
The challenge of pet therapy in systemic sclerosis: evidence for an impact on pain, anxiety, neuroticism and social interaction

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ABSTRACT

Objective. The aim of our study was to evaluate the effect of animal-assisted intervention (AAI), a complementary support to traditional therapies focused on the interaction between animals and human beings, in improving psychological trait, anxiety and pain in a cohort of systemic sclerosis (SSc) patients.

Methods. 42 SSc patients, undergoing iloprost intravenous infusion, were divided in three groups: 1) 14 patients submitted to 20 AAI sessions; 2) 14 patients engaged in alternative social activity (control group 1 – C1); and 3) 14 patients without any alternative activity (control group 2 – C2). All patients underwent Visual Analogue Scale (VAS), the State-anxiety (STAI-S) and emotional faces at the beginning (s0) and at the end (s1) of each single session, while General Anxiety State-Trait Anxiety Inventory (STAI-T), Beck Depression Inventory (BDI), Social Interaction Anxiety Scale (SIAS), Eysenck Personality Questionnaire-Revised (EPQ-R), the Social Phobia Scale (SPS), the Toronto Alexithymia Scale (TAS-20), the Thought Control Questionnaire (TCQ) were administered at baseline (t0) and at the end of the project (t1).

Results. AAI group showed a significant decrease of the anxiety state level in respect to the two control groups ($p < 0.001$). VAS scale resulted lower both in AAI ($p < 0.001$) and C1 group ($p < 0.01$). Moreover, STAI-T and TAS scores were significantly reduced in AAI group ($p < 0.001$). TCQ scale showed that patients treated with AAI, compared to control group C2, had greater capacity to avoid unpleasant and unwanted thoughts ($p < 0.05$). In AAI group, the EPQ-R test revealed an enhancement of extroversion trait compared to both control groups ($p < 0.05$).

Conclusion. Our data show that AAI significantly reduces pain perception, anxiety, neuroticism and ameliorates patients' social interaction, therefore it may be a useful to allow a better compliance to traditional therapies.

Introduction

Pet therapy, defined as animal-assisted intervention (AAI), is based on the interaction between animals and human beings. Pet therapy is a tool which may complement and support traditional therapies and can be used on patients affected by different diseases, improving their quality of life from behavioural, physical and psychosocial point of view (1,2). During the activities with animals, AAI creates an empathetic relationship, which is generated by the comfort and sympathy induced by the animal on the patient. This is a key starting point for the communication with physicians and nurses. In fact, the animal works as an "ice breaker", helps the patient to lower his emotional barriers, encouraging him to face new therapies and new approaches to lifestyle changes.

The relationship with animals (frequently, dogs) promotes a substantial improvement of the psycho-physiological and social welfare of the patient. Patients suffering from chronic diseases, requiring continuous monitoring in a hospital environment, are those that have the biggest benefit from AAI. In the literature, several significant experiences are reported (2, 3), with special focus on paediatric (4, 5), geriatric (6-9), rehabilitation (10, 11), neurological or cardiologic (1, 12, 13) and psychiatric (14, 15) patients. Although there are many reports on this supportive care, a uniform and rigorous methodological approach, which allows to verify its scientific relevance, is still missing.

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Competing interests: none declared.

In rheumatology, AAI studies on patients with rheumatoid arthritis and osteoporosis showed some benefit in increasing pain threshold and cervical function, and reducing anxiety and stress (16). Systemic sclerosis (SSc) is a connective tissue disease which affects the microcirculation and the immune system, leading to tissue fibrosis of the skin and internal organs (17). The disease is characterised by a specific psychological profile, with a very poor quality of life, significantly reducing patients' workability (18) and compliance to therapy (19) and the effect of non-pharmacological approaches has been well described (20).

In the literature, no study on the effects of AAI on SSc are currently available. The aim of our study was to evaluate the effect of AAI in improving psychological trait, anxiety and pain in a cohort of SSc patients.

Patients and methods

Patients classified as SSc according to the 2013 ACR/EULAR criteria (21) attending the Scleroderma Unit of the Azienda Ospedaliera Universitaria Careggi (Firenze, Italy), were enrolled in the study. Fear or phobia of dogs, allergy to dog hair, respiratory insufficiency on oxygen therapy, allergic asthma, neutropenia, fibromyalgia and presence of complications from severe or infected digital skin ulcers were considered as exclusion criteria.

