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ORIGINAL ARTICLE

Randomized controlled study on the effectiveness of animal-assisted therapy on depression, anxiety, and illness perception in institutionalized elderly

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Abstract

Aim: The aim of this study was to verify dog-assisted therapy's effectiveness on depression and anxiety in institutionalized elderly. Patients' illness perception was examined to identify core beliefs regarding mood, personal control, and illness coherence because they can affect treatment compliance. Subjective perception of pain, social interaction, and setting-bound observable variables were also studied.

Methods: This study involved a randomized sample of institutionalized patients 65 years of age and older; the treatment group had 17 subjects and the control group had 14 subjects. All patients were administered the Mini-Mental State Examination, 15-item Geriatric Depression Scale, Positive and Negative Affect Schedule, Generalized Anxiety Disorder 7, Illness Perception Questionnaire, and Numeric Pain Rating Scale. Intra- and inter-group data analysis was performed before and after treatment. Over the course of 10 weeks, patients participated in individual 30-min sessions. An observational methodology was developed to record verbal and non-verbal interactions between the elderly, the dog, and the dog handler.

Results: A large effect size and a statistically significant decrease in 15-item Geriatric Depression Scale scores were identified in the treatment group. No significant differences were detected in the Generalized Anxiety Disorder 7, Positive and Negative Affect Schedule, and Numeric Pain Rating Scale. However, the Positive and Negative Affect Schedule and the Numeric Pain Rating Scale showed a moderate decrease. The Illness Perception Questionnaire's timeline (acute/chronic) and treatment control subscales showed a clinically relevant, large effect size.

Conclusions: Dog-assisted therapy has proved to be effective in reducing symptoms of depression in institutionalized elderly. The increase in verbal interactions with the handlers throughout the study suggests the dog acts as a facilitator of social interaction, eliciting positive emotional responses. Dog-assisted therapy shows promising results in the perception of illness timeline and treatment control, indicating potential enhancement of the sense of treatment-related empowerment. However, further study is required.

Key words: *animal-assisted therapy, depression, dog, elderly, illness perception.*

INTRODUCTION

Major depression and clinically significant depressive symptoms represent a consistently corroborated clinical reality among elderly in long-term care as observed by Thakur and Blazer in a systematic literature review.[1] Nonetheless, such clinical conditions tend to go undetected because of co-morbidities such as cognitive functional impairment; multiple medical conditions, often coupled with physical pain, act as inter-related variables that increase functional impairment.[2]

Non-pharmacological interventions, such as music therapy, have proved to be effective complementary modalities in reducing depression and delaying the deterioration of cognitive functions.[3] In contrast, despite receiving increasing attention in the last few years as reflected in the research and international literature, dog-assisted therapy (DAT) for the elderly still shows mixed results with regard to be an effective treatment of depression and anxiety. However, DAT has been shown to improve social interactions in the patient population according to limited studies of insufficient methodological quality.[4,5]

It should be noted that promising data on the correlation between animal-assisted therapy (AAT) and physical well-being of patients have been observed, particularly in relation to cardiovascular disorders.[6] However, the literature has paid less attention to the study of DAT's effects on mood disorders and illness perception in institutionalized elderly populations, despite the biopsychosocial implications for patients in long-term care facilities.

Popularly referred to as 'pet therapy', this kind of clinical intervention has played an important role in strengthening the therapeutic alliance between patient and treater. It also activates cognitive circuits and communication channels, eliciting thoughts and memory patterns that tend to remain silent, unexplored, and inhibited.[7]

As observed by Moretti *et al.,*[8] the 'frequent co-occurrence of cognitive and mood disorders, psychotic and anxiety symptoms make elderly persons especially suitable for treatment based on affective and emotional motivations and psychological stimulations'.

A study by Stasi *et al*. regarding DAT showed that patients included in the treatment group had decreased depressive symptoms and blood pressure variables.[9] In a report by Kawamura *et al*.,[10] AAT correlated with improvements in mental and emotional functions, steadily increasing patients' emotional well-being. Conversely, Phelps *et al*. indicated that dog visits did not significantly improve depression scores, mood, or social interactions in their sample.[11]

Notably, in 2015, the Italian Ministry of Health determined that DAT is a clinical intervention directed at the 'treatment of disorders of neuro-psychomotor cognitive, emotional and relational spheres' and issued new norms and regulations for its implementation. DAT requires a medical prescription and is entirely patient-centred. According to the current legislation, DAT must be carried out in a manner consistent with evidence-based criteria and requires a clinically stringent treatment plan, a multidisciplinary team, quantifiable objectives, and verification of achieved results.[12]

The dog acts as a catalyst, facilitator, and motivator of social attention in the intervention. The intervention depends on the relationships forged among the patient, the clinician, the dog, and the dog handler. The latter has the fundamental task of identifying which dog is best suited to the patient based on morphological and behavioural characteristics. It is also the dog handler's job to determine the most suitable methods for the patient to interact with the dog, 'translating' both in an ethological and anthropomorphic way what the dog wants to communicate to the patient and vice versa.

In light of the mixed findings on DAT, this present study aimed to investigate its effects on mood, affect, and illness perception. The study was conducted in compliance with the substantial changes introduced by the Italian Ministry of Health on the implementation of AAT in clinical settings. Our main objectives were to identify whether the presence of the dog effectively elicited noteworthy changes in the psychopathological framework, to determine in which specific dimensions of depressive and anxiety disorders these changes occurred, and to assess patients' sense of empowerment and control over their perceived sense of illness and their spontaneous verbal and non-verbal communication.

