>(19,20)</sup> about this modality in the health area.

## OBJECTIVE

Check existing evidence on AAT application in the health area.

## METHODS

### Research strategies

This is an exploratory descriptive research based on a synthesis and evidence method through a systematic review of the literature, whose design was based on scientific recommendations, adopting the following procedures: a) problem definition and revision proposal; b) preparation of the registration form; c) definition of research equations (descriptors and combinations) and identification of sources; d) scope of the research (type of material and period); d) inclusion and exclusion criteria; e) identification, quality assessment and selection of primary study by judges; f) data extraction, analysis and synthesis of results<sup>(19,20)</sup>.

The guiding question was: “for what and how is the practice assisted by animals in the health area?”. The terms used to search for articles were selected from the list of Health Sciences Descriptors (DeCS), edition 2016, selecting the following: “*terapia assistida por animais*”, “*terapia assistida por cavalos*”, “*fonoaudiologia*”, their between-terms and their equivalents, in English: “*Animal Assisted Therapy*”, “*Equine-Assisted Therapy*”, “*speech therapy*”. We organized the search strategy in different ways, with the support of a librarian, considering the specificities of each database, using the logical operators *OR* and *AND* for the combination of the terms used in the search of the publications.

The electronic databases *Medical Literature Library of Medicine* (MedLine) (accessed by PubMed), Scopus, *Latin American and*

*Caribbean Literature* (Lilacs) and *Scientific Electronic Library* (SciELO) were defined as source. The selection criteria were: a scientific paper published in a periodical between January 2010 and October 2018, written in Portuguese or English, full article available for free electronic access, articles that clearly answered the guiding question and mentioned the characteristics of the rehabilitation program, as a resource for intervention in the health area, excluding recreational and/or leisure use.

For the organization of the obtained data, the Mendeley<sup>®</sup> program was used as tool.

## Data analysis

After searching all the databases, the identification of primary studies was performed by the title and abstract by two judges, independently, based on the selection criteria, with an agreement level of 80%. The judges answered the following question: “The articles clearly described the characteristics of the rehabilitation program as a resource for the intervention in the area of health as to the location, type of animal and rehabilitation objective (physical, cognitive, communication, educational or multimodal)?”.

All selected articles were full read for extracting data related to the following categories: I) casuistry (number of participants, age group, gender and diagnosis); II) area of knowledge; III) characteristic of the rehabilitation program in relation to 3.1) place of accomplishment; 3.2) type of animal; 3.3) rehabilitation objective (physical, cognitive, communication, educational or multimodal) and 3.4) description of results. As complementary data were identified: a) type of research, b) year of publication, c) nationality of research, d) number of articles published per year, e) language in which it was published, f) periodical/area of knowledge, g) impact factor. In order to record the data, a form has been prepared and completed. Figure 1 represents the steps of the method performed for the preparation and conclusion of the review.

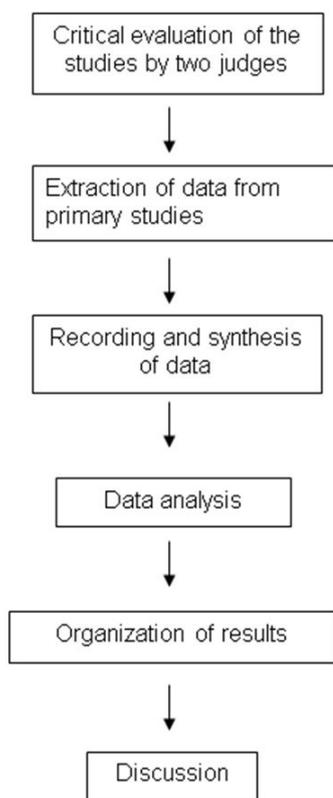
## RESULTS

### Selection

2059 productions classified in the databases were identified. Of these articles, 35% (721) were cataloged in two or more databases and were excluded. There were 1338 primary articles left and 335 were not freely accessible. Thus, the title and abstract of 1070 papers were read and 535 were excluded by the selection criteria. Thus, 436 papers were selected for the evaluation of the judges and, at the end, 43 papers were analyzed (level of agreement of 80%) (Table 1).

