Animal-Assisted Therapy and Agitation and Depression in Nursing Home Residents with Dementia: A Matched Case–Control Trial

Tomislav Majić, M.D., Hans Gutzmann, M.D., Andreas Heinz, M.D., Undine E. Lang, M.D., Michael A. Rapp, M.D., Ph.D.

Objectives: *To investigate the efficacy of animal-assisted therapy (AAT) on symptoms of agitation/aggression and depression in nursing home residents with dementia in a randomized controlled trial. Previous studies have indicated that AAT has beneficial effects on neuropsychiatric symptoms in various psychiatric disorders but few studies have investigated the efficacy of AAT in patients suffering from dementia.* **Methods:** *Of 65 nursing home residents with dementia (mean [standard deviation] age: 81.8 [9.2] years; mean Mini–Mental State Examination score: 7.1 [0.7]), 27 matched pairs (N = 54) were randomly assigned to either treatment as usual or treatment as usual combined with AAT, administered over 10 weekly sessions. Blinded raters assessed cognitive impairment with the Mini–Mental State Examination, presence of agitation/aggression with the Cohen-Mansfield Agitation Inventory, and depression with the Dementia Mood Assessment Scale at baseline and during a period of 4 weeks after AAT intervention.* **Results:** *In the control group, symptoms of agitation/aggression and depression significantly increased over 10 weeks; in the intervention group, patients receiving combined treatment displayed constant frequency and severity of symptoms of agitation/aggression ($F_{1,48} = 6.43$; $p < 0.05$) and depression ($F_{1,48} = 26.54$; $p < 0.001$). Symptom amelioration did not occur in either group.* **Conclusions:** *AAT is a promising option for the treatment of agitation/aggression and depression in patients with dementia. Our results suggest that AAT may delay progression of neuropsychiatric symptoms in demented nursing home residents. Further research is needed to determine its long-time effects.* (Am J Geriatr Psychiatry 2013; 21:1052–1059)

Key Words: AAT, Alzheimer disease, agitation, animal-assisted therapy, BPSD, depression, dog-assisted therapy, nursing home

Received August 6, 2012; revised March 3, 2013; accepted March 5, 2013. From the Clinic for Psychiatry and Psychotherapy (TM, MAR), Charité University Medicine, Campus Mitte, Hospital St. Hedwig, Berlin, Germany; Clinic for Psychiatry and Psychotherapy (HG), Hospital Hedwigshöhe, Berlin, Germany; Department of Psychiatry (AH, MAR), Charité Campus Mitte, Berlin, Germany; Department of Psychiatry (UEL), Psychiatric University Clinics, Basel, Switzerland; and Social and Preventive Medicine (MAR), University of Potsdam, Potsdam, Germany. Send correspondence and reprint requests to Michael A. Rapp, M.D., Ph.D., Social and Preventive Medicine, University of Potsdam, Am Neuen Palais 10, 14469 Potsdam, Germany. e-mail: michael.rapp@uni-potsdam.de

http://dx.doi.org/10.1016/j.jagp.2013.03.004

Nonpharmacologic strategies have been suggested as an option before psychotropic agents for the treatment of behavioral and psychological symptoms of dementia (BPSD).[1] BPSD are among the most common indications for psychiatric treatment of patients suffering from dementia.[2] Agitation/aggression are the most common BPSD[3] and are associated with frequent hospitalization and decreased quality of life for both patients and caregivers.[4,5] Decreased job satisfaction, increased professional burden, and increased risk for burnout[6] have been observed in caregivers treating agitated/aggressive patients. Aggression/agitation result in increased prescription of antipsychotic drugs,[7] which are associated with severe adverse effects and increased mortality in the elderly.[8] Prevalence rates of 30% to 50% have been reported for depression in dementia at all stages of cognitive decline.[9] In contrast to agitation, depression often remains unrecognized[10] because it presents differently compared with younger patients not suffering from dementia[11] and because patients with more severe cognitive impairment are sometimes unable to express distress adequately.[9] Untreated depressive symptoms accelerate the course of the disease in dementia,[12] and depression is associated with mortality in the elderly.[13] It has been suggested that psychosocial interventions in combination with antidepressants are more effective than antidepressive medication alone,[14] and a recent meta-analysis indicated that antidepressant medication in dementia has limited efficacy.[15]

