BMC Complementary Medicine and Therapies

RESEARCH

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Effectiveness of animal-assisted therapy in adolescent psychiatric inpatients: a multicenter clinical trial

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Abstract

Background The number of adolescents hospitalized with mental health problems, which are vulnerable and under a stressful situation, has increased in the last years. Non-pharmacological therapies, including Animal Assisted Therapy (AAT), have been proposed as complementary approaches to current psychiatric interventions and contribute to the comprehensive care of patient; however, current studies are inconclusive and further studies are recommended. This study aimed to evaluate the efficacy of AAT in improving self-efficacy and reducing anxiety symptoms among adolescents in acute psychiatric units, assess healthcare professionals' perceptions, and determine participant satisfaction.

Methods A multicenter, non-randomized clinical trial was conducted in the Acute Child and Adolescent Psychiatry Unit from three Hospitals. The Control Group (CG) had 1 session 1 h per week, and the Experimental Group (EG) also had 1 session 1 h per week with the additional assistance of the therapy dog, during 2 weeks. We used the General Self-Efficacy Scale and State-Trait Anxiety Inventory Questionnaire (STAI) before and after the intervention, and collected the Participant's satisfaction post intervention.

Results A total of 178 participants were included in the study (64 CG and 114 EG). A significant improvement in self-efficacy was obtained in the EG compared to the CG. And a statistically significant improvement in anxiety (STAI-State) was observed in the EG, but the difference was not significant when comparing both groups. Participants reported a high level of satisfaction with the intervention.

Conclusions Our findings suggest that AAT may improve self-efficacy in adolescents with psychiatric conditions. However, no significant differences were observed between groups regarding anxiety levels. This study aims to provide innovation and research in a little studied area that may be useful as a complement to pharmacological treatment in the adolescent population. The clinical trial was retrospectively registered in the "Clinical Trials.gov", registration number: NCT06414850 (05/16/2024).

Keywords Animal-assisted therapy, Mental health, Adolescent psychiatry, Hospital, Nonpharmaceutical interventions

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Introduction

Mental health issues in adolescence are the leading cause of disability among young people, and a major cause of morbidity [1]. Despite improvements in pharmacological treatments, often medication alone is not sufficient for most patients. Polytherapy, including non-pharmacological methods, is widely used in all settings and patient categories [2].

Biological, psychological, and social variables play a factor in the etiology of mental disorders and must be considered in regards to their treatment. It is essential to use a therapeutic strategy that encourages comprehensive care for these young people [3, 4]. Furthermore, hospital admissions involve disruption of routines, with separation from familiar surroundings and social support [3, 5], generating anxiety and stress, and can negatively influence mental health [6]. Studies can be found on the potential benefits to patients of implementing non-pharmacological interventions in hospital settings [6, 7], such as complementary therapy with standard treatment [5]. Animal-assisted therapy (AAT) is an example of such interventions, where the presence of a dog can be a motivating and facilitating element of therapy for adolescents [8].

AAT is a subtype of Animal-Assisted Interventions (AAI) and is defined as a goal-oriented, planned, and structured therapeutic intervention directed and/or delivered by health, education, or human service professionals. It is a formal intervention with specific therapeutic objectives and is integrated within a rehabilitation process [9]. Some studies show that AAI and human-animal interaction can provide beneficial results in improving human health and well-being, while other research is inconclusive or even indicates the opposite [10]. Contact with animals can comfort, calm, and create a general feeling of psychological well-being [11]. Several studies suggest that the stress and anxiety reducing effects in response to animal contact result from the release of oxytocin [12, 13]. Other authors note that lower cortisol levels are found during the presence of a therapy dog, compared to a toy dog in children with emotional challenges who were subjected to a social stress test [14]. In contrast, two randomized controlled studies in hospitalized children showed no significant decrease in cortisol levels [15, 16].

In mental health, AAT in children and adolescents seems to be effective in improving social skills, communication, coping skills and depressive symptoms [17]. In addition, it could reduce anxious symptoms in different hospital settings [18, 19]. The presence of a therapy dog can improve the atmosphere and motivate participants, as well as improve communication between patients and staff, and between the patients themselves [20]. Other authors have suggested the possible benefits of reduced negative feelings related to hospitalization in pediatric patients [16, 21]. However, these studies suggest the need for further research; our study aims to provide scientific evidence on the application of dog-assisted therapy in adolescents in acute psychiatric units.

Another aspect that may influence response to treatment is self-efficacy, which is the belief in one's own competence to perform difficult tasks and cope with adversity [22]. This important factor aids the ability to manage the symptoms of a chronic disease. Particularly when expected to take actions (e.g., take medications, change lifestyles.) to reduce the effects of the disease [23]. Self-efficacy in adolescents has been studied in students [22] and in different chronic diseases [23]. However, the possible effects of AAT on self-efficacy are not conclusive [24], and more research focused on the adolescent population is needed.

AAI, especially dog-assisted therapy, are becoming increasingly popular as adjuvant treatment for psychiatric inpatients [17]. Although studies have reported benefits of AAT in hospital settings, there is little consistency in the clinical populations studied, outcomes, and methodologies emphasizing the need for more research in this area [5]. To our knowledge, no previous studies have specifically examined dog-assisted therapy in acute inpatient adolescents, representing a significant gap in the literature [25]. Therefore, AAT could be a useful intervention to improve certain symptoms among young patients with mental disorders, but further controlled studies are still needed [26–28].

The objectives of this study were to evaluate the effectiveness of AAT in adolescents admitted to the Acute Child and Adolescent Psychiatry Unit, in terms of improving self-efficacy and reducing anxiety symptoms. In addition, our study seeks to assess professional opinions on the effects of intervention on participants, and to determine participant satisfaction.

Methods

Study design and participants

A multicenter, non-randomized, sequential, controlled, open-label, two-arm clinical trial (Control Group and Experimental Group) was conducted; aimed at adolescents aged 13 to 17 years admitted to the Acute Child and Adolescent Psychiatry Units of the 3 hospitals participating in the study: Santa María University Hospital of Lleida, Hospital of Mataró, and Niño Jesús University Children's Hospital of Madrid. The study was retrospectively registered on https://www.clinicaltrials.gov/study/NCT06414850 and the registration date was 05/16/2024.