### Analysis

The casuistry portrayed in the studies had great diversity regarding the number, diagnosis and age group of the participants. On average, the studies reviewed were performed with 43 participants, ranging from 1 to 1960 participants, with ages ranging from 3 to 99 years, of both genders. It was found that the population studied had different diagnoses, with



**Figure 1.** Stages of the method performed for the preparation and conclusion of the review

predominance of Autistic Spectrum Disorder (ASD) ( $n=7$ )<sup>(12,21-26)</sup>, Dementia ( $n=6$ )<sup>(11,14,16,27-29)</sup>, cancer ( $n=5$ )<sup>(8,9,30-32)</sup>, Cerebral Palsy ( $n=4$ )<sup>(4,13,33,34)</sup>, various psychiatric disorders ( $n=5$ )<sup>(18,35-38)</sup>, pain ( $n=4$ )<sup>(6,7,39,40)</sup>, and two ( $n=2$ ) healthy participants<sup>(5,15)</sup>. A survey was conducted with hypertension<sup>(41)</sup>, obesity<sup>(42)</sup>, Stroke<sup>(43)</sup>, and Down Syndrome<sup>(44)</sup>. Communication disorders were specifically cited as diagnoses in three studies<sup>(17,45,46)</sup> ( $n=3$ ).

The infant population was a sample of 19 articles (44.19% of the sample), the majority of which dealt with the use of AAT in ASD<sup>(12,21-26)</sup>, Cerebral Palsy<sup>(13,33,34)</sup>, and communication disorders<sup>(17,46)</sup>, as well as surgical procedures<sup>(47)</sup>, cancer<sup>(9,32)</sup>, pain<sup>(6,7)</sup>, Down syndrome<sup>(44)</sup>, and obesity<sup>(42)</sup>. In the adult/elderly phase, the AAT was studied as a resource for physical rehabilitation (32.55%)<sup>(5,8,11,13,14,27,30,38-41,45,48,49)</sup>.

These findings reinforced that AAT can be indicated for intervention with different objectives, among them, intervention in physical, cognitive, communication and emotional aspects for different populations. Eight ( $n=8$ ) programs with intervention in communication purposes were described<sup>(12,17,18,21,23,24,43,46)</sup>. However, it was found that most publications focused on physical intervention ( $n=29$ ).

Interventions using AAT were performed in most publications in institutions for the elderly<sup>(5,11,14,18,28,29,35,41)</sup> and hospital services<sup>(6-9,32,36,37,39,45,47)</sup>. It was verified that only five ( $n=5$ ) works were developed in specific centers for the practice, such as riding center and/or equine therapy<sup>(12,23-25,34)</sup>. The other places were clinics, rehabilitation centers and classrooms. The AAT can be

**Table 1.** Reference of articles selected in the literature review

Selected articles
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**Table 1.** Continued...

Selected articles
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adopted and practiced in different health and even educational settings, since they go beyond the use of large animals, such as the horse, as mediator. Using the animal can also be interesting in the educational context, as the work carried out in the classroom of elementary education<sup>(17,21)</sup> and university education<sup>(48,49)</sup> pointed out. And, at the university level, it also contributed to reduce student stress<sup>(48,49)</sup>.

The reviewed articles cited as mediators the dog, horse, elephant, association between dog and cat, insect (cricket), fish (aquarium) and guinea pig, and in 72.09% (n=31) (Chart 1) the dog participated in the AAT, followed by horse with 18.60% (n=8). Evidence of different positive effects of mediation with dogs<sup>(4-9,11,13,14,16-18,21,25,28-32,35-43,45-49)</sup> was attributed to the characteristics of this animal, such as: ability to be domesticated (hierarchical nature), ease of feeding and reproduction<sup>(50)</sup>, size, natural affection for people and responding quickly and positively to the touch, facilitating their training and their acceptance<sup>(51)</sup>. Domestic dogs are exceptionally qualified for the social and communicative behavior of human beings<sup>(52)</sup>, since they foster feelings such as trust, loyalty and respect, which can benefit social, psychological and physiological aspects for both, based mainly on emotion<sup>(50)</sup>. It brings emotional benefits to people of different age groups, social classes and health conditions, such as improving the quality of life of the visually impaired in the case of the guide dog<sup>(53)</sup>.

The AAT using dogs or cynotherapy is based on sensitivity, concentration and socialization<sup>(50)</sup>. It can be developed and used as a public health support tool to aid in the rehabilitation process of children<sup>(13)</sup> and institutionalized elderly with potential to improve living conditions and overcoming the general state of inactivity<sup>(41)</sup>. In addition to providing innovative and useful complementary therapy, such as in children undergoing surgical procedures<sup>(47)</sup> and in patients with fibromyalgia in outpatient clinics<sup>(39,40)</sup>, it can significantly improve the emotional distress of family members and friends who accompany patients visits and outpatient clinic staff<sup>(39)</sup>. Its effects on neurological, cardiovascular and endocrine responses to stress and pain in the immediate postoperative period in children submitted to surgical procedures found that, after the dog's entrance, the fastest beta activity of the diffuse electroencephalogram was obtained in all the children of the AAT group and lower pain perception in relation to the control group. Therapy dogs facilitated rapid recovery of surveillance and activity following anesthesia, modifying pain perception, inducing a pre-frontal emotional response and adaptive cardiovascular response<sup>(47)</sup>.