METHODS

Study population

This study was conducted in a National Health Service-accredited long-term care facility for the elderly in northern Italy from March 2017 to September 2017. The study involved two fully randomized groups from this facility: a treatment group of 17 subjects and a control group of 14 subjects.

Patients were selected from the general patient population subject to the following inclusion criteria:

- Age: 65–90 years
- Institutionalized for at least 2 months

- A score of 5 or higher on the 15-item Geriatric Depression Scale (GDS-15)[13]
- A score of 19 or higher on the Mini-Mental State Examination[14]
- Willingness to interact with the dog and absence of animal allergies.

The main exclusion criterion was being unable to interact with the clinical team because of multisensory impairment. Locomotor disability was not an exclusion factor: single or double amputees were not excluded.

Existing records were examined by the facility's clinical team to identify which patients met the inclusion criteria. Fifty-three patients met the Mini-Mental State Examination threshold, and of these, 36 met the GDS-15 threshold. Three were excluded because they refused to participate in any type of activity or leave the unit, and two more were excluded because their clinical condition had severely deteriorated. This left 31 subjects to participate in the study.

Seventeen subjects were randomly assigned (by drawing their names written on pieces of paper from a bowl) to the treatment group, leaving 14 subjects in the control group. One member of the control group died during the study so that person's assessments were excluded.

There was no statistically significant difference in the ages of the participants in the treatment and control groups (median: 85 vs 88 years), and there was no statistically significant difference between the two groups on any of the pretreatment assessments.

Informed consent was obtained from the patients or their legal guardians according to Italian law. Patients' right to privacy was preserved, and patient anonymity was guaranteed so that none of the participants would be identifiable to third parties. The study was approved by the local ethical committee, and it conforms to the Declaration of Helsinki as revised in 2013. The CONSORT 2010 guidelines and checklist were followed.

The study started with a 4-hour training session on AAT for the clinical staff who participated in the research project; they were an integral part of the multidisciplinary team conducting the study. The staff were trained on the foundations of AAT according to the new Italian ministerial guidelines and on the experimental design of this study.

The study involved two professional dog handlers from a fully registered non-profit pet therapy organization, a veterinary surgeon, a clinical psychologist, and six dogs (five golden retrievers and one flat-coated retriever). The facility's team comprised a geriatrician, a professional nurse, a professional rehabilitation therapist, and a clinical supervisor.

Dogs were professionally trained and had passed certification aptitude tests for therapy dogs. All criteria in the Italian Ministry of Health's guidelines for animal-assisted interventions and animal welfare were satisfied.

Assessments

At baseline, assessment tests were administered to all the participants in the study before the DAT began. The same set of tests was administered to all the participants after they completed 10 weeks of treatments. Baseline results were compared with post-treatment results, and the results of the treatment group were compared with those of the control group.

To assess baseline depression, mood, affect, and illness perception, patients completed the GDS-15, Generalized Anxiety Disorder 7 (GAD-7),[15] Positive and Negative Affect Schedule (PANAS),[16] and Illness Perception Questionnaire-Revised (IPQ-R).[17]

They also filled out a Satisfaction Questionnaire and Numeric Pain Rating Scale (NPRS).[18] The NPRS asks respondents to rate their level of pain from 0 to 10, with 0 indicating no pain, 1–3 slight pain, 4–7 moderate pain, and 8–10 severe pain.

The battery of tests included the IPQ-R,[19] a quantitative measure of five components of illness representation according to Leventhal's self-regulatory model. The IPQ-R now also includes subscales assessing cyclical timeline perceptions, illness coherence, and emotional representations.

While illness perceptions have previously been found to correlate with mood,[20] functional adaptation,[21] and compliance to treatment,[2] the IPQ-R components show that 'beliefs in treatment and personal control and a sense of illness coherence [are] inversely related to pessimistic beliefs about the timeline and consequences of the illness as well as negative emotional representations'.[2] Pessimism may result from factors that interfere with therapy in the elderly patient population, leading to poor treatment adherence.

Our study investigated how DAT could impact the IPQ-R components and whether it represented a viable and effective form of treatment for the patients.

DAT

DAT sessions took place once a week for 10 weeks. Each patient in the treatment group participated in one 30-min session each week. Each DAT session involved one patient, one dog, one dog handler, and one observer (trained health volunteers from the civil service). Patients in the control group did not participate in these sessions nor did they participate in any particular substitute activity. Patients in both groups continued with their usual care, including pharmacological treatments and voluntary participation in social activities. The dog, dog handler, and observer rotated each week. The objective was to reduce the confounding effect of a specific dog, dog handler, or observer.

Social interaction focused on verbal and non-verbal cues towards the dog or the dog handler during the DAT. Verbal interaction with the dog was defined as the patient speaking with the dog or emitting sounds or vocalizations towards the dog. Non-verbal interaction with the dog was defined as the patient petting or stroking the dog or giving or throwing the dog a bit of food or a toy (e.g. a ball, rope). Verbal interaction with the dog handler was defined as the patient making a comment or posing a question to the dog handler. Non-verbal interaction was defined as the patient tapping, touching, or carrying out an act directed at the dog handler. At two-minute intervals, the observer would record an interaction as being in one of these four categories of interaction if one or more interactions of that type occurred. Then the total number of interactions during each DAT session in each category was calculated. The resulting figure is the percentage obtained by dividing the total number of interactions by the number of two-minute intervals in the session.

After sessions 3, 6 and 9, participants were asked to complete a short questionnaire about their emotional state using a 5-point Likert scale and their desire to see the dog in the next session of DAT.