Patients undergoing weekly iloprost intravenous infusion were enrolled in the study after signature of the informed consent and divided in three groups (Table 1): the first group (AAI group) was submitted to 20 AAI weekly sessions (50 min) with a professional multidisciplinary team including a doctor, a nurse, and a couple of animal-handler. The second group (C1), considered as a control group, was involved in 20 weekly sessions of alternative recreational activity without dog (50 min), with the specific aim of creating a cooking recipes book. The third group, still used as control group (C2), received 20 weekly sessions of iloprost infusions only. All patients were informed about the project, and filled up an informed consent to the study. All the procedures were con-

Table I. Treatment arms according to the study design.

	AAI sessions AAI group	Alternative sessions C1	No activities C2
Frequency of sessions	once a week	once a week	once a week
Number of sessions	20	20	20
Duration of each session	50 minutes	50 minutes	0 minutes

ducted in accordance with the Helsinki Declaration: the study was approved by the local ethical committee. Iloprost was infused as previously reported (22).

Dogs were periodically washed, submitted to mandatory vaccinations and veterinary checks: routinely intestinal parasite treatments were required. Dogs (evaluated according to international criteria of the Delta Society) (23) had to show a friendly behaviour, to be calm, with a sweet temperament, attitudes and ability to couple. The animal-handler was evaluated and approved by the Associazione Italiana Utilizzo Cani D'Assistenza (AIUCA, association affiliated to Delta Society Pet Partners program) (23) and by a veterinary doctor from the health authorities.

Psychological, pain and cognitive assessment

All patients underwent psychological evaluation at the beginning (t0) and at the end of all sessions (t1) (long term evaluation). Psychological tests were employed to verify anxiety, depression, social behaviour, emotional regulation and cognitive control. Furthermore, pain perception, mood and level of satisfaction were also tested. The following tests, in the Italian standardised version, were used:

- the General Anxiety State-Trait Anxiety Inventory (24) (STAI-T) to assess of anxiety along the two distinct dimensions of "state" (S) and "trait" (T); state anxiety is defined as a temporary condition with unpleasant emotional arousal in face of threatening demands. Trait anxiety arises in response to a perceived threat, but it differs in its intensity, duration and the range of situations in which it occurs. Trait anxiety refers to the differences between people in terms of their tendency to experience state anxiety in response to the anticipation of a threat.
- the Beck Depression Inventory

(BDI-II) (25), was used to evaluate depression;

- the Social Interaction Anxiety Scale (26) (SIAS), which is sensitive to social behaviour and interactions;
- the Eysenck Personality Questionnaire-Revised (27) (EPQ-R), which gives insights into some aspects of personality traits. Scores were collected from its sub-scales: - psychoticism assesses behaviour patterns that characterise forms that might lead to psychoses; extraversion/introversion measures the extent to which individuals are sociable and active; - neuroticism measures the extent to which individuals are predisposed to experience negative emotion; and finally, - the lie subscale that reflects individuals' socially conforming behaviours.
- the Social Phobia Scale (28) (SPS), measures the levels of fear and anxiety during social interactions;
- the Toronto Alexithymia Scale (TAS-20) (29), to measure the recognition and regulation of emotions;
- the Thought Control Questionnaire (TCQ) (30), measures the effectiveness of strategies for controlling unwanted thoughts. The sub-tests were distraction, reappraisal, punishment, worry and social control.

Moreover, the evaluation of specific test was performed at the beginning (s0) and at the end (s1) of every session (short term evaluation).

- the Visual Analogic Scale (VAS) scales for the evaluation of pain, the emotional faces, reflecting mood and emotional distress;
- the State-anxiety (STAI-S) to measure the self-perceived anxiety at the moment of filling in the test (24);
- the emotional faces, reflecting mood and emotional distress.

Statistics

Comparisons between the two observations periods (s0-s1 and t0-t1) were

performed by repeated measures ANOVAs for the scores obtained at each test, with polynomial analysis of contrasts for trend assessment.