Several nonpharmacologic options, including physical activities,[16] sensory-based interventions such as Snoezelen,[17] and music or hand massage,[18,19] have been shown to be effective for the treatment of BPSD.[20] Most nonpharmacologic interventions are based on the idea that, despite cognitive decline, emotional and relational experience is preserved to some degree even in advanced dementia and can be used for therapies aiming at increasing quality of life.[21] At the same time, loneliness is a risk factor for dementia[22] and is associated with depression and suicide attempts in these patients.[23] Because humans and pet dogs respond to quiet interaction with a lowering of blood pressure and an increase of neurochemicals linked to relaxation and bonding,[24] animal-assisted therapy (AAT) has been suggested as a promising method for treating BPSD. However, to date, research on AAT in dementia is limited.[24] Promising results have been observed by previous authors examining the effect of AAT in dementia sufferers with anxiety or agitation,[25–28] on social behavior in dementia,[25,29] and in elderly people with schizophrenia.[30] Moreover, we found dog-assisted interventions ameliorated anxiety in hospitalized patients with episodes of major depression.[31] Previous studies in patients with dementia differ regarding the setting (outpatients[26] versus nursing home residents[28] or psychiatric inpatients[27]), and frequency and duration (resident dogs[32] versus visiting dogs[28]) of the intervention. Most of the studies investigated the short-term effects of AAT on dementia.

In the current study, we compared treatment as usual (TAU) versus TAU plus AAT for nursing home residents who had moderate to severe dementia. The study included blinded assessments of cognitive status and presence of the symptoms subsumed to the terms of agitation/aggression and depression. Assessments were conducted at baseline and after discontinuation of therapy. The primary study hypothesis was that patients receiving TAU plus AAT would experience better outcomes, especially regarding the presence of symptoms of agitation/aggression and depression compared with patients receiving TAU only.

METHODS

Study Design and Subjects

This study is a substudy of a prospective cluster-cohort guideline implementation study in Berlin, Germany (Leuchtturm Projekt VIDEANT, funded by the German Ministry of Health, BMG, LT 44-076). Recruited from 18 nursing homes, all 75 patients met the following criteria: 1) had a sum score on the Mini–Mental State Examination (MMSE)[33] <25; 2) fulfilled criteria for dementia of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*;[34] 3) duration of cognitive impairment was <6 months; and 4) they had clinically significant cognitive impairment. Exclusion criteria were delirium or other relevant Axis I diagnoses such as schizophrenia or bipolar disorder, or terminal somatic illness as defined by clinical examination and history taking. The presence of agitation/aggression or

depression at baseline was neither an obligatory criterion for inclusion nor an exclusion criterion for our study. All included patients had resided in their nursing home for at least 4 weeks. All stages of clinically relevant cognitive decline were included. In most of the subjects, no specific dementia diagnosis was available.

For the AAT intervention study, a matched case–control design with within-participant repeated measures was used to examine the effects of AAT. Seventy-five residents were recruited in eight nursing homes. AAT was implemented in 2 nursing homes, including a total of 35 residents. Forty subjects from six nursing homes were assigned to the control group. Before the end of the intervention, 10 subjects (5 in the intervention group and 5 in the control group) dropped out because of moving to another place, death, or hospitalization. Thus, the remaining sample consisted of 65 residents (30 in the intervention group and 35 in the control group); 47 (72.31%) were women and 18 (27.7%) were men. The mean age of the sample was 82 years, with a range of 57 to 101 years. The mean MMSE score was 7.94, indicating a high percentage of residents with severe dementia. Patients from the two groups were matched for age and scores on the MMSE[33] and the Cohen-Mansfield Agitation Inventory (CMAI).[3] The intervention group received TAU plus AAT, whereas the control group received TAU only. After inclusion, the two groups were pair-matched with the pretest total score of CMAI as the matching variable. After matching, 54 patients remained, with 27 matched pairs. Eleven patients were excluded because they did not fit into the matching.