The inclusion criteria were: between 13 and 17 years of age, willingness to participate in the study on a voluntary basis, submission of the information sheet and signature of the informed consent form (participant and legal

guardian), and attendance at both group sessions from the intervention. Participants were excluded if they stated in the initial interview that they had an allergy to dogs or fear of dogs, a history of aggression towards animals, readmissions who had already participated in the study, or, upon being in informed, the patient and/or legal guardian did not want to participate in the study. Accepting an alpha risk of 0.05 and a power of 0.8 in a two-sided test, and establishing a 2:1 ratio between the EG and the CG 59 subjects were necessary in the CG and 118 in the EG to detect a statistically significant difference greater than or equal to five units in the STAI-State subscale. The common standard deviation was assumed to be 25 and the correlation coefficient between the initial and the final measurement was assumed to be 0.9.

A total of 190 participants were included in the study (72 (37.9%) in the CG and 118 (62.1%)) in the EG. The rate of dropout was 11.1% in the CG and 3.4% in the EG, which represented a borderline statistically significant difference between groups. The reason for abandonment was not wanting to continue participating in the intervention (8 participants in CG, 4 in EG). Missing data only occurred for participants who dropped out, and no missing data were present for participants who completed the study. These dropout cases were not included in the final analysis, and therefore, the data from the participants who completed the study (178 participants: 64 in the CG and 114 in the EG) were fully analyzed.

Selection process

Participation was offered to all of the patients admitted to the units participating in the study and who met all the inclusion criteria and none of the exclusion criteria. The adolescents and their legal guardians were previously informed, were given the information sheet and, if they accepted, were asked to sign the informed consent forms. The initial interview was conducted at the time of hospital admission.

The intervention of the Experimental Group (with therapy dog) was carried out in all three hospitals. Once the Experimental Group intervention was completed, the Control Group intervention (without therapy dog) was carried out at Hospital of Madrid. In Lleida and Mataró hospitals, AAT is implemented at the healthcare level, and a control group cannot be established since all patients participate in AAT. For this reason, the Control Group was conducted at the hospital of Madrid (once the EG intervention was completed), as AAT is continuously conducted in the other two hospitals. The groups were compared at baseline to check that they were truly comparable.

Intervention

Both the experimental group and the control group carried out a total of two one-hour group sessions at the hospitals' own facilities, on a weekly basis for two consecutive weeks. The groups had 8–10 participants. The therapy sessions in the three hospitals took place in a large room, without interruptions and with the appropriate temperature.

In all three hospitals, there was no change in the standard treatment for each patient, including pharmacotherapy, psychotherapy and occupational therapy sessions.

A structured AAT program and standard treatment was conducted in Experimental group. The same structured program without therapy dog and standard treatment was conducted in Control group. In each session, specific objectives were worked on through various group dynamics; and a therapy dog was incorporated into the experimental group as a facilitator and to encourage participant motivation. During the first session of the AAT program, we taught the participants learn how to behave appropriately with the dog.

Intervention EG (with the additional assistance of the therapy dog): Session 1, self-efficacy (executive functions, cause-effect thinking). Session 2, emotional self-regulation and frustration tolerance.

Intervention CG: same sessions without the therapy dog (Supplementary Table S1).

Human resources

The therapist and AAI professional could not be the same in all three hospitals. The hospitals are located in different cities. To reduce individual differences in therapy, a common protocol was used. Coordination meetings were held, the same support material was used during the sessions and the same exercises were carried out in all hospitals. The therapists participating in this study all have a university degree in occupational therapy or psychology and have specialized knowledge and experience in working in mental health care and AAI. The therapist was the one who conducted the therapy sessions in both groups (EG and CG).

The AAI professional was the person responsible at all times for the dog and for the interaction between participants-dog. The AAI professional was trained in ethology and dog training, and always keep animal welfare in mind. The AAI professional monitored canine body language to detect signs of fatigue or stress. Three AAI professionals participated in this study, one in each hospital. All of them are professionally dedicated to AAI and have extensive experience. They are part of the professional teams of the three AAI entities that have participated (Ilerkan Association, Animal Nature - Animal Training and Welfare and Itcan Dog Assisted Interventions).

Animal resources

The intervention included six therapy dogs, selected for their suitable character and appropriate abilities, with a calm, docile, and obedient temperament and training that enriched the sessions. Specifically, two golden retrievers (one male and one female), one male labradoodle, and three mixed-breed dogs weighing 19–25 kg (one male and two females) participated, averaging 4 years of age.

The animals completed a specific training process as therapy dogs, which included positive training techniques and familiarization with the hospital environment to ensure that they could easily adapt to different situations. The physical and mental health of the dogs participating in this study was strictly monitored by the AAI entities. A veterinarian to ensure that they were in good health periodically checked all of the animals. The therapy dogs were always under supervision of the AAI professional.

Additionally, the standards of the Animal-Assisted Intervention Office of Rey Juan Carlos University of Madrid were met, in terms of both animal welfare and zoonosis prevention.

Measures

Baessler and Schwarzer General Self-Efficacy Scale (GSE): pre- and post-intervention

This evaluates self-efficacy beliefs in certain life situations, such as chronic illnesses and consists of 10 items on a 4-point Likert scale (1 = not true; 4 = true). The total scale score ranges from 10 to 40 points. It has been used in many studies, showing a high positive correlation with self-esteem and a negative correlation with anxiety, depression, and physical symptoms [29].

The General Self-Efficacy Scale has demonstrated good internal consistency across different populations, with Cronbach's alpha typically ranging from 0.76 to 0.90 [22]. In clinical samples, values as high as 0.95 have been reported [29]. A higher GSE score indicates a better ability on the part of the adolescent to handle everyday problems in their life, and vice versa.

State-Trait Anxiety Inventory questionnaire (STAI): pre- and post-intervention

It consists of a self-reported questionnaire widely used in the literature to assess both trait anxiety ("most of the time") and state anxiety ("at the present moment"). Each of these subscales has 20 items in a 4-point Likert response system according to intensity (0 = not at all; 3 = very much). The State-Trait Anxiety Inventory is a widely used instrument with high internal consistency (α = 0.93) in both clinical and non-clinical populations [30].

Participant evaluation questionnaire for professionals

This is a questionnaire that was completed by the professionals in the three hospitals at the end of the intervention with the EG, using a Likert scale from 1 to 4 (1 = Not at all, 2 = Somewhat, 3 = Quite, and 4 = A lot). It contains the following questions:

- Have you observed any positive changes in the patient's attitude since the AAT session?
- Has the dog generated motivation?
- Do you consider AAT useful for this patient?

Participant satisfaction questionnaire

The following question was asked in writing and answered by all participants (CG + EG) at the end of the intervention: Did you enjoy the activity that was carried out? It consists of a Likert scale of 1 = Not at all, 2 = Somewhat, 3 = Quite and 4 = A lot.