Different ANOVAs were carried out with the different groups (AAI, C1, C2) as between factor and the pre-post evaluations (s0 - s1 and t0 - t1) as within factor. In the results section only the effects of a significant interaction Groups by pre-post evaluation are reported, the values are reported in Table III. Post-hoc analyses were corrected with Bonferroni for multiple comparisons. When significant differences were observed between the groups in post-hoc analysis, a confirmatory non-parametric analysis with Wilcoxon signed-rank test was also performed. The significance level was set at $p < 0.05$. Data were analysed with SPSS 22.0.0.

Results

Forty-two SSc patients were enrolled in the study and divided in three groups (see Table II for clinical characterisation of the study population). The statistical results regarding the significant interactions between the intervention (pre-post evaluation) and the groups are reported in Table III.

Single sessions testing (s0-s1)

short-term effects

– Pain perception

In the AAI group, pain relief was observed at the end of each session ($p < 0.001$). No significant effects were observed in other groups (Fig. 1a). The perception of pain was significantly reduced in the post intervention testing in the AAI compared to the C2 control group ($p < 0.001$). The C2 group showed an enhanced pain perception before and after testing compared to the AAI and C1 groups ($p < 0.05$), (Fig. 1a).

Mood perception

Emotional faces were shown to the participants and a better mood and emotional feelings resulted significant in the AAI ($p < 0.001$) and in the C2 groups ($p < 0.05$) but not in the C1 group (Fig. 1b). In all groups, mood perception was better at the end of the session, with a more significant improvement

Table II. Clinical characterisation of the study population.

	AAI sessions AAI group (14 patients)	Alternative sessions C1 (14 patients)	Control group C2 (14 patients)
Male gender (n)	0/14	1/14	1/14
Age (mean $\pm$ SD)	60.4 $\pm$ 8.6	63.4 $\pm$ 5.3	62.3 $\pm$ 6.8
ANA positive (n)	13/14	14/14	12/14
Anti-Scl70 positive (n)	2/14	1/14	1/14
Anti-centromere positive (n)	12/14	13/14	13/14
Raynaud's Phenomenon (n)	14/14	14/14	14/14
Skin involvement (diffuse vs. limited) (n)	2 vs. 12/14	1 vs. 13/14	1 vs. 13/14
Digital pitting scars (n)	6/14	7/14	4/14
History of ulcers (n)	0/14	3/14	4/14
Calcinosis (n)	2/14	2/14	3/14
Gastrointestinal involvement (n)	9/14	7/14	7/14
Pulmonary fibrosis (n)	8/14	5/14	5/14
Pulmonary hypertension (n)	2/14	4/14	4/14
Renal impairment (n)	0/14	0/14	1/14
Heart involvement (n)	0/14	0/14	0/14
Joint involvement (n)	1/14	0/14	1/14
Muscle involvement (n)	0/14	0/14	0/14

Table III. Significant interactions Groups x Pre-Post.

Tests	F	d.f	p	η^2_p
s0 - s1				
VAS	9,65	2,39	$p = 0.003$	0,19
Emotional faces	9,54	2,39	$p < 0.001$	0,32
STAI-S	8,24	2,39	$p = 0.001$	0,31
t0 - t1				
STAI-T	9,8	2,39	$p < 0.001$	0,33
TAS	28,5	2,39	$p < 0.001$	0,59
SIAS	8,2	2,39	$p = 0.001$	0,34
BDI	3,4	2,39	$p < 0.05$	0,47
TCQ distraction	7,3	2,39	$p < 0.01$	0,33
TCQ worry	6,04	2,39	$p = 0.005$	0,24
EPQ extraversion	4,12	2,39	$v = 0.02$	0,17
EPQ neuroticism	7,12	2,39	$v = 0.002$	0,27

η^2_p : partial eta square: size effect.

d.f: degrees of freedom.

in the AAI group compared to C1 and C2 groups ($p < 0.001$).

State of anxiety

The results of the STAI-S (Fig. 1c) show that the AAI group was characterised by a significant amelioration with lesser state anxiety at the end of the session ($p < 0.001$). Moreover, in AAI the anxiety was reduced after the animal intervention compared to C1 and C2 groups ($p < 0.01$). No changes were detected in the other groups.

Whole Intervention testing

(t0-t1) long-term effects

– Emotional regulation and recognition

In the AAI group, the TAS scores were

significantly reduced at the end of the whole intervention ($p < 0.001$). The results were also significantly lower for the AAI compared to the scores obtained by control groups ($p_s < 0.001$).