Statistical analyses

Statistical analysis was performed using Real Statistics release 5.5 (http://www.real-statistics.com). Our principal investigation was to see whether there was a significant difference (based on *P*-value) and/or important difference (based on effect size) between GDS-15, PANAS, GAD-7, IPQ-R, and NPRS scores before and after the 10 weeks of DAT. Because some of the respondents gave a range of responses on the NPRS, this was analyzed separately. Also, because of the large number of IPQ-R subscales (eight), these were analyzed separately.

Hotelling's paired T-square test was used to determine whether there was a significant difference between the scores after DAT, and then multiple paired *t*-tests were performed using a Bonferroni correction factor as a follow-up. A significance level of $\alpha = 0.05$ was employed (subject to the Bonferroni experiment-wise error correction based on at most $5 + 1 + 8 = 14$ tests). Cohen's d_{av} (based on a pooled variance equal to the average of the pre- and post-treatment variances) was used to measure effect size. Cohen's d_z (based on the standard deviation of the differences between the pre- and post-treatment scores) was also reported. Because of the limitations in previous DAT studies, we were not able to evaluate the effect size based on previous studies. As such, we used the usual rough guidelines that $d = 0.20$ represents a small effect, 0.50 a medium-sized effect, and 0.80 a large effect. Confidence intervals of the effect size were calculated by using a noncentral *t* distribution approach. Statistical power analysis was performed based on the paired *t*-test.

Assessment scores between the treatment and control groups before DAT were compared to ensure that the separation of patients into the two groups was unbiased. No significant differences were found based on the independent sample versions of Hotelling's T-square test and *t*-tests.

The mean age of the treatment group participants was 82.6 years, and the median was 85 years. The mean age of the control group participants was 87.1 years, and the median was 88 years. This difference was not statistically significant based on the Mann–Whitney test (because the data were not normally distributed): $U = 70$, $P = 0.086$. Except for two men in the treatment group, all the participants were women.

The independent sample versions of Hotelling's T-square test and *t*-tests were also employed to determine whether there was a significant difference between the treatment and control groups regarding the change in the test scores over the treatment period. Cohen's effect size *d* for independent samples as well as effect size confidence intervals (again based on a noncentral *t* distribution approach) were also obtained.

Social interactions are represented in Figures 1-3.

RESULTS

Effectiveness of DAT in the treatment group

GDS-15, PANAS, and GAD-7

The paired sample Hotelling's T-square test showed that there was a significant difference between the scores before and after DAT in the treatment group. The differences occurred across six scales—one GDS-15 scale, one GAD-7 scale, and four PANAS scales ($T^2 = 95.55$, $F_{6,11} = 10.95$, $P = 0.0004$). The follow-up analysis demonstrated that the significant difference was attributable to the GDS-15 test (Table 1).

The scores on the GDS-15 test decreased by an average of 33.5% after DAT, indicating a significant decrease in depression ($t_{16} = 6.52$, $P = .000007$, $d_z = 1.58$, $d_{av} = 2.05$). Even with a Bonferroni correction that brought alpha down to 0.05/14 = 0.00357, this result was still highly significant. The decrease in GDS-15 score was very large, with an effect size much bigger than 0.80. It should be noted that for a sample of size 17, a paired *t*-test can detect an effect size of 0.85 (or higher) with power of 90% for $\alpha = 0.05$ (or an effect size of 1.2 with power of 90% for $\alpha = 0.00357$). This is sufficient for the GDS-15 result.

Of the 15 items on the GDS-15 scale, all but items 2, 5, and 9 improved in the treatment group. The percentage change in scores for all 15 items is shown in Table 2.

PANAS state negative affects showed a 21.3% improvement, a medium-sized effect ($d_z = 0.59$, $d_{av} = 0.65$), and $P = 0.026$, which, although smaller than $\alpha = 0.05$, is not significant after a Bonferroni or similar correction is taken into account.

Table 2 Changes by item on the 15-item Geriatric Depression Scale in the treatment group

	Pre-treatment	Post-treatment	% Change
Q1	0.471	0.294	37.5%
Q2	0.706	0.765	–8.3%
Q3	0.882	0.412	53.3%
Q4	0.882	0.412	53.3%
Q5	0.765	0.824	–7.7%
Q6	0.294	0.235	20.0%
Q7	0.588	0.353	40.0%
Q8	0.882	0.471	46.7%
Q9	0.412	0.471	–14.3%
Q10	0.294	0.176	40.0%
Q11	0.706	0.647	8.3%
Q12	0.882	0.529	40.0%
Q13	0.765	0.412	46.2%
Q14	0.765	0.353	53.8%
Q15	0.706	0.294	58.3%
Total	0.667	0.443	33.5%

All scores are the mean.

NPRS

All patients rated their pain on a scale of 0 to 10, with 10 representing the most severe pain. Three of the patients in the treatment group gave a range of pain values (5–8 or 0–5); the mean was used for these patients.