Sociodemographic and clinical variables

Age at inclusion. Sex: Male, Female, Intersex. Hospital. Diagnosis. Treatment: No, Antidepressants, Anxiolytics, Antipsychotics, Others, Combination. Do you have a pet? Yes, No.

Statistical analyses

Variable normality was assessed using a Shapiro-Wilk test, and variables were treated accordingly. When describing the sample, medians and interquartile ranges were used in the non-normal numerical variables, means and standard deviations were used in the normally distributed numerical variables, and absolute and relative frequencies in the categorical variables. Mann-Whitney U tests or Student's T tests were used to compare continuous variables and chi-square tests to compare categorical variables to assess baseline comparability between the CG and the EG. For the outcomes comparison between the CG and the EG, the differences in test scores from before and after the intervention were first evaluated using a paired Mann-Whitney U test for each group. The differences in the effects that the intervention had on the EG and CG were subsequently compared using the Mann-Whitney U test. Participant satisfaction was compared using chi-squared tests for the question "Did you enjoy the activity carried out?" and a Student's T test was used to compare the numerical degree of satisfaction. Effect sizes were calculated using Rosenthal's r. Statistical significance has been established for $p < 0.05$. Version 4.1.2 of the R statistical program was used.

Ethical considerations

The study protocol was initially approved by the Research Ethics Committee (REC) of the Arnau de Vilanova University Hospital of Lleida (REC identification code 2080),

followed by the REC of the Niño Jesús University Children's Hospital of Madrid (code R-0042/19) and the Consorci Sanitari del Maresme Hospital of Mataró (code 51/19). Confidentiality was maintained in accordance with the European Union's General Data Protection Regulation 2016/679. The study followed the principles of the Declaration of Helsinki. Written informed consent was obtained from each participant and their parents or guardians. Animal welfare and zoonosis prevention protocols were applied. Liability insurance was arranged.

Table 1 Summary descriptive table by groups Table 1. Summary descriptive table by groups

	[ALL]	Control	Experimental	*p*.overall
	N **= 178**	***N*** **= 64**	***N*** **= 114**	
Sociodemographic and Clinical Variables				
Age	15.0 [14.0;16.0]	15.0 [14.0;16.0]	15.0 [14.0;16.0]	0.524
Having a pet at home	36 (20.2%)	11 (17.2%)	25 (21.9%)	0.574
Treatment:				0.320
No	6 (4.55%)	0 (0.00%)	6 (5.26%)	
Antidepressants	18 (13.6%)	3 (16.7%)	15 (13.2%)	
Anxiolytics	19 (14.4%)	0 (0.00%)	19 (16.7%)	
Antipsychotics	7 (5.30%)	1 (5.56%)	6 (5.26%)	
Others	4 (3.03%)	0 (0.00%)	4 (3.51%)	
Combination	78 (59.1%)	14 (77.8%)	64 (56.1%)	
Depressive disorder	81 (45.5%)	32 (50.0%)	49 (43.0%)	0.456
Psychotic disorder	6 (3.37%)	1 (1.56%)	5 (4.39%)	0.421
Conduct disorder	15 (8.43%)	2 (3.12%)	13 (11.4%)	0.104
Eating disorder	59 (33.1%)	19 (29.7%)	40 (35.1%)	0.570
Borderline personality disorder	8 (4.49%)	6 (9.38%)	2 (1.75%)	0.026
Bipolar disorder	5 (2.81%)	3 (4.69%)	2 (1.75%)	0.352
Autism spectrum disorder	4 (2.25%)	0 (0.00%)	4 (3.51%)	0.298
Adaptation disorder	6 (3.37%)	4 (6.25%)	2 (1.75%)	0.190
Obsessive-compulsive disorder	2 (1.12%)	0 (0.00%)	2 (1.75%)	0.537
Initial status of the participants				
Self-efficacy (General Self-efficacy Scale) pre-intervention	25.1 (6.28)	25.2 (5.47)	25.0 (6.72)	0.863
State Anxiety (STAI-State) pre-intervention	30.0 [23.0;42.0]	33.5 [24.0;45.5]	30.0 [22.0;40.8]	0.139
Trait Anxiety (STAI-Trait) pre-intervention	38.5 [30.0;46.8]	40.0 [31.8;47.0]	38.0 [30.0;45.0]	0.193

Results

Description of patients included, analysis of the sociodemographic, clinical, and efficacy variables at baseline (before the intervention)

A total of 178 participants were included in the study (64 (36.0%) in the CG and 114 (64.0%) in the EG), with an average age of 15.0 [14.0;16.0] years, and 85.9% were females. A 20.2% of the participants had pets at home at the time of inclusion. The most frequent diagnoses were depressive disorder with 81 (45.5%) participants and eating disorders with 59 (33.1%) participants. Moreover, the most common pharmacological treatment in all participants was combination of drugs 78 (59.1%), anxiolytics 19 (14.4%) and antidepressants 18 (13.6%) (Table 1).

No significant differences found between the CG and the EG in terms of sociodemographic and clinical variables; except for the borderline personality diagnosis, there were more participants in the CG ($p = 0.026$) (Table 1).

A 53.4% of the sample came from the hospital of Madrid, 29.2% from the hospital of Lleida, and the remaining 17.4% were from the hospital of Mataró.

At baseline, Self-Efficacy (GSE) was obtained in all sample a result of 25.1 (6.28), being by groups: CG 25.2 (5.47) and EG 25.0 (6.72), $p = 0.863$. In all sample the State Anxiety (STAI-State) pre-intervention result was 30.0 [23.0;42.0], being by groups: CG 33.5 [24.0;45.5] and EG 30.0 [22.0;40.8], $p = 0.139$. And the Trait Anxiety (STAI-Trait) pre-intervention was 38.5 [30.0;46.8], being by groups: CG 40.0 [31.8;47.0] and EG 38.0 [30.0;45.0], $p = 0.193$ (Table 1). No significant differences were obtained between the CG and the EG in the pre-intervention results of all the scales (Table 1).

Evaluation of the effectiveness of the intervention

The results obtained after the intervention compared by groups are shown in Table 2. On the General Self-Efficacy Scale, the pre-post difference value in the CG was – 1 [-2.5;0], $p = 0.082$, and in the EG it was 0.5 [-0.5;1.5], $p = 0.265$; the pre-post difference value between groups was greater and significant in the EG: 2 [0;3], $p = 0.036$ (group effect size ($r = 0.158$)). The results observed in State Anxiety (STAI-State) (CG: -2.5 [-5;0.5], $p = 0.090$; EG: -4 [-6;-2], $p < 0.001$) showed a significant decrease in anxiety in the EG; even so, the comparison between groups was not significant (STAI-State: -2 [-5;1], $p = 0.294$ (group effect size ($r = 0.0788$)) (Table 2).

