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Can Animal Assisted Interventions counteract apathy and improve physical activity levels in psychiatric patients with cognitive disability? A case study

Claudia Cerulli [a], Arianna Murri [a], Elisa Grazioli [a,*], Eliana Tranchita [a], Francesca Tinè [a], Chiara De Santis Del Tavano [b], Vittorio Digiacomantonio [c], Marisa Nicolini [c], Attilio Parisi [a]

[a] Unit of Physical Exercise and Sport Sciences, Department of Movement, Human and Health Sciences, University of Rome «Foro Italico», Rome, Italy
[b] ASD Sociale «Il Giardino di Filippo - Agriland», 01100, Viterbo, Italy
[c] Casa di Cura Villa Rosa, 01100, Viterbo, Italy

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ABSTRACT

Background: Patients with psychiatric disorders experience a reduced quality of life also due to the antipsychotic drugs assumed, that negatively affects their cognitive abilities. A healthy lifestyle, such as physical activity, can improve both functional abilities and mental health of patients with a dual diagnosis, psychiatric and cognitive. Despite this knowledge, these people are more sedentary than the general population, probably because of their apathy, core aspects of the illness. Animal Assisted Interventions (AAIs) seem to be a valid tool to stimulate them to practice physical exercise thanks to the empathy generated by the relationship with the animal.
Methods: This case study aims to evaluate the effect of 4 months AAIs on apathy and physical efficiency in 2 patients with dual diagnoses. Patient A and patient B, affected by psychiatric disorders and mild cognitive impairment, were recruited to perform an AAI, one with a dog and the other with a horse.
Results: At the end of the study data showed a decrease of apathy in both patients: −20,6% in patient A and −9.8% in patient B, as well as a reduction of psychiatric symptoms. Moreover, both patients improved the functional parameters evaluated through the Short Physical Battery Test (patient A = +33.3%; patient B = +28.6%).
Conclusions: The preliminary results of this case report suggest that well-structured, individualized AAIs, with a horse or with a dog, could be considered as a useful adjunctive therapy to the usual treatment programs to improve both functional abilities and mental health in psychiatric patients.

1. Introduction

Psychiatric disorders include behavioural, emotional, and cognitive dysfunctions and affect many subjects, reducing patients' quality of life (QoL). It was estimated that in 2019, about 12% of the world's population suffered from one of these pathologies. Moreover, it is frequent that patients affected by a psychiatric disorder have also cognitive deficits. The life expectancy of these patients is reduced by 15–25 years due to the side effects of drug treatments, disease-related symptoms and genetic vulnerability (Cerdà et al., 2010). In fact, the first-generation antipsychotic drugs have an additional negative effect on the patient's cognitive abilities, aggravating a picture already compromised by the disease itself. Recently, researchers focused their attention on those pharmacological, psychological, and rehabilitative therapeutic techniques which could not only control the symptoms of these patients, but also guarantee their reintegration into society and, in general, improve the QoL. Evidence showed that a healthy lifestyle, such as physical activity (PA), can affect both the functional abilities and mental health of patients with a dual diagnosis, psychiatric and cognitive. Despite this knowledge, people affected by severe mental disorders are more sedentary than the general population and they spend almost 7/8 hours a day sitting or lying down, engaging only 38 minutes of moderate to vigorous PA per day (Schuch and Vancamport 2021). Negative psychotic symptoms such as apathy, lack of motivation, and cognitive deficits are the main barriers to rehabilitation treatments and PA (Kalinowska et al., 2021). Animal Assisted Interventions (AAIs) seem to be a valid tool to

* Corresponding author.
E-mail addresses: claudia.cerulli@uniroma4.it (C. Cerulli), a.murri@studenti.uniroma4.it (A. Murri), elisa.grazioli@uniroma4.it (E. Grazioli), eliana.tranchita@gmail.com (E. Tranchita), fratine@hotmail.it (F. Tinè), chiafilippo@gmail.com (C. De Santis Del Tavano), v.digiacomantonio@ospedaliere.it (V. Digiacomantonio), m.nicolini@ospedaliere.it (M. Nicolini), attilio.parisi@uniroma4.it (A. Parisi).