Written informed consent was obtained from patients and caregivers holding power of attorney. Our study was approved by the ethics committee of Charité–University Medicine Berlin (Germany) and conducted in accordance with the Declaration of Helsinki and the Good Clinical Practice Guideline.

Assessment of Cognitive and Noncognitive Symptoms

Clinical and demographic data were assessed by specifically trained raters, including medical students with an advanced academic degree and physicians experienced in geriatric psychiatry, who interviewed both the patients and their professional caregivers (consisting of the nursing home staff members). The observation period for each patient was 14 days for all instruments. The stage of cognitive impairment was assessed with the MMSE.[33] MMSE scores were classified as follows: 19 to 24 points, mild dementia; 10 to 18 points, moderate dementia; and 0 to 9 points, severe and very severe dementia. Agitation symptoms were assessed by the standardized 29-item version of the CMAI,[3] which consists of 29 items, each rated on a 7-point scale of frequency (1 = never; 7 = several times an hour). The CMAI is a broadly used instrument for the assessment of dementia-related symptoms of agitation. Since its publication, several studies have reported that the scale has sufficient construct validity and psychometric properties.[3,36] Depressive symptoms were estimated by using the Dementia Mood Assessment Scale (DMAS),[35] an instrument specifically developed for the assessment of depressive symptoms in subjects with dementia. The DMAS assesses 24 depressive symptoms, and the frequency of each symptom is rated on a 7-point scale (0 = normal; 6 = severely impaired). Using the available literature,[35,37] we defined the presence of a depressive syndrome as a dichotomous variable with the threshold sum score of >17 points on the DMAS. All patients were assessed within 4 weeks before study initiation and after completion of the study.

Preparation and duration of psychotropic drug prescriptions were assessed from medical charts over an observation period of 14 days. The following five groups of drugs were included: typical and atypical antipsychotics, antidepressants, antidementia agents, benzodiazepines, and anticonvulsants. Antipsychotics were recorded in both total dosages and defined daily dosages. Any changes in medications were recorded. Dichotomous variables were used to describe the presence or absence of psychotropic prescriptions. Supervision by physicians experienced in geriatric psychiatry and general psychiatry was constantly available by telephone.

Intervention

In both groups, patients continued to obtain the same care and therapies as before the study. This encompassed their ongoing pharmacologic and nonpharmacologic treatment, including ergotherapy, massage, and physiotherapy. In the intervention

group, AAT was additionally conducted for 10 weeks between March and May 2009, after a phase of preparation and coordination between the Center for Dog-Assisted Therapy Berlin-Brandenburg and the nursing homes. Every participant in the intervention group received AAT once a week for up to 45 minutes. Day of the week and time of dog visits remained constant. In every session, the dog therapy guide was present, conversing with the patient and introducing the therapy dog. The aim of the dog-assisted intervention was focused on the field of entertainment, social interaction, and activation of the residents with dementia. Both therapy dogs were Border Collies, which is a long-haired, middle-sized dog breed. One of the dogs was male and 1.5 years old; the other was female and 2.5 years old. Both were specially educated therapy dogs, with an exclusive relationship to their dog guide and a good level of obedience. Other characteristics included high relatedness to humans and a high threshold level and tolerance. They were regularly examined by a veterinarian. The dog guides were 24 and 26 years old, both female, of an equal level of education and with close relationships to their dogs.

Special precautions were taken in the event of fearful reactions of the residents to the dog. In some of the cases, fearful reactions occurred, and the intervention was discontinued. In the case of contradictory reactions to the dog (e.g., rejecting the intervention verbally while accepting the dog physically [caressing it with the hand]), the intervention was continued. The presentation, the beginnings, and the endings of the sessions were standardized. In the initial session, the dog was presented to the patient with a standardized formula, introducing the name of the dog and announcing that the dog was going to visit the patient once every week. Because not all of the patients remembered the dog 1 week later, sometimes it was introduced again, as in the initial session. The sessions primarily started with verbal interaction between the therapy guide and the dog, the patient speaking to the dog, and then progressing to physical interaction such as stroking/petting the dog. Active interaction, such as throwing balls and retrieving them, was only possible in <10% of patients. The last 15 minutes of the session were mostly left to spontaneous dynamic processes between therapy dog and patients, allowing for an atmosphere of free interaction between them the two. The therapy guide only intervened or reacted if there was a concrete question by the patient. Every session ended with a standardized formula spoken by the therapy guide. Only three patients reacted fearfully to the dog to a degree that made it necessary to end the session before time ran out, but in these patients, contact to the dog could be re-established 1 week later without a fearful reaction. The control group received pharmacologic and nonpharmacologic treatment as usual.