Participant evaluation by practitioners after the AAT intervention (EG)

The participant evaluation carried out by the professionals after the intervention (Table 3) shows that a positive change in patient attitude was observed in 75.4%

Table 2 Pre-post intervention comparison by groups

	Self-efficacy (GSE)	State Anxiety (STAI-State)
Pre Control group	24 [21;30]	33.5 [24;45.5]
Post Control group	24 [21;29]	34 [16.75;42.75]
Control group difference	-1 [-2.5;0]	-2.5 [-5;0.5]
Control group Effect size	0.223	0.211
Control group, p-value difference	0.082	0.09
Pre Experimental group	25 [20;29]	30 [22;40.75]
Post Experimental group	26 [19.25;30]	29 [18.5;34]
Experimental group difference	0.5 [-0.5;1.5]	-4 [-6;-2]
Experimental group Effect size	0.105	0.361
Experimental group, p-value difference	0.265	< 0.001
Difference between groups	2 [0;3]	-2 [-5;1]
Group Effect size	0.158	0.0788
Difference between groups (p-value)	0.036	0.294

Table 3 Participant evaluation by practitioners after the AAT intervention (EG)

	[ALL] 114
Have you observed any positive change in the patient's attitude since the AAT session?	
Not at all	0 (0.00%)
Somewhat	28 (24.6%)
Quite	52 (45.6%)
A lot	34 (29.8%)
Has the dog generated motivation?	
Not at all	0 (0.00%)
Somewhat	11 (9.65%)
Quite	48 (42.1%)
A lot	55 (48.2%)
Do you consider AAT useful for this patient?	
Not at all	0 (0.00%)
Somewhat	5 (4.39%)
Quite	37 (32.5%)
A lot	72 (63.2%)

Table 4 Participant satisfaction evaluation

	Control *N* = 64	Experimental *N* = 114	*p*-overall
Did you enjoy the activity carried out?			0.001
Not at all	0 (0.00%)	0 (0.00%)	
Somewhat	10 (15.6%)	7 (6.16%)	
Quite	32 (50.0%)	35 (30.7%)	
A lot	22 (34.4%)	72(63.2%)	
Degree of satisfaction	3.19(0.69)	3.57(0.61)	< 0.001

of participants after the AAT session (Quite 45.6% and A Lot 29.8%). The presence of the dog built significant motivation in 90.3% of the participants (Quite 42.1% and A Lot 48.2%). Finally, the professionals considered the AAT useful in 95.7% (Quite 32.5% and A Lot 63.2%) of the participants.

Evaluation of participant satisfaction

Satisfaction scores were significantly higher in the EG compared to the CG ($p < 0.001$), with an average score of 3.57 (0.61) out of 4 in the EG and 3.19 (0.69) in the CG. The assessment of the activity carried out by the EG was very positive in 93.9% (A Lot 63.2% and Quite 30.7%) (Table 4).

Discussion

The objectives of this study were to evaluate the effectiveness of AAT in adolescents admitted to the Acute Child and Adolescent Psychiatry Unit in terms of improving self-efficacy and reducing anxiety symptoms.

The intervention showed improvements in self-efficacy. To the best of our knowledge, there are currently no published studies evaluating self-efficacy outcomes specifically in dog-assisted intervention programs targeting adolescents in acute psychiatric units. AAT resulted a significant improvement in self-efficacy compared to the control group. The 2-point difference between the experimental and control groups is small in absolute terms and represents a modest magnitude (approximately 5% of the total scale). Nevertheless, the finding may hold some clinical relevance when interpreted within its specific context: the study involved a vulnerable population, the intervention was brief, and no improvement was observed in the control group. Furthermore, clinicians reported perceived positive changes in adolescents' attitudes and motivation, which supports the potential value of the intervention in practice. Although the group effect size ($r = 0.158$) indicates a small impact, it nonetheless suggests a measurable and consistent benefit that warrants further investigation. In addition, minimal clinically important differences (MCIDs) have not been established for the GSE or STAI in adolescent inpatient mental health populations, limiting definitive conclusions regarding clinical meaningfulness.

Other interventions evaluated the effect of youth empowerment programs; the results found no significant effect of the intervention on self-efficacy in adolescents [31]. AAT research aimed at assessing self-efficacy in people with psychiatric disorders has been conducted with farm animals [24, 32] and with equines [33, 34]. On the one hand, in adults' patients with mental health disorders [24] didn't obtained effect during the farm animal assisted intervention, unlike our results. However, farm animal assisted intervention, demonstrated that six months after the intervention significantly higher results in the EG [24]. On the other hand, equine assisted-therapy as a complementary treatment in patients suffering from substance use disorders is effective in improving

their emotion regulation, self-efficacy, and perceived self-esteem [34]. Our study was the first to provide results on the possible efficacy in adolescents of dog-assisted therapy in improving self-efficacy, paving the way to future studies.

Secondly, the effect on anxiety was assessed. Compared to other studies that examined the effects of AAT on anxiety in hospitalized patients with major depression [7] and university students [35], our participants showed a lower baseline anxiety level. A significant decrease in anxiety was observed in the EG after intervention, but not significant changes were found in the GC and in the comparison between groups. The effect size for the difference in STAI scores between groups was r = 0.0788, which indicates a very small effect according to Rosenthal's criteria. This effect is unlikely to reflect a clinically meaningful reduction in anxiety, suggesting that the intervention had a minimal impact on anxiety levels in this sample. This result was similar to a study with patients suffering from depression, where the STAI-State score was significantly reduced after the presence of a dog, but not in GC [7]. Furthermore, the results presented by Hartwig [36] showed that, although improvements were noticed in the groups separately, no significant differences were found between groups. These effects on anxiety reduction have been found in different studies that performed short interventions of 10–30 min assisted with a dog [15, 16, 35, 37–39]. Nevertheless, it may be interesting to evaluate whether an intervention containing more sessions could have greater effects than those found in our study.