The individual and social benefits obtained by the AAT with dogs can contribute to preventive, improvement and development aspects of children with various types of deficiencies<sup>(13)</sup>, may be due to the feeling of security, permanence and immutability that the dog makes possible, acting as a connection between the inanimate world and the real world<sup>(50)</sup>. It is a plausible possibility, recognized by parents and nurses, to associate it with traditional therapeutics in the hospital environment, aiming at the well-being of children and adolescents with cancer<sup>(8)</sup>. Significant effect was evidenced in a comparative study between patients with psychiatric disorders aged between 11 and 17 years and their controls. After the application of the standard therapeutic

protocol, there was a statistically significant improvement in overall functioning and school attendance in the group that participated in the AAT<sup>(36)</sup>.

The incorporation of dogs into programs for overweight children in outpatient training helped motivate them to perform physical exercises and promote sustainable lifestyle changes<sup>(42)</sup>. They contributed to a greater independence in the execution of activities of daily living, such as posture changes, incitement to approach and the exchange of affections of an adolescent with cerebral palsy with their relatives and close associates<sup>(4)</sup> and were promising in improving motor skills of children with developmental dysphasia<sup>(46)</sup>.

In elderly patients with Alzheimer's, interventions using dogs have confirmed to be applicable and effective to stimulate cognition and improve mood<sup>(16)</sup>. And they benefited a patient with stroke, compared to the modalities of regular therapy, being verified the reduction of stress and the distraction of their aphasia<sup>(43)</sup>. They have been shown to be effective in reducing the symptoms of depression in institutionalized elderly, indicating promising results in the perception of the disease schedule and treatment control<sup>(18)</sup> and significantly reduced anxiety symptoms in adults aged from 21 to 56 years, students of nursing<sup>(38)</sup>.

The horse, the second most used animal (18.60%), was mentioned as a mediator for the treatment of ASD, also showing positive effects<sup>(12,22-26)</sup> on communicative ability, social interaction, measures of irritability and hyperactivity, executive functioning and sensory and Cerebral Palsy processing in children<sup>(33,34)</sup> and as a strategy for physical rehabilitation. It also showed beneficial effects on functions, activities and body perception<sup>(33)</sup> and statistically significant changes in spasticity of hip adductors in the short term<sup>(34)</sup>.

The results of this review showed a great diversity in the objectives of the programs. Most of the articles discussed the use of AAT as a strategy of physical rehabilitation<sup>(29)</sup>, followed by cognitive<sup>(10)</sup>, communication<sup>(8)</sup>, emotional<sup>(4)</sup>, and educational<sup>(1)</sup>. Nine (20.93%) studies mentioned multimodal intervention<sup>(11,17,18,23,27,30,40,46)</sup>, of which six used physical intervention.

Regarding intervention in the communication area, it was observed that AAT was applied to cases of ASD<sup>(4)</sup>, stroke<sup>(1)</sup>, learning delay<sup>(1)</sup>, depression and anxiety<sup>(1)</sup>, and developmental dysphasia<sup>(1)</sup>.

Data on the characteristics of rehabilitation programs are presented in Chart 1.

Three (6.97%) studies mentioned interprofessional intervention<sup>(26,35,42)</sup>, but, despite its interdisciplinary nature, AAT is still restricted in some cases to particular initiatives<sup>(5)</sup> of some professionals, who have aptitude and easy access to animals, and some entities. It was observed (Chart 2) that most of the productions were Medicine (n=16, 37.20%), 16.27% (n=7) were Speech Therapists, of which 13.95% were specific to this area.

As to the type of study (Chart 2), 93.02% were clinical studies (n=40) and 6.97%, case studies (n=3), of which 17 used the control group<sup>(14-16,21,22,24,25,32,34,36,37,39,40,42,44,46,47)</sup>, making it possible to compare the results obtained statistically, and three were case studies<sup>(4,17,43)</sup>. The highest percentage of publications occurred between 2014 and 2018 (83.72%), with seven articles published in 2014, seven in 2015, eleven in 2016, two in 2017 and nine in