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stimulate these patients to practice physical exercise thanks to the empathy that is emphasized in the relationship with a dog or a horse and which also contributes to a natural improvement of their mood. Indeed, AAIs provide multisensory stimuli able to improve attention and motivation, increasing cooperation and involvement of psychiatric patients in rehabilitation programs (Monfort Montolio and Sancho-Pelluz 2019). Particularly, the inclusion of Hippotherapy (HT) in psychotherapy sessions appears to be successful to enhance the sense of self-efficacy and self-esteem (Cerino et al., 2011). Moreover, according to previous studies on patients with psychiatric and cognitive diagnoses, 10 sessions of AAI with a dog allow patients to regain self-control, decrease impulsivity and improve their quality of life (Cerino et al., 2011). Moreover, when AAIs are individualized and well adapted to patients, seem to induce the same positive effects on the physical parameters as a conventional PA (Cerino et al., 2011; Chen et al., 2022). In fact, the horses' movements can improve balance, muscular symmetry, coordination, and posture (Lechner et al., 2007), while dog's activities can increase coordination and conditional abilities such as strength, endurance, and speed of patients (Chen et al., 2022). According to our knowledge, few studies were conducted on patients with dual diagnosis (psychiatric and cognitive), and most of them with dogs: the results are still controversial. In order to improve the evidence on this topic, the aim of this study is to evaluate the effect of two well-structured AAIs, built up by combining the competence of sport science trainers and pet therapy operators, on apathy, psychological and functional parameters in patients with psychiatric and cognitive diagnoses.

1.1. Aim of the study

The present work aims to evaluate, through two case studies, the effect on apathy of two 4-month AAIs, one with the horse and one with the dog, in two patients with dual diagnoses (psychiatric and cognitive). The second objective is to evaluate the effects of these interventions, structured as a conventional physical activity protocol, on the physical efficiency of these patients.

2. Material and methods

2.1. Study design

The study was promoted by the University of Rome "Foro Italico" in collaboration with the therapeutic riding center and social farm "Il Giardino di Filippo – Agriland", and with the Casa di Cura Villa Rosa - Congregazione delle Suore Ospedaliere del Sacro Cuore di Gesù -Psychiatric Intensive Territorial Treatment Facility dependent on the ASL (National Public Service) of Viterbo. The study was designed and conducted following the Declaration of Helsinki and approved by the local bioethical committee of the University of Rome "Foro Italico" (Prot. N. CAR 162/2023). The multidisciplinary team was composed as follows: 1 animal assistant for the horse and 1 for the dog; 2 psychiatric rehabilitation technicians; 1 psychologist specialized in therapeutic horseback riding and 1 professional dog educator; 1 kinesiologist specialized in preventive and adapted PA, which integrated the AAIs with elements of exercise training.

2.2. Sampling methods

In April 2022, patients with dual diagnosis were recruited in Villa Rosa by a psychiatrist and a psychologist/psychotherapist according to the following inclusion criteria: older than 18 years of age, affected by both psychiatric disorders and mild Intellectual Disability, being resident in Villa Rosa. Exclusion criteria: severe cognitive impairment, allergies to animals, presence of symptoms of horse and dog-related phobia. 10 patients were enrolled and invited to spend a day at the center "Il Giardino di Filippo": among them, patients A and B proved to be potential "responders" to AAIs, showing a spontaneous interest in the proposed activities.