Pain levels went down by 11.4%, which was small and not significant ($P = 0.46$, $d = 0.18$). Because the

Table 1 Improvements in GDS-15, PANAS, and GAD-7 in the treatment group

	GDS-15	State PA	State NA	Trait PA	Trait NA	GAD-7
Sample size	17	17	17	17	17	17
Min increase	–8	–11	–15	–14	–11	–9
Max increase	0	17	7	9	9	8
% Increase	–33.5%	6.5%	–21.3%	–8.8%	–8.2%	–8.6%
Mean increase	–3.35	1.53	–3.76	–2.06	–2.12	–0.82
SD	2.12	6.62	6.35	5.67	6.11	4.81
P-value	0.00	0.36	0.03	0.15	0.17	0.49
Lower 95% CI	–4.44	–1.88	–7.03	–4.98	–5.26	–3.30
Upper 95% CI	–2.26	4.94	–0.50	0.86	1.03	1.65
Cohen's d_z	–1.58	0.23	–0.59	–0.36	–0.35	–0.17
Hedges' g_z	–1.51	0.22	–0.56	–0.35	–0.33	–0.16
Lower d_z	–2.29	–0.25	–1.10	–0.85	–0.83	–0.65
Upper d_z	–0.85	0.71	–0.07	0.13	0.15	0.31
Cohen's d_{av}	–2.05	0.19	–0.65	–0.30	–0.34	–0.17
Hedges' g_{av}	–1.95	0.18	–0.62	–0.28	–0.32	–0.16
Lower d_{av}	–2.97	–0.21	–1.20	–0.69	–0.81	–0.63
Upper d_{av}	–1.10	0.58	–0.07	0.11	0.15	0.30

All measurements reflect post-treatment scores minus pre-treatment scores. 95% CI is the 95% confidence interval of the mean increase. d_z is Cohen's effect size based on the standard deviation of score differences. d_{av} is Cohen's effect size based on the average of the standard deviations pre- and post-treatment. Hedges' *d* is a more unbiased statistic corresponding to Cohen's *d.* Tests are based on paired *t*-tests. GAD-7, Generalized Anxiety Disorder 7; GDS, 15-item Geriatric Depression Scale; PANAS, Positive and Negative Affect Schedule; NA, Negative Attributes; PA, Positive Attributes.

normality assumption was violated, the Wilcoxon signed-rank test was used instead of a paired *t*-test.

IPQ-R

The paired sample Hotelling's T-square test showed there was no significant difference between the scores on the eight subscales before and after therapy in the treatment group (T^2 = 17.65, $F_{8,9}$ = 1.24, P = 0.37). Based on this result, no follow-up was necessary, but it was performed anyway to get further information (Table 3).

The mean of subscale 4 decreased by 30.4%, a large effect size (d_z = 0.62, d_{av} = 0.88), but it was not significant when a Bonferroni correction was taken into account (P = 0.021).

Satisfaction

The patients in the treatment group were asked to rate their satisfaction with DAT on a scale of 1–5 after weeks 3, 6, and 9. The mean rating was 4.89, with all rating being 4 or 5.

Comparison between the treatment and control groups

Comparison before DAT

There was no significant difference between the treatment and control groups on any of the tests. A series of two-sample *t*-tests for 13 scales were performed as well as a Mann–Whitney test for the NPRS (because the normality assumption was violated). None of the *P*-values for these tests was less than 0.05. In fact, none was lower than 0.27, except for IPQ-R scale 2 (P = 0.069). These results gave us more confidence that patients were indeed randomly assigned to the treatment and control groups.

Comparisons of the changes in each scale

The two-sample Hotelling's T-square test showed there was no significant difference in the net scores between the treatment and control groups on the GDS-15, the GAD-7, and the four PANAS scales (T^2 = 16.51, $F_{6,23.4}$ = 2.22, P = 0.077). Based on this result, no follow-up was necessary, but it was performed anyway using multiple two-sample *t*-tests to get further information (Table 4). We also added NPRS to this table (using the Mann–Whitney test because the normality assumption was violated).

The GDS-15 result was significant and showed a large effect size (mean ± SD: –3.10 ± 2.18, $t_{22.8}$ = 3.73, P = 0.0011, d = 1.42, power = 95%). This demonstrated a high degree of confidence that the treatment group had a much greater improvement on the GDS-15 than the control group.

Similarly, the two-sample Hotelling's T-square test showed there was no significant difference in the net scores between the treatment and control groups on the eight scales of the IPQ-R test (T^2 = 14.13, $F_{6,25.1}$ = 1.29, P = 0.29).

Table 3 Improvement in the Illness Perception Questionnaire-Revised in the treatment group

	Scale 1	Scale 2	Scale 3	Scale 4	Scale 5	Scale 6	Scale 7	Scale 8
Sample size	17	17	17	17	17	17	17	17
Min increase	–7	–11	–7	–20	–11	–5	–14	–12
Max increase	7	8	7	9	11	8	9	4
% Increase	14.4%	–4.3%	–1.1%	–30.4%	9.5%	8.0%	–16.1%	–8.1%
Mean increase	0.76	–1.18	–0.24	–4.82	1.35	1.47	–1.76	–1.88
SD	3.63	3.91	4.01	7.75	6.04	4.19	5.23	4.40
P-value	0.40	0.23	0.81	0.02	0.37	0.17	0.18	0.10
Lower 95% CI	–1.10	–3.19	–2.30	–8.81	–1.75	–0.68	–4.45	–4.14
Upper 95% CI	2.63	0.83	1.83	–0.84	4.46	3.62	0.92	0.38
Cohen's d_z	0.21	–0.30	–0.06	–0.62	0.22	0.35	–0.34	–0.43
Hedges' g_z	0.20	–0.29	–0.06	–0.59	0.21	0.33	–0.32	–0.41
Lower d_z	–0.27	–0.78	–0.53	–1.14	–0.26	–0.14	–0.82	–0.92
Upper d_z	0.69	0.19	0.42	–0.09	0.70	0.84	0.16	0.08
Cohen's d_{av}	0.23	–0.29	–0.04	–0.88	0.34	0.31	–0.40	–0.31
Hedges' g_{av}	0.22	–0.27	–0.04	–0.84	0.33	0.29	–0.38	–0.29
Lower d_{av}	–0.30	–0.75	–0.35	–1.61	–0.40	–0.13	–0.97	–0.66
Upper d_{av}	0.76	0.18	0.28	–0.13	1.08	0.74	0.18	0.05

All measurements reflect post-treatment score minus pre-treatment score. 95% CI is the 95% confidence interval of the mean increase. d_z is Cohen's effect size based on the standard deviation of score differences. d_{av} is Cohen's effect size based on the average of the standard deviations pre- and post-treatment. Tests are based on paired *t*-tests.