In a selective review of evidence-based medicine, three randomized controlled trials were reviewed. The studies compared the effects of dog-assisted therapy with a control group in patients under 18 years of age receiving medical treatment [40]. Similar to our results, none of the three articles found there to be a significant decrease in anxiety following AAT when compared to the control group. In the McCullough et al. [21] study, participants received AAT on an outpatient basis, whereas the Branson et al. [16] and Barker et al. [37] patients were inpatients (with a variety of diagnoses, but no mental health diagnoses). Branson et al. [16] also utilized the STAI to measure anxiety levels; patients in the AAT group spent 10 min with a therapy dog, while those in the control group were given a stuffed animal to play with for 10 min. Anxiety levels were measured directly before and immediately after intervention in both groups; in the same way as in our study.

Thirdly, the opinion of the professionals in regards to the effect of AAT on participants was assessed. The professionals considered AAT useful in 95.7% of the participants. Following the intervention, they observed a positive change in attitude, with the presence of the dog building significant motivation. These results help corroborate that brief AAT intervention can provide benefits in terms of an individual's psychological well-being [7, 16, 18, 38, 39], especially among adolescents with conduct disorders [41]. This aspect has also been demonstrated in other studies [17, 42], which corroborate that AAT can improve the behavior of young people and change the emotional regulation strategies of this vulnerable population.

In a clinical trial targeting children and adolescents, the 20 EG participants with AAT were given questionnaire, as we did. This aimed to examine the satisfaction, acceptance and perceived effectiveness of AAT in parents and nurses. Similar to our study, the results showed that the professionals valued AAT as a very helpful approach in the care of adolescents [43].

One aspect that should be noted is the high degree of satisfaction expressed by the majority of participants, which was statistically higher among the EG. The act of interacting with the therapy dog motivates patients to actively participate in the therapeutic process [18, 44]; improve the psychotherapeutic strategies and provides high adherence in this type of intervention [45, 46]. Satisfaction and perception in terms of the usefulness of AAT have been very positive among both participants and health professionals. Future studies may benefit from combining self-report with staff ratings, independent observations, and parental input to obtain a more comprehensive and triangulated assessment of satisfaction.

Mental health interventions should be "youth-friendly" and "engaging" [4, 17]. AAIs have been shown can be an effective tool to help with engagement and relationship building [47, 48]. Initial research evidence suggests that animals can be an excellent complementary option for youth with significant challenges and those who may have low engagement in traditional therapy [49]; by favoring the therapeutic alliance among patients who have difficulties with adherence to therapeutic programs [50].

Individual differences in demographic variables such as age, gender, and race/ethnicity may significantly contribute to variability in intervention outcomes [10]. Previous studies have shown that females tend to report more positive attitudes and behaviours toward animals [51] and are generally more receptive to animal-assisted interventions [52]. In our sample, 85.9% of participants were female, which likely reflects the higher prevalence of depressive and eating disorders, our most common diagnoses among adolescent girls [53]. This demographic pattern is consistent with previous research, where similarly high proportions of female participants have been reported [37, 54, 55], with the exception of one study that maintained a balanced gender distribution [44]. These factors may limit the generalizability of our findings to more gender-diverse populations. Future studies should

take sociodemographic variables into account when analysing intervention outcomes [56].

Outpatient studies were more frequent than inpatient studies, and the sample size was generally low [50]. The question persists as to how the integration of AAT into inpatient child and adolescent psychiatric facilities should be evaluated [25]. In addition, most studies did not include any follow-up; however, where prospective data were available, the benefits of AAT appeared lasting [50]. Our study may contribute to providing evidence on the benefits of AAT within this population group, as a complement to traditional treatment. However, more research is needed in order to establish its effectiveness and long-term effects; and consider subgroup analyses to identify which populations may benefit most from AAIs [47, 57–59].

Strengths and limitations

A strength of this study is the final sample size of 178 participants, which is larger than most studies published to date. Most of the literature with AAT and hospitalized children are either anecdotal or pilot studies [43, 44], with study cohorts ranging from 12 [7] to 94 [54] participants. The intervention duration of 2 sessions of 60 min might seem a limitation; but there is a large variability among different studies: from a single session of 10 to 30 min [7, 16, 18, 19, 38, 39], to an intervention that included weekly sessions of 45 min over 12 weeks [44]. The question remains as to how many AAT sessions are needed to obtain results in patients. This study provides positive results with a brief intervention, which is more applicable to clinical practice considering the duration of admission of these patients. However, we must be cautious with the results and recognize that a longer intervention might potentially yield stronger effects.

The multicenter study design is another strength. However, it employed a non-randomized design due to practical and ethical constraints related to the availability and implementation of AAT across participating hospitals. We acknowledge that the sequential and site-specific implementation may introduce allocation bias and affect group comparability. To address this, baseline comparisons were conducted to ensure that groups were similar on key characteristics prior to intervention.

Another limitation is the use of a single-site control group, while the intervention group was drawn from multiple centers. This design choice introduces potential confounding factors related to institutional and contextual differences. Although the standard treatment protocols (including pharmacotherapy, psychotherapy, and occupational therapy) were consistent across all sites, variations in clinical practice, staff experience, and institutional procedures could have influenced both intervention delivery and outcomes. To mitigate these differences, coordination meetings were held to align procedures and promote consistency across sites. Although there was a different therapist and AAI-team in each hospital, all had previous experience and specific training in AAI. Nevertheless, we recognize that site-specific factors beyond our control may have impacted the comparability between groups.

Due to the nature of the intervention, the study design was open-label, as blinding participants or professionals was not feasible. To reduce potential bias from professionals influencing the results, all questionnaires were self-administered. Another possible limitation is the concurrent implementation of other therapeutic interventions during admission, which may have influenced outcomes. To minimize this, outcome measures were collected immediately before and after the intervention period in both groups.

Finally, the study did not assess whether the observed effects were sustained beyond the immediate post-intervention period. Future research should consider evaluating long-term outcomes through follow-up assessments conducted weeks or months after the intervention.

Conclusions

This study addresses a notable gap in the literature, particularly regarding the effects of animal-assisted therapy on self-efficacy and anxiety in adolescents. Our findings suggest that AAT may enhance self-efficacy in adolescents with psychiatric conditions. However, no significant differences were observed between groups in terms of anxiety levels. The group effect size ($r = 0.158$) further supports the practical relevance of the self-efficacy results, indicating a small but measurable impact of the intervention. Additionally, a high degree of satisfaction was reported by the participants.

The results suggest that professionals perceive AAT as a potentially effective complementary therapy that may foster improved attitudes among adolescents and greater motivation to engage in treatment. Animal-assisted interventions are increasingly used in clinical psychiatric settings, yet standardized protocols remain limited.