2.3. Patients' diagnosis

Patient A, 31 years old, male, height 172 cm, weight 67 kg, and BMI 22.6 kg/m^2 suffering from a psychotic disorder due to a genetic disease (i.e., DiGeorge syndrome). Concerning comorbidities, he presented with diabetes mellitus. At the beginning of the study, patient A carried out the following usual therapy: two first-generation antipsychotics, Haloperidol (7.5 mg/day) and Clotiapine (100mg/day) respectively and a second-generation antipsychotic, Clozapine (100 mg/day). He also took Gabapentin (900 mg/day), a mood stabilizer, and Clonazepam (6 mg/day), an anxiolytic (benzodiazepine). Finally, this patient is on 30 I.U./day of rapid insulin and 24 I.U./day of long-acting insulin. Patient A suffered from a cognitive deficit detected by an IQ of 57 points on Wechsler Adult Intelligence Scale (WAIS-r).

Patient B, 34 years old, height 193 cm, weight 100.1 kg and BMI 26.8 kg/m^2 was affected by schizoaffective disorder according to the DSM-5. This disturbance induces manifestations of both schizophrenia and mood disorders. Patient B carried out the following usual therapy: a first-generation antipsychotic, Haloperidol (3 mg/day), and a second-generation antipsychotic, Clozapine (250 mg/day). He also followed a therapy with Valproic Acid (1000 mg/day), a mood stabilizer, and Delorazepam (3 mg/day), an anxiolytic (benzodiazepine). The WAIS-r scale indicated a cognitive deficit in patient B with an IQ of 61 points.

At the onset of their psychiatric history, both patients also showed an intermittent explosive disorder (according to the Diagnostic and Statistical Manual of Mental Disorders – DSM-5, American Psychiatric Association). Both of them completed an 8-degree school level (compulsory schooling).

Dual diagnosis of psychiatric disorder and cognitive impairment was detected in both patients. Specifically, they suffered from mild Intellectual Disability (ID) which refers to a deficit in intellectual functions pertaining to abstract/theoretical thinking, ID is a neurodevelopmental disorder characterized by mental ability deficits, like problem-solving, reasoning, planning, abstract thinking, judgment, academic learning, and learning from experience (according to DSM-5, American Psychiatric Association).

Both patients can be partially independent despite the presence of cognitive impairment.

2.4. Assessments

Before (T0) and after (T1) 4 months of intervention, both patients underwent the following assessments.

2.5. Psychiatric, psycho-cognitive evaluation

Brief Psychiatric Rating Scale (BPRS), which evaluates psychiatric symptoms. Apathy Evaluation Scale (AES) to evaluate the apathetic state of patients.

Global Assessment Scale (GAF) evaluates changes in psychotic disorders and the psychosocial functioning of patients.

Health of The Nation Outcome Scales (HoNOS), analyze the quality of life-related to psychopathological, health, family, and social domains.

Mini Mental State Examination (MMSE), that assesses the neurocognitive and functional state. All questionnaires were administered by the psychologist, while BPRS by the psychiatrist.

2.6. Anthropometric assessment and body composition analysis

Body weight (kg) and Height (cm) were recorded for each patient. Body mass index (BMI) was calculated as body weight divided by height squared (kg/m^2).

Bioelectrical impedance analysis (BIA) was performed to assess body composition. Fat Free Mass (FFM), Fat Mass (FM), Basal Metabolic Rate

Phase	Description	Duration
Welcoming	Autobiographical narration and expectations	10 minutes
Warm-up	Introduction of pet, Greeting, Preparation of the context	10 minutes
Central Phase	Fieldwork with pet	30 minutes
Shared Time	Review of day's activity and diary writing	10 minutes
Closing Greeting		

Fig. 1. Structure of the session.

Patient A		
Content	**General topic**	**Functional goal**
PA in the woods with the herd of horses	Approach to the outdoor environment and first contact with the horse herd	Gait coordination, increasing the number of steps, aerobic activity
Hand walking	Management of the body with the horse	Posture exercises, human-animal coordination
Leading the horse on psychomotor trails	Human-animal management in coordinative trail	Balance capacity, kinesthetic differentiation ability, hand-eye coordination, spatial-temporal coordination, and lower limb strengthening
Psychomotor trails with closed eyes	Trust and safety between man and animal	Sensory-motor activities
Introduction to mounted	How to ride a horse	Core stability, proprioception exercises, upper limbs strengthening and balance

Fig. 2. Characteristics of horse assisted intervention.