Table 4 Comparison of GDS-15, PANAS, GAD7, and NPRS between treatment and control groups

	GDS-15	State PA	State NA	Trait PA	Trait NA	GAD-7	NPRS
% Increase treatment group	−33.5%	6.5%	−21.3%	−8.8%	−8.2%	−8.6%	−11.4%
% Increase control group	−3.2%	16.8%	−23.9%	1.8%	−14.9%	−18.4%	−5.0%
Size of treatment group (*n*)	17	17	17	17	17	17	17
Size of control group (*n*)	12	11	11	11	11	12	12
Treatment mean	−3.35	1.53	−3.76	−2.06	−2.12	−0.82	−0.26
Control mean	−0.25	1.36	−4.91	−1.55	−4.64	−2.25	−0.04
Mean difference	−3.10	0.17	1.14	−0.51	2.52	1.43	−0.22
Treatment SD	2.12	6.62	6.35	5.67	6.11	4.81	1.45
Control SD	2.26	6.47	9.65	6.36	7.58	4.20	1.74
Pooled SD	2.18	6.57	7.79	5.95	6.71	4.57	1.57
P-value	0.00	0.95	0.73	0.83	0.37	0.40	0.40
Lower mean difference	−4.79	−5.06	−5.05	−5.24	−2.82	−2.11	—
Upper mean difference	−1.42	5.39	7.34	4.22	7.86	4.96	—
Cohen's *d*	−1.42	0.03	0.15	−0.09	0.38	0.31	−0.14
Hedges' *g*	−1.38	0.02	0.14	−0.08	0.36	0.30	−0.14
Lower *d*	−2.24	−0.73	−0.61	−0.84	−0.39	−0.43	
Upper *d*	−0.58	0.78	0.91	0.67	1.14	1.05	

All measurements reflect change in treatment scores versus change in control scores. 95% confidence intervals for the mean difference and Cohen's *d* (two independent samples). Hedges' *d* is an unbiased statistic corresponding to Cohen's *d*. All tests are based on two independent sample *t*-tests, except the NPRS, which used the Mann–Whitney test. The effect size for NPRS is *r* = −0.16 (based on the Mann–Whitney test). GAD-7, Generalized Anxiety Disorder 7; GDS, 15-item Geriatric Depression Scale; NPRS, Numeric Pain Rating Scale; PANAS, Positive and Negative Affect Schedule; NA, Negative Attributes; PA, Positive Attributes.

Follow-up testing using multiple *t*-tests was performed to get further information (Table 5).

Although there were no significant differences between the treatment and control groups (based on a Bonferroni correction), the results for subscales 2 (timeline: acute/chronic) and 5 (treatment control) are interesting and worth further investigating. The scores for subscale 2 in the treatment group decreased, whereas those for the control group increased, with a difference of 3.54, $P = 0.05$ and $d = 0.84$, denoting a large effect. The scores for subscale 5 in the treatment group increased, but those for the control group decreased, with a difference of 4.17, $P = 0.07$ and $d = 0.73$, denoting a large effect.

Analysis: social interaction

Social interaction was measured by participants' verbal and non-verbal interactions with the dog and the dog handler during a DAT session. The highest level of participation was verbal with the handler (mean: 79.6%), followed by 68.0% for non-verbal with the

Table 5 Comparison of the Illness Perception Questionnaire-Revised between the treatment and control groups

	Scale 1	Scale 2	Scale 3	Scale 4	Scale 5	Scale 6	Scale 7	Scale 8
% Increase treatment group	14.4%	−4.3%	−1.1%	−30.4%	9.5%	8.0%	−16.1%	−8.1%
% Increase control group	2.3%	6.7%	−11.1%	−33.9%	−20.8%	9.3%	−14.4%	−14.9%
Size of treatment group (*n*)	17	17	17	17	17	17	17	17
Size of control group (*n*)	11	11	11	11	11	11	11	11
Treatment mean	0.76	−1.18	−0.24	−4.82	1.35	1.47	−1.76	−1.88
Control mean	0.18	2.36	−1.91	−6.27	−2.82	2.18	−2.45	−2.82
Mean difference	0.58	−3.54	1.67	1.45	4.17	−0.71	0.69	0.94
Treatment SD	3.63	3.91	4.01	7.75	6.04	4.19	5.23	4.40
Control SD	3.03	4.70	4.35	6.68	5.25	3.68	6.38	6.35
Pooled SD	3.41	4.23	4.14	7.36	5.75	4.00	5.70	5.24
P-value	0.65	0.05	0.32	0.60	0.07	0.64	0.77	0.68
Lower mean difference CI	−2.13	−6.90	−1.62	−4.40	−0.40	−3.89	−3.84	−3.23
Upper mean difference CI	3.30	−0.18	4.97	7.30	8.74	2.47	5.22	5.10
Cohen's *d*	0.17	−0.84	0.40	0.20	0.73	−0.18	0.12	0.18
Hedges *g*	0.17	−0.81	0.39	0.19	0.70	−0.17	0.12	0.17
Lower *d* CI	−0.59	−1.62	−0.37	−0.57	−0.06	−0.94	−0.64	−0.58
Upper *d* CI	0.93	−0.04	1.17	0.96	1.50	0.58	0.88	0.94

All measurements reflect change in treatment scores versus change in control scores. CI represents the 95% confidence intervals for the mean difference and Cohen's *d* (two independent samples). Hedges' *d* is an unbiased statistic corresponding to Cohen's *d*. Tests are based on two independent sample *t*-tests.