Data Analysis

All statistical analyses were performed in SPSS 17 (IBM SPSS Statistics, IBM Corporation, Armonk, NY). Demographic data, dementia severity, and presence of psychotropic prescriptions were recorded both in terms of percentages and absolute frequencies. Demographic characteristics at baseline as a function of control versus intervention group were calculated by using paired *t* tests for continuous variables and McNemar's test with continuity correction for dichotomous variables. A repeated measures analysis of covariance was used to test the difference in treatment group effects between baseline and after treatment; the pre- and post-scores of CMAI and DMAS were used as dependent variables, treatment group (TAU only versus TAU plus AAT) as between-subject factors, and age, gender, pretest MMSE sum score, and matched-pair denominators as covariates. We specifically used this type of analysis because the intervention group had more depression at baseline, and we wanted to compensate for nonequivalent groups while delineating the effects of treatment condition. Differences between symptom scores at baseline relative to the end of treatment were examined by using paired *t* tests for continuous variables.

RESULTS

Sample Characteristics

Baseline characteristics are presented in Tables 1 and 2. At baseline, the two groups were not significantly different in terms of age; gender; prescription of antipsychotics, antidepressants, mood stabilizers, and benzodiazepines; and CMAI total scores. The mean DMAS total scores were significantly higher in the intervention group than in the control group at baseline, and significantly more patients received antidementia agents in the control group. At baseline, 27

TABLE 1. Baseline Characteristics: Gender and Psychotropic Medication

	TAU + AAT (n = 27)		TAU Only (n = 27)		Analysis		
	No.	%	No.	%	χ^2	*df*	p
Male gender	9	33.3	7	25.9	0.25	1	0.62
Psychotropic drug prescription	17	68.0	22	88.0	.00	1	0.99
Antipsychotics	10	40.0	14	56.0	1.13	1	0.29
Antidepressants	3	12.0	8	32.0	2.29	1	0.13
Antidementia agents	1	4	7	28	3.13	1	0.08
Benzodiazepines	3	12.0	0	0	1.34	1	0.25
Anticonvulsants	5	20.0	6	24.0	.00	1	0.99

Notes: Elderly dementia sufferers were randomly allocated to treatment as usual (TAU) with or without animal (dog)-assisted therapy (AAT). The pair-matched study sample (n = 54) was from a sample of 65 patients. Group differences at baseline between the groups regarding gender, overall psychotropic prescriptions, prescription of antipsychotics, antidepressants, antidementia agents, benzodiazepines, and anticonvulsants were calculated by using McNemar's test with continuity correction.

pairs (n = 54) were matched from the overall sample (N = 65), with the baseline CMAI total score as matching variable and then used for further analyses.

Of the 54 subjects, 16 (29.6%) were men and 38 (70.4%) were women. The mean (standard deviation) age of the sample was 81.70 (9.37) years (range: 57–101 years). This demographic distribution is comparable to the original sample (N = 304; 30.7% male; mean age: 81.17 years, median: 83.50 years) and consistent with other previous studies.[2,4,7]

The mean MMSE score was 7 (2.39) (range: 0–20), and the median was 6.5. Thirty-five (64.8%) patients had an MMSE score <10, and 9 (16.7%) scored 0 points, indicating a high percentage of patients with severe to very severe dementia. Psychotropic agents were prescribed to 72.2% of the patients, with 44.4% receiving antipsychotics, 20.4% antidepressants, 5.6% benzodiazepines, 20.4% anticonvulsants, and 14.8% antidementia agents (cholinesterase inhibitors or memantine) (Table 1).