(BMR), Body Cell Mass (BMC) were measured by Handy 3000 from DS Medica using the 50 kHz and 100 kHz frequencies.

2.7. Functional evaluation

Handgrip strength test (HST): to measure the muscle strength of both upper limbs using Jamar Plus® dynamometer (Patterson Medical Ltd., Sutton-In-Ashfield, UK). The trial was performed with both hands, alternately, three times, and the average score was taken into consideration.

Sit and Reach test: to evaluate the flexibility of the back and hamstrings muscles.

Patient B		
Content	**General topic**	**Functional goal**
Approach to the dog through PA	Approach to the outdoor environment and create a bond with the dog	Gait coordination, increasing the number of steps, aerobic activity, increasing running speed
Come here	Calling the dog when stationary and on the move	Agility, balance, coordination of movements
Golden Retriever		
Give me a paw	Human-animal coordination, cognitive skills	Coordination of movements and cognitive memory
Play with me	Throwing games and treasure hunt	Scapulohumeral and spinal mobilization, upper limbs strengthening, cognitive memory
Leading the dog on psychomotor trails	Management human-animal in coordinative courses	Posture exercises, human-animal coordination, spatial-temporal coordination, balance
Poodle		
Introduction to "Agility dog"	Human-animal coordination in different position: seated, supine, lateral decubitus, standing, quadrupedal	Core stability, balance, upper and lower limbs strengthening, stretching back chains, scapulohumeral and spinal mobilization

Fig. 3. Characteristics of dog assisted intervention.

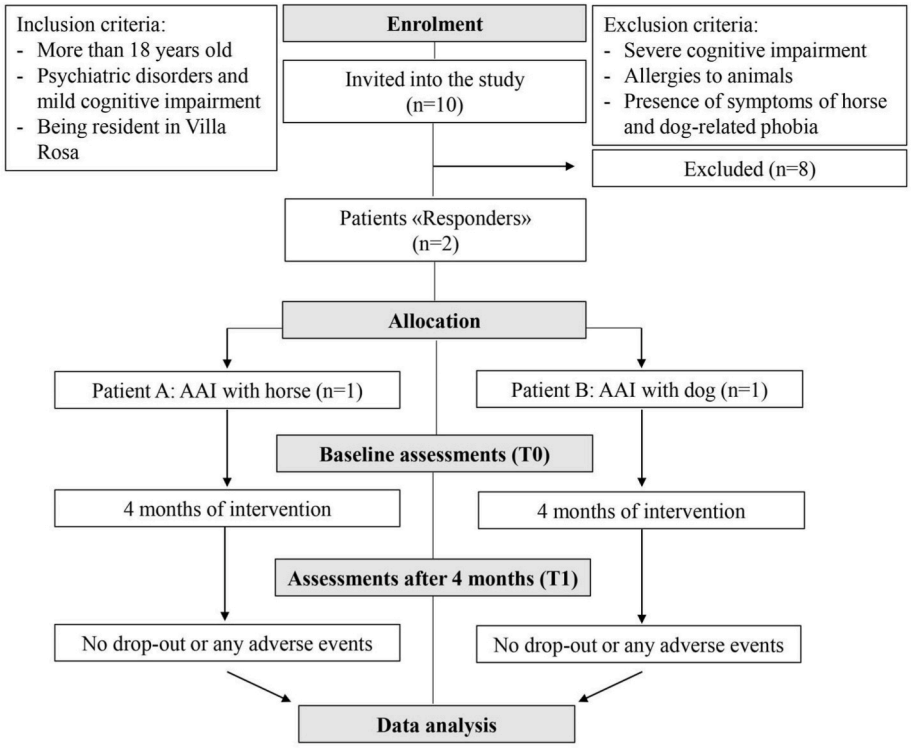

Fig. 4. Recruitment flow-chart.