**Chart 1.** Characteristics of Rehabilitation Programs

Authors (year)	Population						Local	Rehabilitation objective	Animal Type
	Year	N	Age (years)	Gender	Diagnosis	Comorbidity			
1. Moretti et al. <sup>(95)</sup>	2011	21	>65	F	Mental diseases (Dementia/ Psychotic Disorders/Depression)	No	Nursing home	Cognitive	Dog
2. Berry et al. <sup>(41)</sup>	2011	19	Average of 85	F/M	Hypertension, type 2 diabetes and/or locomotor deficiency Osteoarthritis	No	Nursing home	Physical	Dog
3. Nordgren and Engström <sup>(11)</sup>	2012	9	58 to 88	F/M	Dementia	No	Nursing home	Physical/ Cognitive	Dog
4. Marcus et al. <sup>(99)</sup>	2012	382	31 to 51	F/M	Chronic pain (in the back, fibromyalgia, neck, neuropathic, arthritis, lower extremities, headache/migraine and other unspecified pain)	No	Tertiary Outpatient Clinic - Interdisciplinary Clinic for Pain Management	Physical	Dog
5. Wohlfarth et al. <sup>(42)</sup>	2012	12	Average of 9.67	F/M	Obesity	No	Interdisciplinary obesity program - Germany	Physical	Dog
6. Marcus et al. <sup>(40)</sup>	2013	133	≥18	F/M	Fibromyalgia	Anxiety and depression	Chronic Pain Clinic	Physical / Emotional	Dog
7. Ward et al. <sup>(12)</sup>	2013	21	Average of 8.1	F/M	ASD	No	Horse riding center	Communication	Horse
8. Porto and Quadrin <sup>(4)</sup>	2013	1	15	M	Cerebral Palsy	No	Parents and Friends Association of the Exceptional (APAE)	Physical	Dog
9. Edwards et al. <sup>(27)</sup>	2014	142	61 to 99	F/M	Dementia	No	Dementia Care Unit	Physical/ Cognitive	Fish (aquarium)
10. Nordgren and Engström <sup>(28)</sup>	2014	1	84	F	Dementia	No	Nursing home	Cognitive	Dog
11. Swall et al. <sup>(29)</sup>	2014	5	89 to 95	F/M	Alzheimer's disease	No	Nursing home	Cognitive	Dog
12. O'Haire et al. <sup>(21)</sup>	2014	64	5.2 to 12.8	F/M	ASD	No	School's classrooms	Communication Educational	Guinea pig
13. Lanning et al. <sup>(22)</sup>	2014	25	4 to 15	F/M	ASD	No	Services offered by Private University	Physical	Horse
14. Holm et al. <sup>(23)</sup>	2014	3	6 to 8	M	ASD	No	Therapeutic riding center, home and community	Physical/ Communication	Horse
15. Stefanini et al. <sup>(96)</sup>	2014	34	11 to 17	F/M	Acute psychiatric disorders (psychopathy, suicide attempt, mood disorders, anxiety disorders and eating disorders)	Yes/without specification	Unit of Neurology and Pediatric Children's Psychiatry Hospital	Physical	Dog
16. Fleishman et al. <sup>(90)</sup>	2015	37	Average of 57	F/M	Head and neck cancer	Hypertension/ hyperlipidemia	Cancer center	Physical/ Emotional	Dog
17. White et al. <sup>(91)</sup>	2015	8	39 to 61	F	Breast cancer	No	Department of Psychosocial Resources	Emotional	Dog

Chart 1. Continued...