Trait anxiety

Only in the AAI group the presence of the dog fostered a reduction of trait anxiety with minor scores at the STAI-T at the end of all sessions (Fig. 2b) ($p < 0.001$). Moreover, the AAI showed an overall reduced anxiety in the post evaluation compared to the C1 and C2 groups ($p < 0.001$).

Social behaviour

In the AAI group a significant reduc-

TESTING t0 - t1 (short term effects)

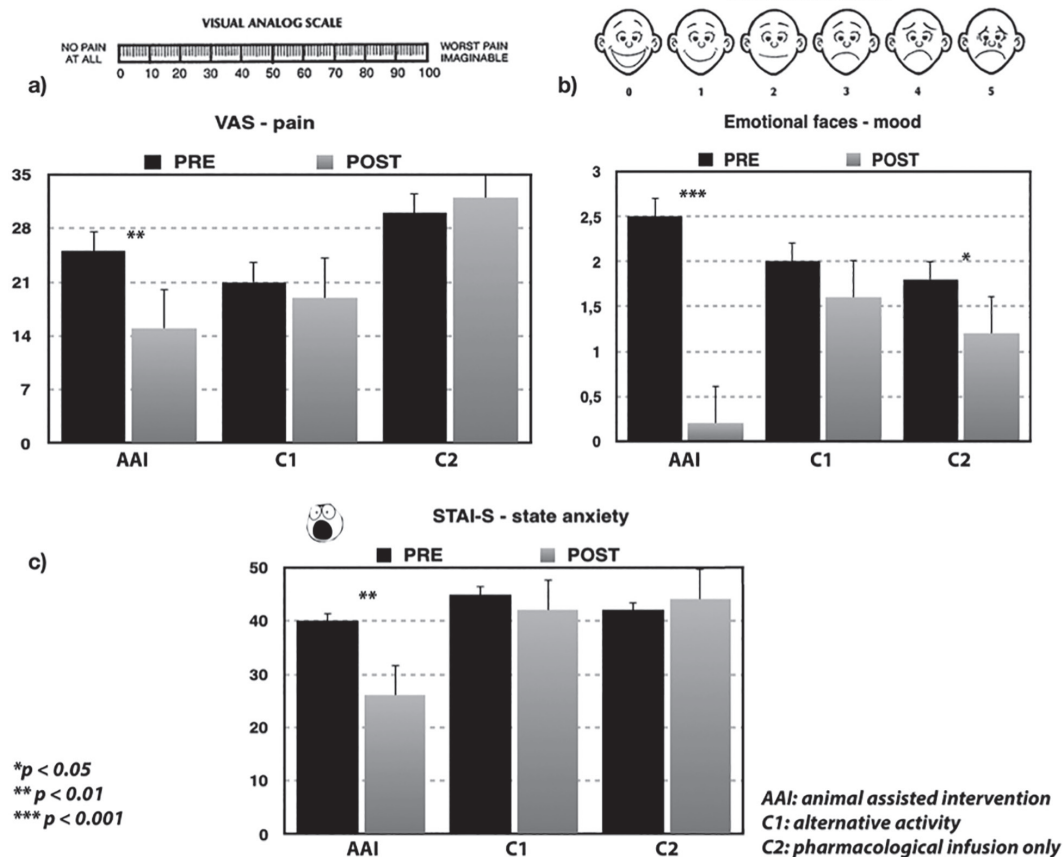


Fig. 1. The results of short terms evaluations (s0-s1) in the three groups are reported: **a)** pain perception scale; **b)** emotional faces; **c)** state anxiety test.

tion in the SIAS scores ($p < 0.001$), reflecting less anxiety to engage in social situations and greater interest to interact with others, was found. The post intervention in AAI was reduced compared to the scores of both the other control groups ($p < 0.01$). The C1 group showed an opposite pattern of result with an enhanced score at t1 compared to t0 ($p < 0.05$).

Depression tendency

The AAI group showed a reduction in the tendency to depression compared to C1 and C2 groups ($p < 0.05$), with only a trend to significance for the C1 group ($p = 0.06$).