Outcomes

During treatment, the treatment group by time effect was significant for symptoms of agitation (CMAI) ($F_{1,48}$ = 6.43; p <0.05) and depression (DMAS) ($F_{1,48}$ = 26.54; p <0.001), determined by repeated measures analysis of variance and controlled for age, gender, MMSE total score, and matched-pair denominators (Table 3).

In paired *t* tests, no significant difference was found in the treatment group for CMAI (t = 0.243, df = 26, p = 0.810) and DMAS (t = 1.899, df = 26, p = 0.069) total scores at baseline compared with the end-of-treatment scores (Table 3). In contrast, in the group that received TAU only, both CMAI (t = −4.306, df = 26, p <0.001) and DMAS (t = −4.963, df = 26, p <0.001) total scores increased from baseline to the end of treatment. These results suggest that the treatment effect was mainly due to an aggravation of both depression and agitation in the control group, whereas symptoms remained stable in the intervention group.

DISCUSSION

In our sample of elderly nursing home residents with mostly severe and very severe stages of dementia, we found that symptoms of agitation/aggression and depression remained on a constant level when combining AAT with TAU, compared with TAU only, in which agitation/aggression and

TABLE 2. Baseline Characteristics: Age, Cognitive Status, Prevalence of Agitation/Aggression and Depression Before the Intervention

	Overall Sample (N = 65)	Matched Sample (n = 54)	Intervention Group (n = 27)	Control Group (n = 27)	Analysis		
					t	*df*	p
Age, years	81.82 (9.22)	81.7 (9.37)	81.33 (10.20)	82.07 (8.65)	−1.25	26	0.22
MMSE	7.13 (5.74)	7.0 (5.66)	6.37 (5.41)	7.63 (5.94)	−0.72	26	0.48
CMAI	47.6 (16.41)	46.83 (16.41)	46.78 (16.89)	46.89 (16.23)	−0.02	26	0.98
DMAS	21.71 (15.32)	22.02 (15.33)	26.85 (16.91)	17.19 (12.21)	2.25	26	0.03

Notes: Values are mean (standard deviation) scores on the Mini–Mental State Examination (MMSE), Cohen-Mansfield Agitation Inventory (CMAI), and Dementia Mood Assessment Scale (DMAS) from the overall sample versus matched-pair sample. Group differences were calculated by using paired *t* tests (df = 26).

TABLE 3. Group Effects Between Treatment As Usual With Animal-Assisted Therapy Versus Without Animal-Assisted Therapy

	Intervention Group		Control Group	
	Baseline	Posttest	Baseline	Posttest
CMAI	46.78 (16.89)	45.96 (15.87)	46.89 (16.23)	56.44 (23.34)
DMAS	26.85 (16.91)	21.59 (16.36)	17.19 (12.03)	30.33 (15.99)

Notes: Values are mean (standard deviation) scores on the Cohen-Mansfield Agitation Inventory (CMAI) and Dementia Mood Assessment Scale (DMAS). Analysis of variance with repeated measures, covaried for age, gender, Mini–Mental State Examination scores, and matched pair denominators, showed significant effects for both agitation and depression. Post hoc paired *t* tests revealed in the intervention group that there was no significant change in either CMAI ($t = 0.24$, $df = 26$, $p = 0.81$) or DMAS ($t = 1.9$, $df = 26$, $p = 0.069$); in the control group, both agitation ($t = -4.31$, $df = 26$, $p < 0.001$) and depression ($t = -4.96$, $df = 26$, $p < 0.001$) increased significantly over time.

depression increased over time. AAT seems to have helped some of the patients receiving combined therapy avoid developing more severe stages of these symptoms. The treatment groups did not differ significantly in their stages of cognitive decline. Thus, our findings suggest AAT is a promising option for the treatment of some BPSD.