Authors (year)	Population						Local	Rehabilitation objective	Animal Type
	Year	N	Age (years)	Gender	Diagnosis	Comorbidity			
18. Elmaci and Cevizci <sup>(13)</sup>	2015	10	4 to 23	F/M	Cerebral Palsy, physical and mental disabilities	Blindness (one participant)	Private training and rehabilitation center	Physical	Dog
19. Friedmann et al. <sup>(14)</sup>	2015	40	56 to 95	F/M	Dementia	Depression and psychiatric disorders	Nursing home	Physical	Dog
20. Calcaterra et al. <sup>(47)</sup>	2015	40	3 to 17	F/M	Immediate postoperative to surgical procedures (orchidopexy, inguinal or umbilical hernia, circumcision, varicocele)	No	Pediatric Surgery's Unit	Physical	Dog
21. Gabriels et al. <sup>(24)</sup>	2015	127	6 to 16	F/M	ASD	No	Barn	Communication	Horse
22. Ichitani and Cunha <sup>(6)</sup>	2015	17	7.5 to 17.4	F/M	Pain associated with any basal disease	No	Children's Hospital hospitalization section	Physical	Dog
23. Cechetti et al. <sup>(5)</sup>	2016	9	68 to 79	F/M	Apparently healthy participants (no musculoskeletal, neurological, or cognitive changes)	No	Lar da velhice institution	Physical	Dog
24. Ko et al. <sup>(15)</sup>	2016	94	Average of 71.07 (Gender F) 72.65 (Gender M)	F/M	Healthy participants Absence: decreased daily life activity due to illness, history of psychiatric illness; of medication consumption that can affect psychological symptoms, marked reduction of cognitive function (Mental State Mini Exe score or clinical diagnosis of dementia).	No	Community center	Cognitive	Insects (crickets)
25. Calvo et al. <sup>(97)</sup>	2016	22	Average of 47.8	F/M	Schizophrenia	No	Public psychiatric hospital	Cognitive	Dog
26. Borgi et al. <sup>(25)</sup>	2016	28	6 to 12	M	ASD	No	Riding center	Physical	Horse
27. Menna et al. <sup>(16)</sup>	2016	50	Average of 75	F/M	Alzheimer's	No	Alzheimer's Center	Cognitive	Dog
28. Burres et al. <sup>(43)</sup>	2016	1	80	F	Stroke	No	Acute rehabilitation facility	Communication	Dog
29. Satiensukpong et al. <sup>(44)</sup>	2016	16	control group 11.18 ± 2.13 and experimental group 9.59 ± 2.74	F/M	Down Syndrome	No	Chiang Mai	Physical	Elephant
30. Moreira et al. <sup>(8)</sup>	2016	16	20 to 54	F/M	Cancer	No	Reference Hospital for Infant Cancer	Physical	Dog

Chart 1. Continued...

Authors (year)	Population						Local	Rehabilitation objective	Animal Type
	Year	N	Age (years)	Gender	Diagnosis	Comorbidity			
31. Ichitani and Cunha <sup>(7)</sup>	2016	17	≥ 7	F/M	Pain associated with any pathology (abdominal and pelvic), acute, head, hereditary spherocytosis, unspecified bronchopneumonia, Streptococcal Tonsillitis, Cellulitis of the trunk, Polyarteritis nodosa, Dengue.	No	Pediatric unit of the hospitalization center of Sabará Pediatric Hospital - HIS/SP	Physical	Dog
32. Oliveira et al. <sup>(17)</sup>	2016	1	11	M	Delay in the learning process	Aggressive behavior, hyperactivity and isolation	Day care center - school	Cognitive / Communication	Dog
33. Giuliani and Jacquemet <sup>(45)</sup>	2016	53	36.5 ± 11.2	F/M	Learning Difficulty	Generalized Anxiety Disorder	Section of Mental Development Psychiatry (SPDM) at University Hospital Center, Vaud (CHUV)	Physical	Dog
34. Hsieh et al. <sup>(33)</sup>	2017	14	3 to 8	F/M	Cerebral Palsy	No	Early intervention centers in Taipei, Taiwan	Physical	Horse
35. Lucena-Antón et al. <sup>(34)</sup>	2017	44	8 years and 10 months (treatment group) Control group (average of 9 years and 6 months)	F/M	Spastic Cerebral Palsy	No	Equestrian and Therapeutic Association	Physical	Horse
36. McCullough et al. <sup>(62)</sup>	2018	106	3 to 17	F/M	Cancer	No	Hospital	Physical	Dog
37. Tan and Simmonds <sup>(63)</sup>	2018	6	3 to 14	F/M	ASD	No	Monash University	Emotional	Horse
38. Ambrosi et al. <sup>(18)</sup>	2018	31	≥ 65	F/M	Depression and anxiety	No	Long-term accredited institution for the elderly in northern Italy	Cognitive / Communication	Dog
39. Silva and Osório <sup>(9)</sup>	2018	24	Average of 8	F/M	Leukemia and solid tumors	No	Barretos' Cancer Hospital	Physical	Dog
40. Binfet et al. <sup>(48)</sup>	2018	1960	University students from the first to the fourth year	F/M	Stress	No	British Columbia University, Kelowna, Canada	Physical	Dog
41. Wood et al. <sup>(49)</sup>	2018	131	University students from 18 to 35	F/M	Stress	No	Sheffield University	Physical	Dog
42. Machová et al. <sup>(46)</sup>	2018	69	experimental group: 4 to 7 (A = 5.53 years); control group: between 4 and 6 (A = 4.85 years)	F/M	Developmental dysphasia	No	Department of Speech / Language Pathology in the Czech Republic	Physical/ Communication	Dog
43. Hall <sup>(38)</sup>	2018	77	21 to 56	F/M	Anxiety and depression	No	Community College Health Science Campus	Physical	Dog

2018, there was a gradual increase of publications between 2011 and 2018, with 20.93% published in 2018, which contributes to the scientific basis of the AAT, with the publication of the different methods and their results. After this review, it can be verified that the positive effects were attested in groups of people with Mental Disorders<sup>(11,13,14,27,28,36,37)</sup>, ASD<sup>(21-26)</sup>, Cancer<sup>(8,9,30-32)</sup>, Cerebral Palsy<sup>(4,13,33,34)</sup>, Alzheimer's<sup>(16,29)</sup>, Down Syndrome<sup>(44)</sup> and Stroke<sup>(43)</sup>, among others.