Cognitive control

At the end of the AAI treatment in the cognitive domain, the evaluation of the TCQ brought to some insights into the ability to control unpleasant and unwanted thoughts. The results showed that the patients that underwent the AAI had greater capacity to use positive distraction strategies to avoid intrusive

and repetitive thinking. Regarding the issue of having disproportionate worries (Worry sub-scale), a better cognitive control was observed in patients in the AAI group compared to controls ($p < 0.01$). Furthermore, after the animal intervention, patients were more able to control and reduce the level of worries than the two control groups ($p < 0.05$) (Fig. 3a). The scores obtained at the TCQ-Distraction sub-scale, showed significant differences between t0 and t1 for the AAI and the C2 groups (Fig. 3b). Distraction is here considered a positive ability, which consists in a control strategy used to avoid intrusive thoughts. Higher scores of this scale indicate a higher thought control ability. The results for these groups were the opposite whereas the AAI showed more cognitive and thought control ($p < 0.001$), the C2 showed a reduction, in the thought control ability ($p < 0.01$).

Personality traits

The EPQ-R test showed some influences also on personality traits such

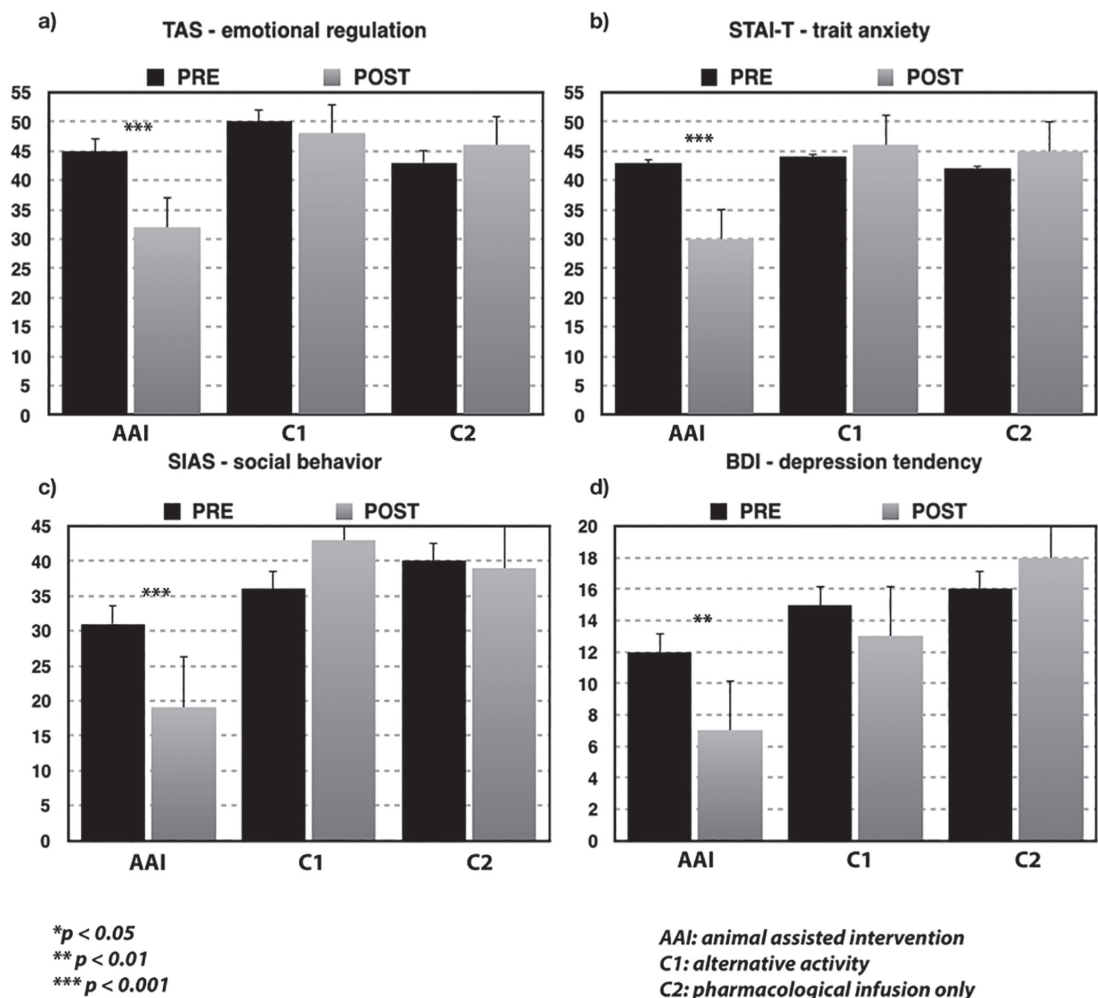
as neuroticism and extraversion/introversion. Regarding Neuroticism, after the AAI project the patients showed lesser neurotic traits ($p < 0.05$). At the end of the intervention, the AAI group showed less neuroticism than the C1 and C2 (Fig. 3c). On the Extraversion trait, a significant difference was detected after the intervention in the AAI group ($p < 0.01$), with an enhancement in the extraversion trait (Fig. 3d). No significant differences were found for the other groups. At the end of the project, patients in the AAI group reported higher score in the extraversion scale than patients in other groups ($p < 0.05$).