To our knowledge, this is the first randomized controlled trial examining the efficacy of AAT in BPSD. Although overall research on AAT in BPSD is limited, our findings can be compared with some previous studies. The positive effect of AAT on the prevalence of agitation/aggression that we found is in line with a previous study,[32] which investigated the effect of a therapy dog being permanently placed into an special care unit (SCU) with demented patients for up to 3 days over a period of 1 month. A significant decrease in agitation was found. However, because there was no control group, it remains unclear whether the effect was partly due to unspecific aspects of the intervention. In addition, a study examining SCUs found that therapy visits were significantly more effective in reducing agitation and aggressive behaviors and improving social behaviors in the presence of a therapy dog.[25] This finding proved independent of the stage of dementia severity. The intervention, however, was limited to 2 occasions of 30 minutes' duration. Furthermore, another study[28] found that symptoms of agitation were significantly decreased in a sample of SCU residents with dementia when exposed daily to visiting therapy dogs for 3 weeks. A 3-month Japanese study investigated AAT (using therapy dogs) and its effects on BPSD in a dementia day-program.[27] In line with our findings, they found that BPSD worsened in the control group, whereas symptoms of aggressiveness, anxieties, and caregiver burden improved. Another study investigated the effects of pet exposure on BPSD in home-dwelling dementia sufferers.[26] In patients who were exposed to pets, verbal aggression was significantly reduced compared with patients who were not exposed. However, because no quantitative assessment instruments were applied, outcome measures relied solely on caregiver reports. Furthermore, home-dwelling patients cannot be directly compared with nursing home residents, and different types of pets were permitted in this study, making it only partly comparable to our study.

In contrast to our findings, all the aforementioned studies found improvement in behavioral symptoms. This may be partly due to different frequencies and intensities of therapy dog interactions compared with our study, in which symptoms remained on a constant level in the AAT group compared with the group receiving TAU only. In contrast to our study and the earlier findings, another study[38] found no significant effects of AAT on rating scores of behavioral symptoms, either in the intervention or in the control group. This study examined the effects of a visiting therapy dog on symptoms of agitation in a psychiatric ward over a 12-week period. Heart rates were found to be significantly decreased in the intervention group, however, suggesting a calming effect of AAT. In the presence of therapy dogs, the noise level in the departments was significantly reduced, indicating an effect of AAT on verbal agitation. The authors were not conclusive about the lack of a measurable effect.

To date, long-term effects of AAT have not been evaluated. To our knowledge, this is the first study that investigated mid- to long-term efficacy of AAT (the observation and assessment period post-intervention lasted for 4 weeks). This time frame could possibly explain why we did not find symptom amelioration but only stabilization of symptoms on a constant level. Symptoms would probably have equalized in both groups with a longer observation period. In the resident dog study, effects remained stable for a mid-term period of a few days after discontinuation of AAT.[32] In another study, the calming effects of a visiting dog did not persist after

the therapy dog was removed, suggesting a lack of long-term effects.[38] Mid- and long-term effects were not investigated,[25,32] nor were symptoms found to increase, after discontinuation of AAT.[28] Hence, the efficacy of dog-assisted interventions might be limited to short-term effects connected to the therapy dog's continuous presence.

In contrast, a study investigating animal-assisted activity (AAA)[21] did not find any effect of AAA on CMAI-measured agitation. This may be due to the fact that AAA is methodically not directly comparable to AAT. To date, only one study examined the effect of AAT on depressive syndromes in patients with dementia.[39] The authors found improvement in depressive symptoms in both the intervention and control groups. However, the AAT intervention group revealed a significantly better reduction of such symptoms. Another study found depressive symptoms remained unaffected by AAA; however, Observed Emotion Rating Scale scores of "sadness" decreased, whereas scores of "pleasure" and "general alertness" increased, which could be perceived as an improvement in certain aspects of mood.[21] Furthermore, several studies found that AAT enhanced social behaviors in patients with dementia.[25,28,29,40] Because social isolation and loneliness are risk factors for depression in the elderly, AAT might indirectly be considered as a promising strategy for reducing depressive symptoms in dementia. In addition, because agitation/aggression and depression are associated with impairment of social interactions, secondary prevention in this field seems to be crucial to helping dementia patients becoming more engaged in social interaction or contact.