To improve the feasibility of implementing AAT in real-world clinical settings, it is essential that professionals receive appropriate training and certification in AAT and canine behavior to ensure the well-being of participants and animals. Zoonotic disease prevention and animal welfare protocols must be followed. Adequate liability insurance coverage is also necessary, along with proper selection and preparation of therapy dogs for work in therapeutic contexts. This study contributes innovation and research to an understudied area, and may support the use of AAT as a complement to pharmacological treatment in adolescent populations.

Abbreviations

AAI	Animal-Assisted Interventions
AAT	Animal Assisted Therapy
CG	Control Group
EG	Experimental Group
GSE	General Self-Efficacy Scale
REC	Research Ethics Committee
STAI	State-Trait Anxiety Inventory Questionnaire

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12906-026-05385-4.

Supplementary Material 1.

Acknowledgements
The authors would like to thank all of the patients who participated in the study; the professionals from the Acute Child and Adolescent Psychiatry Units at the three Hospitals; the Fundació Institut Universitari per a la Recerca a l'Atenció Primària de Salut Jordi Gol i Gurina (IDIAPJGol); as well as the Animal Nature, Itcan, and Ilerkan Associations. The authors are grateful to the Office of Animal-Assisted Interventions at the Rey Juan Carlos University of Madrid collaboration to carry out the intervention at the Niño Jesús University Hospital in Madrid, and with Nestlé Purina PetCare Spain for the manuscript translation costs.

Guidelines
ZAll methods were carried out by relevant guidelines and regulations.

Authors' contributions
M.R-C. (M. Rodrigo-Claverol), N.R-C., E.M-D., and I.G-G. participated on the design of the work; M.M-C. and M.R-C. (M. Roman-Casenave) interpretation of data; M.R-C. (M. Rodrigo-Claverol) and E.R-C. wrote the main manuscript text; L.L-R. and J.P. have revised it and Y.M-B. prepared all tables. All authors have read and agreed to the published version of the manuscript.

Funding
There is no fund.

Data availability
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study protocol was initially approved by the Research Ethics Committee (REC) of the Arnau de Vilanova University Hospital of Lleida (REC identification code 2080), followed by the REC of the Niño Jesús University Children's Hospital of Madrid (code R-0042/19) and the Consorci Sanitari del Maresme Hospital of Mataró (code 51/19). Confidentiality was maintained in accordance with the European Union's General Data Protection Regulation 2016/679. The study followed the principles of the Declaration of Helsinki. The adolescents and their legal guardians were previously informed, were given the information sheet and, if they accepted, were asked to sign the informed consent forms (participant and legal guardian). The study was retrospectively registered on https://www.clinicaltrials.gov/study/NCT06414850 and the registration date was 05/16/2024.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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Received: 5 September 2024 / Accepted: 13 April 2026
Published online: 17 April 2026

References

1. World Health Organization. Guidelines on mental health promotive and preventive interventions for adolescents: helping adolescents thrive: executive summary. 2021. https://iris.who.int/handle/10665/341140. Accessed 27 April 2024.
2. Okkels N, Mogensen RB, Crean LC, Vestergaard CH, Skadhede S, Rasmussen C, Shanmuganathan JWD, Hansen KB, Munk-Jørgensen P. Treatment profiles in a Danish psychiatric university hospital department. Nord J Psychiatry. 2017;71(4):289–95. https://doi.org/10.1080/08039488.2017.1279212.
3. Grigoropoulou M, Kapetanakis EI, Attilakos A, Charalampopoulos A, Dimopoulou A, Vamvakas E, Mavrigiannaki E, Zavras N. Investigating non-pharmacological stress reduction interventions in pediatric patients confirmed with salivary cortisol levels: a systematic review. Pediatr Rep. 2023;15(2):349–59. https://doi.org/10.3390/pediatric15020031.
4. Fazel M, Soneson E. Current evidence and opportunities in child and adolescent public mental health: a research review. J Child Psychol Psychiatry. 2023;64:1699–719. https://doi.org/10.1111/jcpp.13889.
5. Barker SB, Gee NR. Canine-assisted interventions in hospitals: best practices for maximizing human and canine safety. Front Vet Sci. 2021;8:615730. https://doi.org/10.3389/fvets.2021.615730.
6. Sarman A, Günay U. The effects of goldfish on anxiety, fear, psychological and emotional well-being of hospitalized children: a randomized controlled study. J Pediatr Nurs 2023 Jan-Feb;68:e69–78. https://doi.org/10.1016/j.pedn.2022.11.012.
7. Hoffmann AOM, Lee AH, Wertenauer F, Ricken R, Jansen JJ, Gallinat J, Lang UE. Dog-assisted intervention significantly reduces anxiety in hospitalized patients with major depression. Eur J Integr Med. 2009;1(3):145–8. https://doi.org/10.1016/j.eujim.2009.08.002.
8. Arnskötter W, Martin S, Walitza S, Hediger K. Effects of including a dog on treatment motivation and the therapeutic alliance in child and adolescent psychotherapy: study protocol for a randomized controlled trial. Trials. 2024;5(251):26. https://doi.org/10.1186/s13063-023-07854-4.
9. International Association of Human-animal Interaction Organizations. IAHAIO White Paper 2014–2018: the IAHAIO definitions for animal assisted intervention and guidelines for wellness of animals involved. 2014. https://iahaio.org/wp/wp-content/uploads/2021/01/iahaio-white-paper-2018-english.pdf. Accessed 10 Dec 2023 .
10. Rodriguez KE, Herzog H, Gee NR. Variability in human-animal interaction research. Front Vet Sci. 2021;15:7:619600. https://doi.org/10.3389/fvets.2020.619600.
11. Kerns KA, Obeldobel CA, House H, Kochendorfer LB, White A, Gastelle M. Children's experiences of positive affect with pet dogs: a multi-method study. Human-Animal Interact. 2023;11:1. https://doi.org/10.1079/hai.2023.0022.
12. Beetz A, Uvnäs-Moberg K, Julius H, Kotrschal K. Psychosocial and psychophysiological effects of human-animal interactions: the possible role of oxytocin. Front Psychol. 2012;3:234. https://doi.org/10.3389/fpsyg.2012.00234.
13. Jennings ML, Granger DA, Bryce CI, Twitchell D, Yeakel K, Teaford PA. Effect of animal assisted interactions on activity and stress response in children in acute care settings. Compr Psychoneuroendocrinol. 2021;31:8:100076. https://doi.org/10.1016/j.cpnec.2021.100076.
14. Beetz A, Julius H, Turner D, Kotrschal K. Effects of social support by a dog on stress modulation in male children with insecure attachment. Front Psychol. 2012;3:352. https://doi.org/10.3389/fpsyg.2012.00352.