Discussion

Our data clearly show that in SSc patients AAI is of remarkable help in ameliorating psychological trait, and reducing anxiety and pain. The interaction with dogs led to a significant amelioration of pain perception and a better approach in the psychological domain like mood, depression, anxiety, emotional regulation, social interest and

Fig. 2. The results collected at t0 and t1 of **a)** alexithymia scale; **b)** trait anxiety test; **c)** social anxiety; **d)** depression, are shown.

TESTING t0 - t1 (long term effects)



behaviour, cognitive control and personality traits such as neuroticism and extraversion.

The bond between people and animals, has become the subject of scientific investigation only recently. In this perspective, our aim was to evaluate the efficacy of AAI in improving the quality of life and the compliance to standard pharmacological treatment in SSc patients. To the best of our knowledge, this is the first study exploring the effects of the human-animal interaction in patients who suffer from a chronic illness which has severe consequences on physical, affective, social and cognitive domains. In fact, SSc is characterised by high level of pain, fatigue, and impaired physical functioning (1, 2), thus affecting human relationships, cause functional problems, and alter patient's self-image, leading to body image dis-

satisfaction. These chronic relevant aspects (31) determine and foster depression, anxiety, sleep disruption, and problems with the body image, leading also to sexual dysfunction (32). These aspects have a dramatic impact on patient's quality of life.

Our data provide the evidence that AAI has a beneficial effect reducing pain, anxiety and social isolation, thus representing a support to traditional therapies. Our SSc patients were highly motivated and happy to participate to AAI and showed several positive effects compared to control groups. The data clearly show that, after meeting with the dog and experiencing the animal intervention, patient's mood was considerably better, while the state of anxiety and the reported chronic pain were reduced. Moreover, the AAI was able also to reduce the state anxiety and the trait

anxiety. This result may suggest that the time spent with the dog immediately before and during the sessions may also have a long-term effect by reducing the general level of stress in SSc patients. After 20 sessions, new insights into the affective world of our patients after the dog intervention were provided by the evidence of amelioration of the scores obtained at the TAS test. Interestingly, the AAI group showed an improved capacity to regulate their emotional experiences, to have access to one's own emotional states, to better understand the emotions of others and in general to gain more awareness regarding the emotional life. Another important result obtained was the amelioration of behaviour and increase in the interest in creating interactions and communication with other patients. This also led to start friendly relations with

TESTING t0 - t1 (long term effects)