The United States of America published 27.90% (n=12), Brazilian researchers produced seven articles in the period (16.27%) and in Italy, 16.27% were produced. It is also necessary to publish national clinical evidence, since seven studies (16.27%), among 43 articles reviewed, were conducted in Brazil, of which

four studies (9.30%) were published in Brazilian Portuguese and the other in English, confirming other findings<sup>(3,6)</sup>. It can be assumed that internationally there is the scientific recognition of AAT as a rehabilitation strategy. This assertion is based on the number of international publications (39 studies) and impact factor of journals.

The articles were published in 30 journals and 16 had an impact factor in the Journal Citation Report (JCR) 2016. In seven of these journals (Psychogeriatrics, Journal Autism Dev Disord, Frontiers in Psychology, Pain Medicine, American Journal of Alzheimer's disease & Other Dementias, PlosOne and Journal of Mental Health), with an impact factor between 1,693 and 3,332 (Chart 2), there was more than one published

**Chart 2.** Characteristics of the primary studies

Authors	Year	Original Language	Country of Origin	Periodic	Impact Factor (Journal Citation Report, JCR, 2016)	Professional area of knowledge	Type of Study
1. Moretti et al. <sup>(35)</sup>	2011	English	Italy	Psychogeriatrics	1.693	Medicine/ Psychology	Clinic (without CG)
2. Berry et al. <sup>(41)</sup>	2012	English	Italy	Psychogeriatrics	1693	Physiotherapy	Clinic (without CG)
3. Nordgren and Engström <sup>(11)</sup>	2012	English	Sweden	American Journal of Alzheimer's Disease & Other Dementias	1.864	Occupational therapy	Clinic (without CG)
4. Marcus et al. <sup>(39)</sup>	2012	English	USA	Pain Medicine	2.820	Medicine	Clinic (with CG)
5. Wohlfarth et al. <sup>(42)</sup>	2013	English	Germany	Frontiers in Psychology	2.321	Medicine/ Psychology	Clinic (with CG)
6. Marcus et al. <sup>(40)</sup>	2013	English	USA	Pain Medicine	2.820	Medicine	Clinic (with CG)
7. Ward et al. <sup>(12)</sup>	2013	English	USA	J Autism Dev Disord	3.332	Pedagogical	Clinic (without CG)
8. Porto and Quadrin <sup>(4)</sup>	2014	Portuguese	Brazil	ConScientiae Saúde	Nothing is known	Physiotherapy	Case Report
9. Edwards et al. <sup>(27)</sup>	2014	English	USA	Western Journal of nursing research	1.313	Nursing	Clinic (without CG)
10. Nordgren and Engström <sup>(28)</sup>	2014	English	Sweden	Clinical Nursing Research	1.311	Nursing	Clinic (without CG)
11. Swall et al. <sup>(29)</sup>	2014	English	Sweden	International Journal of Older People Nursing	Nothing is known	Medicine	Clinic (without CG)
12. O'Haire et al. <sup>(21)</sup>	2014	English	Australia	The journal of alternative and e complementary medicine	Nothing is known	Medicine	Clinic (with CG)
13. Lanning et al. <sup>(22)</sup>	2014	English	USA	J Autism Dev Disord	3.332	Psychology	Clinic (with CG)
14. Holm et al. <sup>(23)</sup>	2014	English	USA	J Autism Dev Disord	3.332	Occupational therapy	Clinic (without CG)
15. Stefanini et al. <sup>(36)</sup>	2015	English	Italy	Complementary Therapies in Clinical Practice	Nothing is known	Medicine	Clinic (with CG)
16. Fleishman et al. <sup>(30)</sup>	2015	English	USA	The journal of community and supportive oncology	Nothing is known	Medicine	Clinic (without CG)
17. White et al. <sup>(31)</sup>	2015	English	Canada	Integrative Cancer Therapies	1.923	Psychology	Clinic (without CG)

Chart 2. Continued...