CONCLUSIONS

To our knowledge, this clinical trial is the largest sample to date examining the effects of AAT on BPSD. Our results indicate that AAT is a promising option for treating symptoms of agitation/aggression and depression in elderly demented nursing home residents. Additional research is needed to determine middle- and long-term effects, although long-term effects might not be expected due to the natural course of cognitive decline, especially in more severely demented subjects. However, in these patients, continuous placement of a therapy dog might be a promising option. Given the diversity of noncognitive symptoms and the underlying individual types of dementia, a single type of AAT intervention is not likely to work equally well for all types of patients. Thus, additional research is needed to tailor different types of AAT interventions to reach the individual needs of various types of patients.

This study was supported by the German Federal Ministry of Health in the framework of the "Leuchtturm Projekt Demenz," a services research program on dementia (BMG LT 44-076).

Disclosures: No disclosures to report.

References

1. Gauthier S, Cummings J, Ballard C, et al: Management of behavioral problems in Alzheimer's disease. Int Psychogeriatr 2010; 25: 1–27
2. Lyketsos CG, Lopez O, Jones B, et al: Prevalence of neuropsychiatric symptoms in dementia and mild cognitive impairment: results from the Cardiovascular Health Study. JAMA 2002; 288: 1475–1483
3. Cohen-Mansfield J, Marx MS, Rosenthal AS: A description of agitation in a nursing home. J Gerontol 1989; 44:M77–M84
4. Testad I, Aasland AM, Aarsland D: Prevalence and correlates of disruptive behavior in patients in Norwegian nursing homes. Int J Geriatr Psychiatry 2007; 22:916–921
5. Wetzels RB, Zuidema SU, de Jonghe JF, et al: Determinants of quality of life in nursing home residents with dementia. Dement Geriatr Cogn Disord 2010; 29:189–197
6. Brodaty H, Draper B, Low LF: Nursing home staff attitudes towards residents with dementia: strain and satisfaction with work. J Adv Nurs 2003; 44:583–590
7. Selbaek G, Kirkevold Ø, Engedal K: The course of psychiatric and behavioral symptoms and the use of psychotropic medication in patients with dementia in Norwegian nursing homes—a 12-month follow-up study. Am J Geriatr Psychiatry 2008; 16: 528–536
8. Ballard C, Hanney ML, Theodoulou M, et al: DART-AD investigators. The dementia antipsychotic withdrawal trial (DART-AD): long-term follow-up of a randomised placebo-controlled trial. Lancet Neurol 2009; 8:151–157
9. Lee HB, Lyketsos CG: Depression in Alzheimer's disease: heterogeneity and related issues. Biol Psychiatry 2003; 54: 353–362
10. Baller M, Boorsma M, Frijters DH, et al: Depression in Dutch homes for the elderly: under-diagnosis in demented residents? Int J Geriatr Psychiatry 2010; 25:712–718
11. Kunik ME, Snow AL, Davila JA, et al: Causes of aggressive behavior in patients with dementia. J Clin Psychiatry 2010; 71: 1145–1152