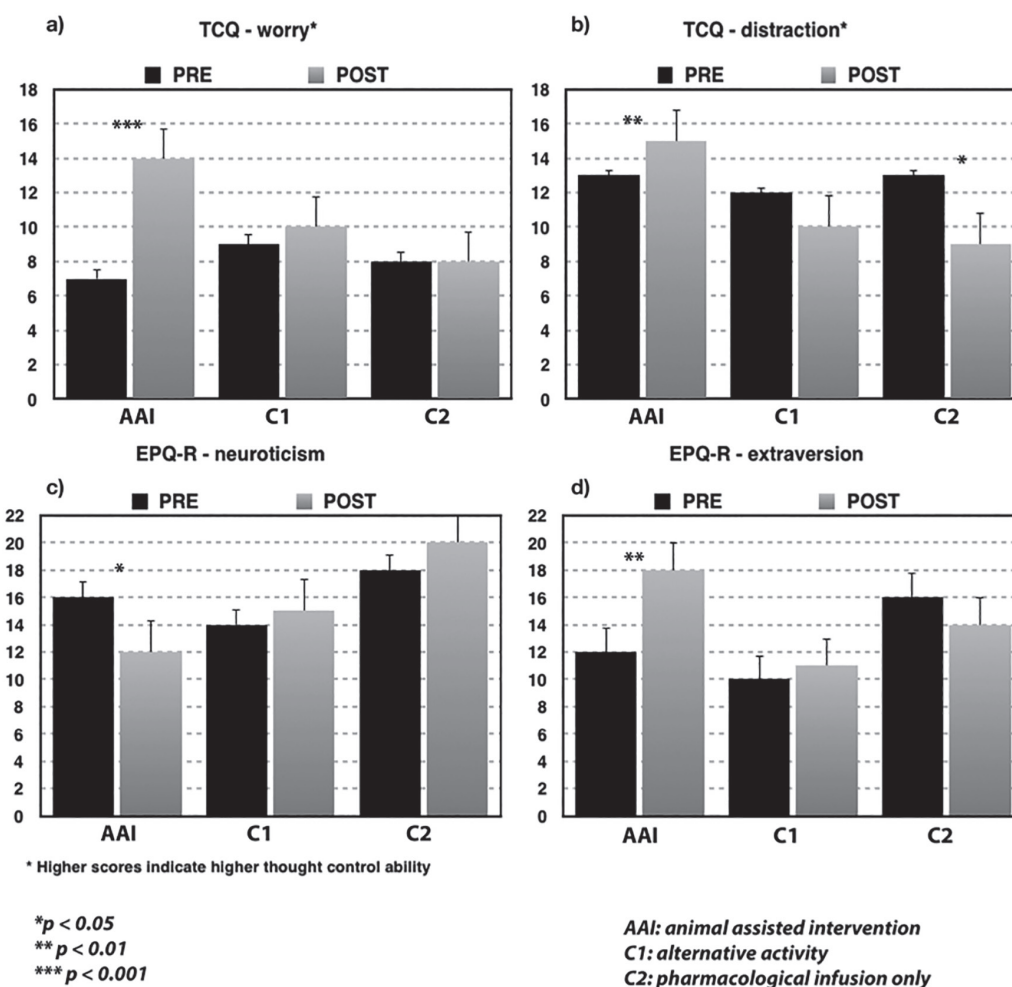


Fig. 3. The data collected at t0 and t1. For **a)** worry sub-scale of the TCQ; **b)** distraction sub-scale of the TCQ and scores obtained from the EPQ-R **c)** neuroticism and **d)** extraversion, are presented.

the dog-handler and the medical staff. In the control group, the alternative activity (writing a recipes cooking book) had also some effects but these were less significant than those obtained in the AAI group. Likely, the interaction with the dog during the therapy seems to be a remarkable affective and social component. In fact, the simple act of touching the dog resulted in a significant implementation of the social behaviour in the AAI group.

When evaluating some aspects of personality traits by the EPQ it was shown that at the end of all AAI sessions patients were more extraverted than those in the two control groups and presented less aspects of neuroticism. Finally, with TCQ we also examined some cognitive responses to distraction, worries, in general to unwanted thoughts and memories. Patients in the AAI group were more able to control unpleasant

and unwanted thoughts by using different cognitive strategies.

The present results show that AAI facilitates social interactions and communication, reducing anxiety and increasing pain thresholds, fostering new cognitive strategies to cope with stress and worries in SSc patients. Our work is in agreement with the data published in the literature, demonstrating that the AAI might be a useful tool to support traditional therapies. We selected a very difficult and challenging disease, like SSc, where the compliance of patients to treatment is usually low. In SSc, AAI creates, through an "alternative" way of communication, an environment and a relationship with the patient that allow to lower their emotional barriers and increasing the pain threshold.

During our study, the enthusiasm was clear, since the first meetings, both among the medical staff of the Sclero-

derma Unit and among the patients.

Our study has several limitations, including the small number of patients, the short time of intervention, and the lack of an alternative activity without dog that is standardised to represent a good control group. Moreover, the animal communication is based on multi-sensory mechanisms (visual, olfactory, tactile) that can change depending upon the time and the user.

Conclusions

Our data show that AAI significantly ameliorates anxiety, neuroticism and the patient's social life. This evidence may suggest that AAI can be used as a support activity, which can be a valuable tool to complement traditional therapies. Indeed, AAI may serve as an emotional bridge to mediate interactions in otherwise awkward and uncomfortable therapeutic contexts.

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