Authors	Year	Original Language	Country of Origin	Periodic	Impact Factor (Journal Citation Report, JCR, 2016)	Professional area of knowledge	Type of Study
18. Elmaci and Cevizci <sup>(13)</sup>	2015	English	Turkey	Int. j. Environ. Res. Public health	Nothing is known	Occupational therapy	Clinic (without CG)
19. Friedmann et al. <sup>(14)</sup>	2015	English	USA	American Journal of Alzheimer's Disease & Other Dementias	1.864	Nursing	Clinic (with CG)
20. Calcaterra et al. <sup>(47)</sup>	2015	English	Italy	Plos One	2.806	Medicine	Clinic (with CG)
21. Gabriels et al. <sup>(24)</sup>	2015	English	USA	J Am Acad Child Adolesc Psychiatry	Nothing is known	Speech Therapy	Clinic (with CG)
22. Ichitani and Cunha <sup>(6)</sup>	2016	Portuguese	Brazil	Rev Dor	Nothing is known	Speech Therapy	Clinic (without CG)
23. Cechetti et al. <sup>(5)</sup>	2016	English	Brazil	Scientia Medica	Nothing is known	Physiotherapy	Clinic (without CG)
24. Ko et al. <sup>(15)</sup>	2016	English	Corea	Gerontology	4.252	Medicine	Clinic (with CG)
25. Calvo et al. <sup>(37)</sup>	2016	English	Spain	Frontiers in Psychology	2.321	Medicine	Clinic (with CG)
26. Borgi et al. <sup>(25)</sup>	2016	English	Italy	J Autism Dev Disord	3.332	Medicine	Clinic (with CG)
27. Menna et al. <sup>(16)</sup>	2016	English	Italy	Psychogeriatrics	1.693	Medicine	Clinic (with CG)
28. Burres et al. <sup>(43)</sup>	2016	English	USA	Association of rehabilitation nurses rehabilitation nursing	Nothing is known	Speech Therapy	Case Report (without CG)
29. Satiansukpong et al. <sup>(44)</sup>	2016	English	Thailand	Occupational Therapy International	0.78	Occupational therapy	Clinic (with CG)
30. Moreira et al. <sup>(8)</sup>	2016	Portuguese	Brazil	Rev Bras Enferm	Nothing is known	Nursing	Clinic (without CG)
31. Ichitani and Cunha <sup>(7)</sup>	2016	English	Brazil	Psychology: Reflection and Criticism	0.500	Speech Therapy	Clinic (without CG)
32. Oliveira et al. <sup>(17)</sup>	2016	Portuguese	Brazil	Communication	Nothing is known	Speech Therapy	Case Report (without CG)
33. Giuliani and Jacquemetaz <sup>(45)</sup>	2017	English	Switzerland	European Journal of Integrative Medicine	0,698	Medicine	Clinic (without CG)
34. Hsieh et al. <sup>(33)</sup>	2017	English	China	Disability and Rehabilitation	2,042	Physiotherapy	Clinic (without CG)
35. Lucena-Antón et al. <sup>(34)</sup>	2018	English	Spain	Complementary Therapies in Clinical Practice	Nothing is known	Physiotherapy	Clinic (with CG)
36. McCullough et al. <sup>(32)</sup>	2018	English	USA	Journal of Pediatric Oncology Nursing	1,294	Medicine	Clinic (with CG)
37. Tan and Simmonds <sup>(26)</sup>	2018	English	Australia	Journal of Autism and Developmental Disorders	3.332	Speech Therapy Physiotherapy Occupational therapy Psychology	Clinic (without CG)
38. Ambrosi et al. <sup>(18)</sup>	2018	English	Italy	Psychogeriatrics	1.693	Psychology	Clinic (without CG)
39. Silva and Osório <sup>(9)</sup>	2018	English	Brazil	PlosOne	2.806	Medicine	Clinic (without CG)
40. Binfet et al. <sup>(48)</sup>	2018	English	Canada	Journal of Mental Health	1,807	Education	Clinic (without CG)
41. Wood et al. <sup>(49)</sup>	2018	English	United Kingdom	Journal of Mental Health	1,807	Psychology	Clinic (without CG)
42. Machová et al. <sup>(46)</sup>	2018	English	Czech Republic	Anthrozoös	Nothing is known	Speech Therapy	Clinic (with CG)
43. Hall <sup>(38)</sup>	2018	English	USA	Teaching and Learning in Nursing	Nothing is known	Nursing	Clinic (without CG)

article. From the different ways to evaluate a scientific journal, the impact factor of the publications is what presents notoriety and prioritization by the development agencies<sup>(54)</sup>. Its value is obtained by dividing the total number of citations of the articles, accumulated in the last two years, by the cumulative total of articles published by the journal in said period<sup>(54)</sup>.