12. Rapp MA, Schnaider-Beeri M, Wysocki M, et al: Cognitive decline in patients with dementia as a function of depression. Am J Geriatr Psychiatry 2011; 19:357–363
13. Rapp MA, Gerstorf D, Helmchen H, et al: Depression predicts mortality in the young old, but not in the oldest old: results from the Berlin Aging Study. Am J Geriatr Psychiatry 2008; 16:844–852
14. Mecocci P, Cherubini A, Mariani E, et al: Depression in the elderly: new concepts and therapeutic approaches. Aging Clin Exp Res 2004; 16:176–189
15. Andreescu C, Reynolds CF 3rd: Late-life depression: evidence-based treatment and promising new directions for research and clinical practice. Psychiatr Clin North Am 2011; 34:335–355, vii–iii
16. Alessi CA, Yoon EJ, Schnelle JF, et al: A randomized trial of a combined physical activity and environmental intervention in nursing home residents: do sleep and agitation improve? J Am Geriatr Soc 1999; 47:784–791
17. van Weert JC, van Dulmen AM, Spreeuwenberg PM, et al: The effects of the implementation of snoezelen on the quality of working life in psychogeriatric care. Int Psychogeriatr 2005; 17:407–427
18. Remington R: Calming music and hand massage with agitated elderly. Nurs Res 2002; 51:317–323
19. Woods DL, Craven RF, Whitney J: The effect of therapeutic touch on behavioral symptoms of persons with dementia. Altern Ther Health Med 2005; 11:66–74
20. Bharani N, Snowden M: Evidence-based interventions for nursing home residents with dementia-related behavioral symptoms. Psychiatr Clin North Am 2005; 28:985–1005
21. Mossello E, Ridolfi A, Mello AM, et al: Animal-assisted activity and emotional status of patients with Alzheimer's disease in day care. Int Psychogeriatr 2011; 23:899–905
22. Wilson RS, Krueger KR, Arnold SE, et al: Loneliness and risk of Alzheimer disease. Arch Gen Psychiatry 2007; 64:234–240
23. Wiktorsson S, Runeson B, Skoog I, et al: Attempted suicide in the elderly: characteristics of suicide attempters 70 years and older and a general population comparison group. Am J Geriatr Psychiatry 2010; 18:57–67
24. Filan SL, Llewellyn-Jones RH: Animal-assisted therapy for dementia: a review of the literature. Int Psychogeriatr 2006; 18:597–611
25. Churchill M, Safaoui J, McCabe BW, et al: Using a therapy dog to alleviate the agitation and desocialization of people with Alzheimer's disease. J Psychosoc Nurs Ment Health Serv 1999; 37:16–22
26. Fritz CL, Farver TB, Kass PH, et al: Association with companion animals and the expression of noncognitive symptoms in Alzheimer's patients. J Nerv Ment Dis 1995; 183:459–463
27. Kanamori M, Suzuki M, Yamamoto K, et al: A day care program and evaluation of animal-assisted therapy (AAT) for the elderly with senile dementia. Am J Alzheimers Dis Other Demen 2001; 16:234–239
28. Richeson NE: Effects of animal-assisted therapy on agitated behaviors and social interactions of older adults with dementia. Am J Alzheimers Dis Other Demen 2003; 18:353–358
29. Kongable LG, Buckwalter KC, Stolley JM: The effects of pet therapy on the social behavior of institutionalized Alzheimer's clients. Arch Psychiatr Nurs 1989; 3:191–198
30. Barak Y, Savorai O, Mavashev S, et al: Animal-assisted therapy for elderly schizophrenic patients: a one-year controlled trial. Am J Geriatr Psychiatry 2001; 9:439–442
31. Hoffmann OM, Lee AH, Wertenauer F, et al: Dog-assisted intervention significantly reduces anxiety in hospitalized patients with major depression. Eur J Integr Med 2009; 1:145–148
32. McCabe BW, Baun MM, Speich D, et al: Resident dog in the Alzheimer's special care unit. West J Nurs Res 2002; 24: 684–696
33. Cockrell JR, Folstein MF: Mini-Mental State Examination (MMSE). Psychopharmacol Bull 1988; 24:689–692
34. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision. Washington, DC, American Psychiatric Association, 2000
35. Sunderland T, Hill JL, Lawlor BA, et al: NIMH Dementia Mood Assessment Scale (DMAS). Psychopharmacol Bull 1988; 24: 747–753
36. Miller RJ, Snowdon J, Vaughan R: The use of the Cohen-Mansfield Agitation Inventory in the assessment of behavioral disorders in nursing homes. J Am Geriatr Soc 1995; 43:546–549
37. Gutzmann H, Schmidt KH, Richert A, et al: Dementia Mood Assessment Scale (DMAS): Ein Instrument zur quantitativen Erfassung depressiver Veränderungen bei dementen Patienten. Z Gerontopsychol Psychiatr 2008; 21:273–280
38. Walsh PG, Mertin PG, Verlander DF, et al: The effects of a 'pets as therapy' dog on persons with dementia in a psychiatric ward. Aust Occup Ther J 1996; 42:161–166
39. Moretti F, De Ronchi D, Bernabei V, et al: Pet therapy in elderly patients with mental illness. Psychogeriatrics 2011; 11: 125–129
40. Berry A, Borgi M, Terranova L, et al: Developing effective animal-assisted intervention programs involving visiting dogs for institutionalized geriatric patients: a pilot study. Psychogeriatrics 2012; 12:143–150