15. Kelker HP, Siddiqui HK, Beck AM, Kline JA. Therapy dogs for anxiety in children in the emergency department: a randomized clinical trial. JAMA Netw Open. 2025;8(3):e250636. https://doi.org/10.1001/jamanetworkopen.2025.0636.
16. Branson SM, Boss L, Padhye NS, Trötscher T, Ward A. Effects of animal-assisted activities on biobehavioral stress responses in hospitalized children: a randomized controlled study. J Pediatr Nurs. 2017;36:84–91. https://doi.org/10.1016/j.pedn.2017.05.006.
17. Jones MG, Rice SM, Cotton SM. Incorporating animal-assisted therapy in mental health treatments for adolescents: a systematic review of canine assisted psychotherapy. PLoS ONE. 2019;14(1):e0210761. https://doi.org/10.1371/journal.pone.0210761.
18. Hinic K, Kowalski MO, Holtzman K, Mobus K. The effect of a pet therapy and comparison intervention on anxiety in hospitalized children. J Pediatr Nurs. 2019;46:55–61. https://doi.org/10.1016/j.pedn.2019.03.003.
19. Mulvaney-Roth P, Jackson C, Bert L, Eriksen S, Ryan M. Using pet therapy to decrease patients' anxiety on two diverse inpatient units. J Am Psychiatr Nurses Assoc. 2023;29(2):112–21. https://doi.org/10.1177/1078390321999719.
20. Machová K, Procházková R, Konigová P, Svobodová I, Přibylová L, Vadroňová M. Acceptability of AAI from the perspective of elderly clients, family members, and staff-a pilot study. Int J Environ Res Public Health. 2020;17(16):5978. https://doi.org/10.3390/ijerph17165978.
21. McCullough A, Ruehrdanz A, Jenkins MA, Gilmer MJ, Olson J, Pawar A, Holley L, Sierra-Rivera S, Linder DE, Pichette D, Grossman NJ, Hellman C, Guérin NA, O'Haire ME. Measuring the effects of an animal-assisted intervention for pediatric oncology patients and their parents: a multisite randomized controlled trial. J Pediatr Oncol Nurs. 2018;35(3):159–77. https://doi.org/10.1177/1043454217748586.
22. Luszczynska A, Scholz U, Schwarzer R. The general self-efficacy scale: multicultural validation studies. J Psychol. 2005;139(5):439–57. https://doi.org/10.3200/JRLP.139.5.439-457.
23. Cramm JM, Strating MM, Roebroeck ME, Nieboer AP. The importance of general self-efficacy for the quality of life of adolescents with chronic conditions. Soc Indic Res. 2013;113(1):551–61. https://doi.org/10.1007/s11205-012-0110-0.
24. Berget B, Ekeberg O, Braastad BO. Animal-assisted therapy with farm animals for persons with psychiatric disorders: effects on self-efficacy, coping ability and quality of life, a randomized controlled trial. Clin Pract Epidemiol Ment Health. 2008;4:9. https://doi.org/10.1186/1745-0179-4-9.
25. Fornefeld D, Zellin U, Schmidt P, Fricke O. The supporting role of dogs in the inpatient setting: a systematic review of the therapeutic effects of animal-assisted therapy with dogs for children and adolescents in an inpatient setting. Eur Child Adolesc Psychiatry. 2023;26. https://doi.org/10.1007/s00787-023-02326-1.
26. Hoagwood KE, Acri M, Morrissey M, Peth-Pierce R. Animal-assisted therapies for youth with or at risk for mental health problems: a systematic review. Appl Dev Sci. 2017;21(1):1–13. https://doi.org/10.1080/10888691.2015.1134267.
27. Shen RZZ, Xiong P, Chou UI, Hall BJ. We need them as much as they need us: a systematic review of the qualitative evidence for possible mechanisms of effectiveness of animal-assisted intervention (AAI). Complement Ther Med. 2018;41:203–7. https://doi.org/10.1016/j.ctim.2018.10.001.
28. Waite TC, Hamilton L, O'Brien W. A meta-analysis of animal assisted Interventions targeting pain, anxiety and distress in medical settings. Complement Ther Clin Pract. 2018;33:49–55. https://doi.org/10.1016/j.ctcp.2018.07.006.
29. Kleinstäuber M, Lambert MJ, Hiller W. Recurrent brief depression: a new subtype of depressive disorders? Psychother Psychosom. 2020;89(3):162–73. https://doi.org/10.1159/000505126.
30. Mathiesen BB, Lindschou J, Petersen AK, Kliem A, Jørgensen MB, Winkel P, et al. Psychometric properties of the Danish State-Trait Anxiety Inventory (STAI) in patients with severe health anxiety, depression and anxiety disorders. BMC Psychiatry. 2019;19(1):206. https://doi.org/10.1186/s12888-019-2189-9.
31. Morton MH, Montgomery P. Youth empowerment programs for improving adolescents' self-efficacy and self-esteem: a systematic review. Res Social Work Pract. 2013;23(1):22–33. https://doi.org/10.1177/1049731512459967.
32. Pedersen I, Nordaunet T, Martinsen EW, Berget B, Braastad BO. Farm animal-assisted intervention: relationship between work and contact with farm animals and change in depression, anxiety, and self-efficacy among persons with clinical depression. Issues Ment Health Nurs. 2011;32(8):493–500. https://doi.org/10.3109/01612840.2011.566982.
33. Hauge H, Kvalem IL, Enders-Slegers MJ, Berget B, Braastad BO. Persistence during tasks with horses in relation to social support, general self-efficacy and self-esteem in adolescents. Anthrozoös. 2015;28:2333–347. https://doi.org/10.1080/08927936.2015.11435406.
34. Souilm N. Equine-assisted therapy effectiveness in improving emotion regulation, self-efficacy, and perceived self-esteem of patients suffering from substance use disorders. BMC Complement Med Ther. 2023;23:363. https://doi.org/10.1186/s12906-023-04191-6.
35. Grajfoner D, Harte E, Potter LM, McGuigan N. The effect of dog-assisted intervention on student well-being, mood, and anxiety. Int J Environ Res Public Health. 2017;14(5):483. https://doi.org/10.3390/ijerph14050483.
36. Hartwig EK. Building solutions in youth: evaluation of the human–animal resilience therapy intervention. J Creativity Mental Health. 2017;12(4):468–81. https://doi.org/10.1080/15401383.2017.1283281.
37. Wołyńczyk-Gmaj D, Ziółkowska A, Rogala P, Ścigała D, Bryła L, Gmaj B, Wojnar M. Can dog-assisted intervention decrease anxiety level and autonomic agitation in patients with anxiety disorders? J Clin Med. 2021;4(21):5171. https://doi.org/10.3390/jcm10215171.
38. Barker SB, Knisely JS, Schubert CM, Green JD, Ameringer S. The effect of an animal-assisted intervention on anxiety and pain in hospitalized children. Anthrozoös. 2015;28:101–12. https://doi.org/10.2752/089279315X14129350722091.
39. Ávila-Álvarez A, Pardo-Vázquez J, De-Rosende-Celeiro I, Jácome-Feijoo R, Torres-Tobío G. Assessing the outcomes of an animal-assisted intervention in a paediatric day hospital: perceptions of children and parents. Animals. 2020;1(10):1788. https://doi.org/10.3390/ani10101788.
40. Carroll K. Does animal-assisted therapy reduce anxiety in pediatrics? PCOM physician assistant studies student scholarship. 2020;566. https://digitalcommons.pcom.edu/pa_systematic_reviews/566.
41. Calvo P, Pairet S, Vila M, Losada J, Bowen J, Cirac R, Bulbena A, Holloway A, Fatjó J. Dog assisted therapy for teenagers with emotional and behavioural issues: a multicentre study. Eur Psychiatry. 2017;41(S1):S432–3. https://doi.org/10.1016/j.eurpsy.2017.01.418.
42. Muela A, Balluerka N, Sansinenea E, Machimbarrena JM, García-ormaza J, Ibarretxe N, Eguren A, Baigorri P. A social-emotional learning program for suicide prevention through animal-assisted intervention. Animals. 2021;11(12):3375. https://doi.org/10.3390/ani11123375.
43. Stefanini MC, Martino A, Bacci B, Tani F. The effect of animal-assisted therapy on emotional and behavioral symptoms in children and adolescents hospitalized for acute mental disorders. Eur J Integr Med. 2016;8(2):81–8. https://doi.org/10.1016/j.eujim.2016.03.001.
44. Stefanini MC, Martino A, Allori P, Galeotti F, Tani F. The use of animal-assisted therapy in adolescents with acute mental disorders: a randomized controlled study. Complement Ther Clin Pract. 2015;21(1):42–6. https://doi.org/10.1016/j.ctcp.2015.01.001.
45. Lundqvist M, Carlsson P, Sjödahl R, Theodorsson E, Levin LÅ. Patient benefit of dog-assisted interventions in health care: a systematic review. BMC Complement Altern Med. 2017;17(1):358. https://doi.org/10.1186/s12906-017-1844-7.
46. Brown S, Snelders J, Godbold J, Moran-Peters J, Driscoll D, Donoghue D, Mathew L, Eckardt S. Effects of animal-assisted activity on mood states and feelings in a psychiatric setting. J Am Psychiatr Nurses Assoc. 2020;26(6):555–67. https://doi.org/10.1177/1078390319853617.
47. Fennig MW, Weber E, Santos B, Fitzsimmons-Craft EE, Wilfley DE. Animal-assisted therapy in eating disorder treatment: a systematic review. Eat Behav. 2022;47:101673. https://doi.org/10.1016/j.eatbeh.2022.101673.
48. Maharaj N. Companion animals and vulnerable youth: promoting engagement between youth and professional service providers. J Loss Trauma. 2015;21(4):335–43. https://doi.org/10.1080/15325024.2015.1084857.
49. Flynn E, Gandenberger J, Mueller MK, Morris KN. Animal-assisted interventions as an adjunct to therapy for youth: clinician perspectives. Child Adolesc Soc Work J. 2020;37:631–42. https://doi.org/10.1007/s10560-020-00695-z.
50. Spattini L, Mattei G, Raisi F, Ferrari S, Pingani L, Galeazzi GM. Efficacy of animal assisted therapy on people with mental disorders: an update on the evidence. Minerva psichiatrica. 2018;59(1):54–66. https://doi.org/10.23736/S0391-1772.17.01958-6.
51. Herzog HA. Gender differences in human–animal interactions: a review. Anthrozoös. 2007;20(1):7–21. https://doi.org/10.2752/089279307780216687.
52. Crossman MK, Kazdin AE. Perceptions of animal-assisted interventions: the influence of attitudes toward companion animals. J Clin Psychol. 2018;74:566–78. https://doi.org/10.1002/jclp.22548.
53. Bacigalupe A, Cabezas A, Bueno MB, Martín U. Gender as a determinant of mental health and its medicalization. SESPAS Report 2020. Gaceta Sanitaria. (2020) 34:61–7. https://doi.org/10.1016/j.gaceta.2020.06.013