Short Physical Performance Battery (SPPB): to assess the lower extremity functioning. The trial provides 3 tests assessing gait speed (4 m walking), lower limbs' power (5 times chair sit-to-stand), and balance (tandem test).

2.8. Intervention

Both AAI programs with horse and with dog lasted four months, once a week, for a total of 16 lessons of 60 minutes each. All sessions were supervised by the HT technician or

The professional dog educator and the kinesiologist. Each patient followed the same macro-subdivision of sessions (Fig. 1). During the first month, the activity was focused on building a relationship with the pet, and the exercise aimed to improve walking technique and posture typically impaired in psychiatric patients (Feldman et al., 2019).

Patient A worked with several horses according to the goals to be achieved as reported in Fig. 2. Hippotherapy included horse handling, grooming, and hand walking, until autonomous mounted work. Moreover, the exercises focused on strengthening the core muscles to achieve correct posture on horseback.

Patient B, during the first two months worked with a large breed dog, Golden Retriever, to perform eye-hand and spatial-temporal coordination exercises. For the following two months, he worked with a small Poodle to train strength and flexibility (Fig. 3).

Each exercise was proposed by AAIs technicians and the kinesiologist suggested specific adaptations to increase the functional capacity by stimulating patients' conditional and coordination skills. During the last phase of all sessions, patients talked about their activities and wrote a diary about the lesson and feelings of the day.

3. Results

Fig. 4 showed the recruitment flow chart. Pre- (T0) and post- (T1) intervention psychological and functional data were reported, and the differences were assessed through the percentage change using the initial data as a reference. This intervention involved only two patients, so it was not possible to generalize the results.

Table 1
Patient A and B psychiatric, psycho-cognitive assessment results.

Psychiatric and psycho-cognitive assessment	Patient	T0	T1	% Diff
AES	**A**	**63**	**50**	**−20.6**
	B	51	46	−9.8
BPRS	**A**	**66**	**39**	**−40.9**
	B	61	52	−14.8
GAF	**A**	**41.2**	**47.5**	**+15.2**
	B	51.2	55.0	+7.3
MMSE	**A**	**24**	**27**	**+12.5**
	B	27	28	+21.7
HoNOS	**A**	**19**	**15**	**−21.1**
	B	14	12	−14.3

Note: Patient A and B psychiatric, psycho-cognitive assessment before (T0) and after (T1) intervention; difference between T0 and T1 expressed in %.
Abbreviations: AES, Apathy Evaluation Scale; BPRS, Brief Psychiatric Rating Scale; HoNOS, Health of The Nation Outcome Scales; GAF, Global Assessment of Functioning Scale; MMSE, Mini Mental State Examination; Diff, difference.

3.1. Apathy, psychiatric and psycho-cognitive results

According to the results reported in Table 1, the data showed a decrease of the AES score at the end of the study in both patients: −20,6% in patient A and −9.8% in patient B. Both patients experienced a reduction in the psychiatric symptoms assessed with BPRS (patient A: −40.9%; patient B: −14.8%). The GAF scale increased by +7.3% in patient B and by +15.2% in patient A who started from a lower score at T0. In addition, the MMSE score increased in both patients (patient A = +12.5%; patient B = +21.7%). Lastly, the quality of life improved in both patients, the HoNOS showed a reduction in the disorder severity by −21.1% in patient A and −14.3% in patients B.

Table 2
Patient A and B Anthropometric and Functional assessments results.

Anthropometric Assessment	Patient	T0	T1	% Diff
Weight (kg)	**A**	**67.0**	**68.0**	**+1.5**
	B	100.1	98.0	−2.1
BMI (kg/m2)	**A**	**22.6**	**23.0**	**+1.8**
	B	26.8	26.3	−1.9
FFM (kg)	**A**	**52.6**	**56.2**	**+6.8**
	B	66.7	69.5	+4.2
FFM %	**A**	**78.5**	**82.6**	**+5.2**
	B	66.7	70.9	+6.3
FM (kg)	**A**	**14.4**	**11.8**	**−18.1**
	B	33.3	28.5	−14.4
FM %	**A**	**21.5**	**17.4**	**−19.1**
	B	33.3	29.1	−12.6
BMC (kg)	**A**	**22.6**	**24.5**	**+8.4**
	B	28.8	27.9	−3.1
BMC %	**A**	**33.7**	**36.0**	**+6.8**
	B	28.8	28.5	−1.0
BMR (kcal)	**A**	**1506**	**1584**	**+5.2**
	B	1810	1871	+3.4