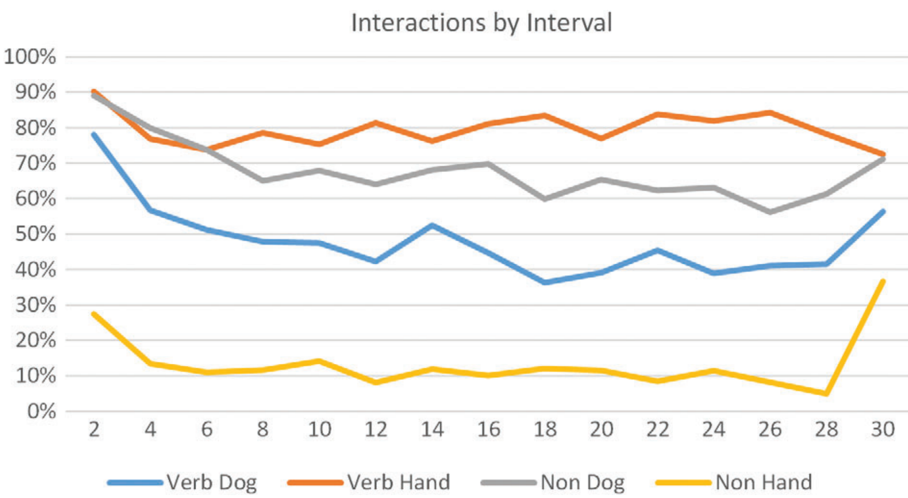

Figure 1 Interactions at 2-min intervals. Hand, dog handler; non-verb, non-verbal interactions; verb, verbal interactions.

dog, 48.1% verbal with the dog, and 13.4% for non-verbal with the handler (Fig. 1).

In general, participation levels were highest at the beginning of the session and, except for verbal interactions with the handler, rose again at the end of the session (Fig. 2).

Figure 3 shows how the percentage of interactions varied by week. In general, these increased for verbal interactions with the handler and decreased for the other three categories. The frequency of interactions showed little variation with each dog or handler, although many of the participants did favour one dog over another.

DISCUSSION

The purpose of our study was to assess the effectiveness of DAT in reducing depression and anxiety

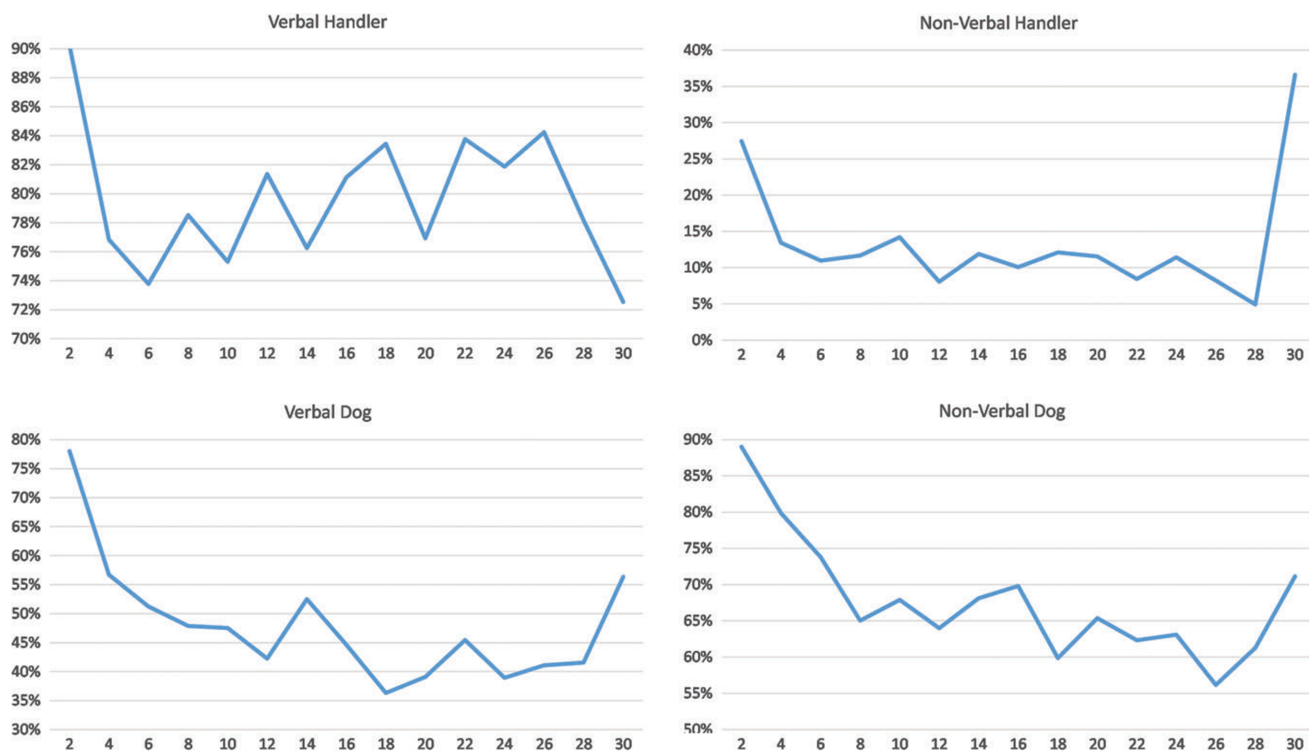

Figure 2 Interactions at 2-min intervals by category. In each of the four categories, there is a reduction in interaction, often with a slight rise in the last 2 min.