Regarding the technical term, was observed the use of animal therapy, AAT, AAA and ET as synonyms for AAT. It is important that there is a consensus among the researchers about the theoretical basis for their work and/or research, because, in addition to bringing scientific credibility, it contributes to the reapplication of the method in other researches.

The main characteristics of the studies included in this review regarding authors, year of publication, original language, country of origin, periodical, impact factor, professional area of knowledge and type of study are shown in chart 2.

This review has shown, therefore, that AAT can provide therapeutic efficacy, since animal involvement brings biopsychosocial benefits in all age groups<sup>(55)</sup>, extending over the life of patients<sup>(43)</sup>, but little knowledge about the use of this practice was pointed out as a detrimental factor to the incorporation of AAT into the clinical routine<sup>(5,8)</sup>, mainly with animal management<sup>(8)</sup>, and additional research is required<sup>(4,5,11-18)</sup>. In therapeutic riding, for example, future studies should investigate reports of families, teachers and instructors and standardized measures of child behavior, as well as compare the results with other alternative leisure interventions, such as other forms of AAT<sup>(12)</sup>. The positive effects of AAA evidenced in communication and social interaction of a child with complaints of aggression, hyperactivity, frequent behavior of isolation, fights and refusal to participate in group activities, using a dog as a mediator, also suggests the relevance of research that analyze their effectiveness in the school environment<sup>(17)</sup>. But it is also necessary to consider access and care with the animal and the technical preparation of the professional as a limiting factor of the practice, in addition to issues related to its regulation in Brazil. Several countries already have legislation on animal-assisted intervention or specific legislation on the use of assisted intervention dogs or animals (United States, Canada, United Kingdom, Australia, New Zealand, Japan, Spain, Denmark, Austria, Belgium, Germany, Italy, Norway, Portugal, Ecuador, Nicaragua, Uruguay, Chile, Argentina, among others)<sup>(56)</sup>, which could justify the findings obtained in this review. In Brazil, to date, the use of animals in assisted intervention has been regulated exclusively in relation to the guide dog (Law no. 11,126, of June 27, 2005) and is in progress in the Federal Chamber, Bill No. 5,083, of 2016, which provides for the IAA and the use of assisted intervention animals. AAT researchers understand the Brazilian Law on Inclusion of People with Disabilities (Law No. 13,146, of 2015), in which assistive technology or technical assistance aims to promote the functionality of the activity and participation of people with disabilities or reduced mobility for autonomy, independence, quality of life and social inclusion, as being regulating, even though AAT *latere*<sup>(56)</sup>. Therefore, public hearings are required in Federal and Municipal Chambers, Legislative Assemblies and Courts, involving the Federal and State Councils to better delineate the attributions of health professionals (physicians,

psychiatrists, psychologists and veterinarians) and should be considered animal welfare and health and safety criteria<sup>(56)</sup>, since the animal should not only be seen as a tool<sup>(55)</sup>, but ethical aspects and animal welfare should be considered<sup>(50)</sup>. Hence, there is a need for standardization, intermediation and follow-up of a Bioethics committee for issues related to institutions, professionals, patients and animals. The variables should be weighed and strategies developed that result in the patient's and the animal physical and mental well-being<sup>(55)</sup>.

There is still a lack of knowledge both of health professionals and families about this practice and, although they recognize it as beneficial, they do not know the true therapeutic objective and its applications. In addition, there are many doubts and fears related to AAT, especially in children with cancer, due to the state of immunosuppression that favors the appearance of opportunistic infections<sup>(8)</sup>.

Ergo, it is necessary to expand the number of studies in Brazil that scientifically describe the use of AAT in different settings<sup>(3)</sup>, involving different pathologies<sup>(6)</sup>, such as facial paralysis, Parkinson's disease, among others<sup>(46)</sup>, to improve it as a complementary method in the different health areas.

## CONCLUSION

There was a great diversity in the practice of AAT, performed by several professionals in the areas of health and education, mostly in the medical field, but few programs used interprofessional intervention. Different animals were used as mediators of the therapeutic intervention, predominating the dog for the different diagnoses, while the horse, specifically for the ASD. The programs were carried out in different health and education settings, with different populations regarding the number of participants, age group, gender and diagnosis (with and without comorbidities), with a predominance of physical rehabilitation followed by cognitive, communication, emotional and educational rehabilitation and multimodal intervention, with positive effects in different genders and age groups, extending from pre-school age to senility.

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#### Authors contributions

*The author PPM participated as a research guide and was responsible for defining the objectives and method, and follow the steps of bibliographical survey, analysis, data discussion and article elaboration. The data collection, analysis and discussion were carried out by the author LAA. The review and submission of the article was done by RCSK and TCFM.*