Functional assessment			*T0*	*T1*	*% Diff*
SPPB	Tandem (s)	**A**	**10**	**10**	**0**
		B	10	10	0
	GS4m (s)	**A**	**5.5**	**2.1**	**−60.9**
		B	4.8	2.8	−41.7
	STS-5 (s)	**A**	**12,2**	**9.0**	**−26.1**
		B	23.5	17.2	−27.1
	Total Score	**A**	**9**	**12**	**+33.3**
		B	7	9	+28.5
	HG R (kg)	**A**	**37.6**	**36.7**	**−2.4**
		B	30.0	30.6	+2.0
	HG L (kg)	**A**	**34.3**	**36.6**	**+6.7**
		B	26.2	30.0	+14.5
					cm Diff
	Sit and Reach (cm)	**A**	**−7**	**0**	**+7**
		B	−32	−56	−24

Note: Patient A and B Anthropometric and Functional assessments before (T0) and after (T1) intervention; difference between T0 and T1 expressed in %.
Abbreviations: BMI, Body Mass Index; FFM, Fat Free Mass; FM, Fat Mass; BCM, Body Cell Mass; BMR, Basal Metabolic Rate; GS4m, Gate Speed 4 m; Diff, difference; m, meters; kg, kilograms; kcal, kilocalories; SPPB, Short Physical Performance Battery; GS4m, Gate Speed 4 m; STS5, 5 time sit-to-stand; HG, Handgrip; R, Right; L, Left; Diff, difference; s, seconds; m, meters; kg, kilograms; cm, centimeters.

3.2. Physical efficiency results

According to the anthropometric results (Table 2), after 4 months of intervention, body weight evidenced a trend to increase in patient A (+1.5%) and to decrease in patient B (−2.1%), as well as the BMI value (patient A = +1.8%; patient B = −1.9%). Patient A and B recorded an improvement in FFM% (patient A = +5.2%; patient B = +6.3%) and a decrease in FM% (patient A = −19.1%; patient B = −12.6%). Regarding BMC%, an increase by +6.8% was observed in patient A while a slight decrease was recorded in patient B (−1.0%). Both patients showed an increase of BMR (patient A = +5.2%; patient B = +3.4%).

3.3. Functional evaluations

As reported in Table 2 after the end of AAIs, the SPPB total score showed an increase in both patients (patient A = +33.3%; patient B = +28.6%). Specifically, the 4 m test showed a decrease in walking time (patient A: −60.9% and patent B: −41.7%), the 5 times sit-to stand test reported a better score in both patients (patient A = −26.1%; patient B = −27.1%), the tandem test did not report differences, because data showed the maximum score both before and after AAIs in patients. The results of Handgrip test in patient A evidenced an increased strength on left upper limb (+6.7%) and a slight decrease in right upper limb (−2.4%); while patient B increased the strength of both upper limbs (Right = +2.0%; Left = +14.5%). The Sit and Reach test recorded an improvement in back chain flexibility in patient A (+7cm) and a decreasing in patient B (−24cm).