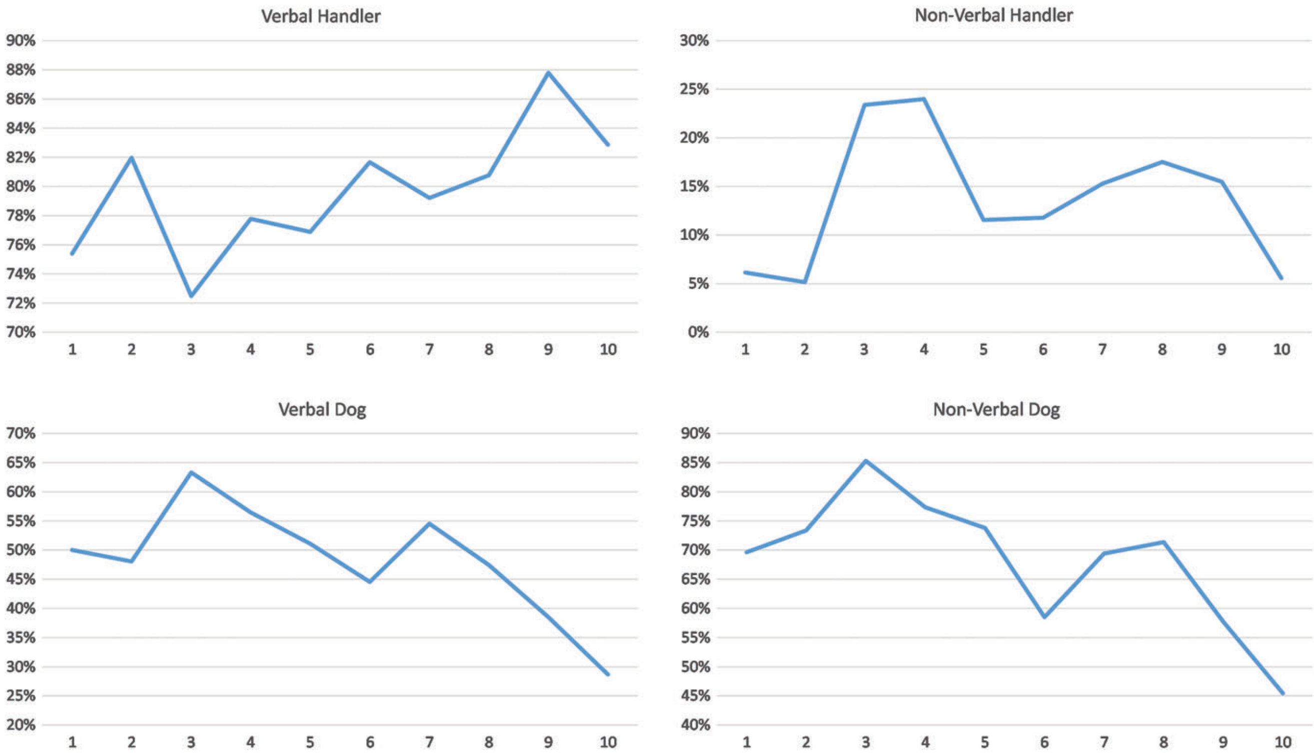

Figure 3 Interactions each week by category. Note that verbal communication with the handler trends up while communication with the dog trends down.

and to investigate the impact of such a therapeutic approach on affect and illness perception through a randomized controlled study. Our findings corroborate the notion that animals help patients shift the focus off their symptoms of distress and, through interactions with the animal, elicit a sense of serenity and tranquillity, positively affecting their mood and thereby enhancing social interaction.[22]

The participants in this study had an increasing willingness to engage in DAT as well as positive emotional responses towards their encounters with the dogs, as overwhelmingly reported in the satisfaction questionnaires. These responses are indicative of the achievement of a major indirect objective: a consistent level of participation and engagement. DAT seemed to counteract signs of social withdrawal and the lack of motivation often observed in depressed institutionalized elderly.[23]

Based on a significant and very large decline in GDS-15 scores after treatment, our results demonstrate the effectiveness of DAT in reducing depressive symptoms. Although changes in anxiety and positive and negative affect were not significant, they should be investigated further to explore possible correlations between the elicitation and unearthing of emotional and memory patterns, which may remain dormant and unexplored,[7] and the multidimensional compounded construct between alexithymia, anxiety, and ageing.[24]

The large effect size on subscales 2 and 5 of the IPQ-R suggests a considerable shift in the perception of treatment effectiveness. This shift may be generalizable with regard to further treatment adherence and a stronger sense of empowerment over the future of one's disorder, which deserves further investigation. The reduction in the perception of physical pain, although not sizeable, also merits further study in light of the correlation between pain and depression in institutionalized elderly.[2]

There are some potential limitations to the generalizability of these findings. The samples were selected from a single long-term nursing care facility. However, the facility is a National Health Service-accredited clinical institution; unlike in privately run facilities, its patients come from a wide sociodemographic and clinical population, suggesting that the findings have broad relevance. Additionally, the Mini-Mental State Examination cut-off score was 19, which means subjects with severe cognitive deterioration in comorbidity with depression were excluded. Further study is therefore recommended.