54. Fodstadt JC, Bauers J, Sexton M, Butler M, Karlsson C, Neff M. Development of an animal-assisted activity program on a pediatric behavioural health unit. Complement Ther Clin Pract. 2019;36:152–7. https://doi.org/10.1016/j.ctcp.2019.07.001.
55. Germone MM, Gabriels RL, Guerin NA, Pan Z, Banks T, O'Haire ME. Animal-assisted activity improves social behaviour in psychiatrically hospitalized youth with autism. Autism. 2019;23(7):1740–51. https://doi.org/10.1177/1362361319827411.
56. Thorpe RJ, Kelley JA. Epidemiological panel studies of older adults: new frontiers in the research on human–animal interaction. Anthrozoös. 2019;32:209–20. https://doi.org/10.1080/08927936.2019.1569904.
57. Flynn E, Zoller AG, Gandenberger J, Morris KN. Improving engagement in behavioral and mental health services through animal-assisted interventions: a scoping review. Psychiatr Serv. 2022;73(2):188–95. https://doi.org/10.1176/appi.ps.202000585. Epub 2021 Jun 23. PMID: 34157858.
58. Serpell J, McCune S, Gee N, Griffin JA. Current challenges to research on animal-assisted interventions. Appl Dev Sci. 2017;21:223–33. https://doi.org/10.1080/10888691.2016.1262775.
59. Cook K, Robertson C, Gudivada K, Mitchell I, Nourse M, Hosey MM, Paterson C, Rai S. Pawsitive care: canine-assisted intervention for anxiety in ICU patients and family members: a single-center, single-arm study. Crit Care Explor. 2025;7(5):e1258. https://doi.org/10.1097/CCE.0000000000001258.

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