4. Discussion

The results of this case study showed a positive trend of AAIs on decreasing apathy feelings in psychiatric patients with cognitive impairments, supporting the evidence that AAIs can improve patients' mood (Matuszek, 2010), through the empathy generated by the relationship with the animals, both horses and dogs, that can be explained by the increased release of oxytocin (Beetz et al., 2012). In line with the theory of self-determination (Deci and Ryan, 1985) the intervention proposed in this study was adapted to the physical and psychological daily needs of patients to stimulate their motivation without obligation or constraint. Furthermore, in patient A, a decrease in the BPRS value was noted, indicating a reduction in negative symptoms, as also confirmed by the decrease in the percentage value of apathy. This improvement can also be supported by the increase in the value of the Global Assessment of Functioning Scale (GAF), where the improve in the result is an indication of a decrease in the severity of the disorder. Even in patient B, improvements were noted in the various tests investigating the course of the psychiatric pathology, although less marked than those seen in patient A. This leads us to think that AAIs practiced with the help of the horse, or of the dog, could attenuate psychotic symptoms (Chen et al., 2021). Moreover, these positive trends are corroborated by the improvement in both patients' QoL as evidenced by HoNOS score after the AAIs. Regarding the cognitive disorders, after 4 months both patients reached a level of "normality" on the Mini Mental Statement Examination (MMSE), suggesting that AAIs could induce cognitive improvement, similar to conventional PA protocols (Girdler et al., 2019). Probably, the introduction of the kinesiologist into the multidisciplinary teamwork made it possible to adapt the AAIs activity as a conventional training program. The effectiveness of this synergetic process was evidenced by positive changes in clinical and physical fitness parameters of both patients. In fact, our results obtained from body composition analysis were in line with previous studies on PA in psychiatric patients (Rosenbaum et al., 2015). In particular, both patients improved FFM with a decrease of FM, suggesting that AAIs with horse and dog could be an alternative type of PA to counteract the overweight which is the main side effect of this condition (Casey, 2005). In line with Matuszek, 2010; Cerino et al., (2011), the results reported in our study of the Short Physical Performance Battery (SPPB) evidenced that the well-tailored AAIs proposed can improve conditional abilities, such as strength and speed as well as gait coordination and core stability (Fig. 5). According to the evaluation of the referred psychiatrist, after 4 months of AAIs, the patients reduced the daily assumption of drugs, especially the first-generation antipsychotics. In particular, these changes were slightly more evident in patient A which stopped the assumption of Haloperidol and Clotiapine and decreased the therapy with the anxiolytic Clonazepam, while patient B suspended the antipsychotic Haloperidol. Moreover, the intake of rapid insulin therapy was reduced in patient A at the end of the study.

5. Conclusion

Despite this is a case study and the observed effects cannot be generalized to a broader group of patients our preliminary results suggest that a well-structured, individualized, AAI, with a horse or with a dog, could be considered as a useful adjunctive therapy to the usual treatment programs to counteract apathy in psychiatric patients with mild cognitive impairment. Moreover, the multidisciplinary team that includes psychiatrists, psychologists, pet therapy operators, and kinesiologists seems to be able to create an intervention that induces improvement in several dimensions: psychiatric, psychological, cognitive, and physical.

Fig. 5. Patient's A posture before (A) and after (B) 4 months Horse Assisted Intervention program, Patient's B posture before (C) and after (D) 4 months Dog Assisted Intervention program.

Clinical relevance

Animal Assisted Interventions seem to be a valid program, feasible and free of adverse event. Both horse and dog activities should be integrated in the clinical practice due to the positive effects on apathy, functional parameters and in decreasing drugs related to the psychiatric condition of patients with mild cognitive impairment. This multidisciplinary approach could improve the global management of these patients.

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CRediT authorship contribution statement

Claudia Cerulli: Conceptualization, Project administration, Resources, Software, Supervision, Writing – original draft. **Arianna Murri:** Writing – original draft, Data curation, Methodology, Resources. **Elisa Grazioli:** Methodology, Software, Writing – review & editing. **Eliana Tranchita:** Supervision, Writing – original draft. **Francesca Tinè:** Data curation, Methodology. **Chiara De Santis Del Tavano:** Conceptualization, Supervision, Validation, Writing – review & editing. **Vittorio Digiacomantonio:** Conceptualization, Supervision, Writing – review & editing. **Marisa Nicolini:** Conceptualization, Writing – review & editing. **Attilio Parisi:** Conceptualization, Project administration, Validation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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