The approach used in this study emphasized patients' active participation in the therapeutic process. The synergetic relationship among the clinical team promoted cohesiveness and helped facilitate patients' spontaneous behaviour that emerged during therapy. For example, one patient had a strong passion for photography and was granted permission by the facility to take pictures of the dogs; this became a pivotal aspect of participants' sense of belonging that occurred spontaneously over time and promoted interactions within the treatment group.

Psychotherapeutic treatment for institutionalized elderly should aim to help patients gain a sense of time and space continuity, as well as identity coherence, after the 'rupture' from the individual's ordinary reality. The institution can and should represent a haven where multiple clinical and relational aspects of a patient's life are taken into account and addressed. This can help to promote a sense of psychological well-being, as can interventions that stimulate patient interactions and bonds, which may be fostered by the quiet, sensitive, and thought-provoking presence of a dog.

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REFERENCES

1 Thakur M, Blazer DG. Depression in long-term care. *J Am Med Dir Assoc* 2008; **9**: 82–87.
2 Mossey JM, Gallagher RM, Tirumalasetti F. The effects of pain and depression on physical functioning in elderly residents of a continuing care retirement community. *Pain Med* 2008; **1**: 340–350.
3 Chu H, Yang CY, Lin Y *et al*. The impact of group music therapy on depression and cognition in elderly persons with dementia: a randomized controlled study. *Biol Res Nurs* 2014; **16**: 209–217.
4 Banks M, Banks W. The effects of animal-assisted therapy on loneliness in an elderly population in long-term care facilities. *J Gerontol* 2002; **57**: 428–432.
5 Cherniack E, Cherniack A. The benefits of pets and animal-assisted therapy to the health of older individuals. *Curr Gerontol Geriatr Res* 2014: 623203.
6 Cole KM, Gawlinski A, Steers N, Koylerman J. Animal-assisted therapy in patients hospitalized with heart failure. *Am J Crit Care* 2007; **16**: 575–585.
7 Maiorani C, Cesa-Bianchi G, Crostini C. Un'esperienza di "Dog assisted therapy" in RSA. *J Gerontol Geriatr* 2012; **60**: 51–55.
8 Moretti F, De Ronchi D, Bernabei V *et al*. Pet therapy in elderly patients with mental illness. *Psychogeriatrics* 2011; **11**: 125–129.
9 Stasi M, Amati D, Costa C *et al*. Pet therapy: a trial for institutionalized frail elderly patients. *Arch Gerontol Geriatr* 2004; **38**: 407–412.
10 Kawamura N, Niiyama M, Niiyama H. Long term evaluation of animal-assisted therapy for institutionalized elderly people: a preliminary result. *Psychogeriatrics* 2007; **7**: 8–13.
11 Phelps K, Miltenberger G *et al*. An investigation of the effects of dog visits on depression, mood, and social interaction in elderly individuals living in a nursing home. *Behav Interventions* 2008; **23**: 181–200.
12 Regine Lombardia. Bollettino Ufficiale Serie Ordinaria n.16, 2016, Interventi Assistiti con gli Animali (I.A.A.). *Linee Guida Nazionali*. D.g.r. 2016-nX/5059: 154.
13 Sheikh JA, Yesavage JA. Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. In: Brink TL, ed. *Clinical Gerontology: A Guide to Assessment and Intervention*. New York: Haworth Press, 1986.
14 Folstein MF, Folstein SE, McHugh PR. 'Mini Mental State'. A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res* 1975; **12**: 189–198.
15 Spitzer RL, Kroenke K, Williams JB *et al*. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med* 2006; **166**: 1092–1097.
16 Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: the PANAS scales. *J Pers Soc Psychol* 1988; **54**: 1063–1070.
17 Moss-Morris R, Weinman J, Petrie K, Horne R, Cameron DL, Buick D. The Revised Illness Perception Questionnaire (IPQ-R). *Psychol Health* 2002; **17**: 1–16.
18 Williamson A, Hoggart B. A review of three commonly used pain rating scales. *J Clin Nurs* 2005; **14**: 798–804.
19 Fortune DG, Richards HL, Main CJ, Griffiths CE. Pathological worrying, illness perception and disease severity in patients with psoriasis. *Br J Health Psychol* 2000; **5**: 71–82.
20 Scharloo M, Kaptein AA, Weinman JA, Willems LN, Rooijmans HG. Physical and psychological correlates of functioning in patients with chronic obstructive pulmonary disease. *J Asthma* 2000; **37**: 17–29.
21 Weinman J, Petrie KJ, Sharpe N, Walker S. Causal attribution in patients and spouses following first time myocardial infarction and subsequent lifestyle changes. *Br J Health Psychol* 2000; **5**: 263–273.
22 Creagan E. Pet prescription: not just puppy love. *J Active Aging* 2003; **2**: 46.
23 Cornwell EY, Waite LJ. Social disconnectedness, perceived isolation and health among older adults. *J Health Soc Behav* 2009; **50**: 31–48.
24 Onor ML, Trevisiol M, Spano M, Aguglia E, Paradiso S. Alexthymia and ageing. *J Nerv Ment Dis* 2010; **198**: 891–895.

