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An Evaluation of Dog-Assisted Therapy for Residents of Aged Care Facilities with Dementia

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ABSTRACT Although some research suggests that dog-assisted therapy may be beneficial for people with dementia living in residential aged care facilities, the intervention has not been adequately investigated. To address this shortcoming, we conducted a randomized controlled trial of dog-assisted therapy versus a human-therapist-only intervention for this population. Fifty-five residents with mild to moderate dementia living in three Australian residential aged care facilities completed an 11-week trial of the interventions. Allocation to the intervention was random and participants completed validated measures of mood, psychosocial functioning, and quality of life (QOL), both prior to and following the intervention. No adverse events were associated with the dog-assisted intervention, and following it participants who had worse baseline depression scores demonstrated significantly improved depression scores relative to participants in the human-therapist-only intervention. Participants in the dog-assisted intervention also showed significant improvements on a measure of QOL in one facility compared with those in the human-therapist-only group (although worse in another facility that had been affected by an outbreak of gastroenteritis). This study provides some evidence that dog-assisted therapy may be beneficial for some residents of aged care facilities with dementia.

Keywords: behavior therapy, dementia, dogs, residential facilities, social behavior

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Dementia is a leading cause of disability in later life (The World Health Organization and The World Bank 1996) and often precipitates institutional placement in developed countries (Knapp and Prince 2007). Frequently, behavioral and psychological symptoms such as wandering, agitation, aggression, disinhibition, and apathy accompany dementia and have been reported in as many as 86% of patients with dementia living in residential care settings (Ballard et al. 2001). These symptoms not only cause distress to the individual concerned but negatively impact upon the quality of life of carers and co-residents, and lead to considerable stress and burn-out in care staff (Gilley et al. 1991; Astrom et al. 2004).

Although a need for effective treatments for behavioral and psychological symptoms in patients with dementia is clearly evident, few such treatments have been identified. Pharmacological approaches are mainly of benefit in the short-term and pose safety concerns in these patients (Schneider, Dagerman and Insel 2005), and although a number of non-pharmacological approaches have been trialed, the effects are modest, at best. Of the non-pharmacological approaches that have been investigated, dog-assisted therapy has demonstrated some promise in ameliorating these symptoms in people with dementia, with increases in pro-social behavior and decreases in agitated behavior reported (Perkins et al. 2008). It has been suggested that dog-assisted therapy addresses the "unmet needs" of patients with dementia that underlie the behavioral and psychological symptoms (Cohen-Mansfield and Werner 1997; Richeson 2003), by introducing activities that provide meaningful activity, stimulation, pleasurable social interaction, and comfort through physical contact.

However, evidence regarding the effects of dog-assisted therapy for patients with dementia is limited and only nine such studies were identified for inclusion in a recent review (Perkins et al. 2008). The studies, however, involved relatively small numbers of participants, ranging from four to 28, and varied in a number of dimensions including the outcome measures used (physiological versus observational versus questionnaire), the setting in which the intervention was delivered (residential care versus psychiatric day hospital), the severity of dementia of the participants (mild to moderate to severe), the duration and frequency of the intervention (from one 10-minute session to 24 $\times$ 3-hour sessions over 12 weeks) and the mode of the intervention (resident dog versus visiting dog, delivered individually or in a group setting) (Kongable, Buckwalter and Stolley 1989; Walsh et al. 1995; Batson et al. 1998; Churchill et al. 1999; Kanamori et al. 2001; McCabe et al. 2002; Richeson 2003; Motomura, Yagi and Ohyama 2004; Sellers 2005). Seven of the studies involved a test-retest design with only two being randomized controlled trials (RCTs) (Walsh et al. 1995; Kanamori et al. 2001). So for most of these studies, it is not possible to assess the extent to which the outcomes were due to the dog or whether they might also have occurred without the dog (human-therapist-only therapy).

Thus, the aim of the present study was to conduct a RCT of dog-assisted therapy for people with dementia living in aged care facilities using validated instruments of mood, quality of life, and psychosocial functioning, and controlling for potentially confounding variables. It was hypothesized that dog-assisted therapy would result in improvements in mood, quality of life and psychosocial functioning in residents with dementia compared with a human-therapist-only intervention.

Methods

A multicenter RCT was conducted, with participants randomly allocated to either the dog-assisted or the human-therapist-only interventions within three aged care facilities. The University of Queensland Human Research Ethics Committee approved the study, and informed, written consent was obtained from each participant or their legal guardian, prior to commencing the study.

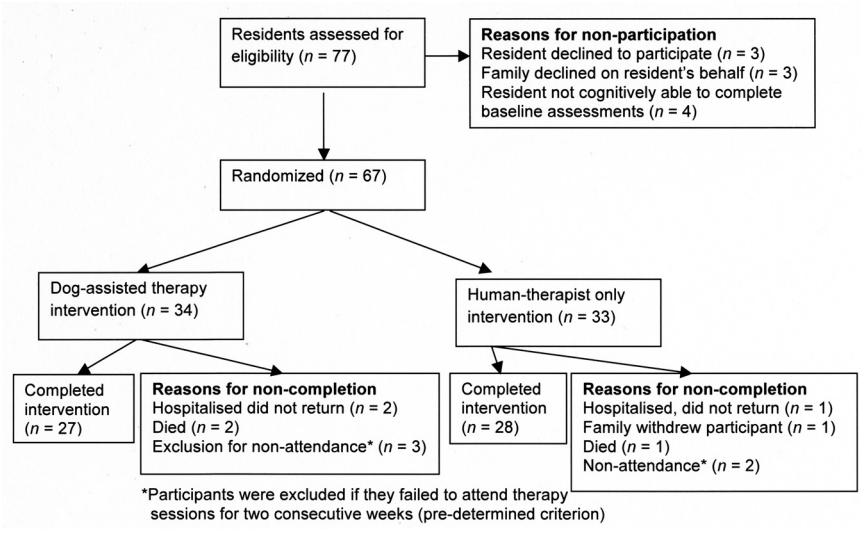

Figure 1. Study flowchart.

Sample Size

Based on logistic and resource constraints, it was estimated that approximately 20 participants in each of three facilities could be managed in the therapy sessions, 10 in each intervention group. Accordingly, as these constraints determined sample size, no a priori sample size/power calculations were performed.

Participants

Residents from three residential aged care facilities located in and around Brisbane (population 1.85 million; Australian Bureau of Statistics 2008), Australia, were invited to participate in the study. The facilities ranged in size from 90 to 130 beds, and each facility catered for residents with low- and high-care needs. No facility had a current or prior pet therapy program and none had a resident dog, although all facilities had caged parakeets. Residents were eligible for inclusion in the study if a probable diagnosis of mild to moderate dementia of any kind was recorded in the resident's medical record. Residents with severe dementia were excluded, as participants were required to be cognitively able to complete the baseline and follow-up measures. Initially, 77 residents were deemed potentially eligible for the trial by the study psychologist, in collaboration with each facility's senior recreational therapist. Of those, 10 were ineligible or did not participate. Sixty-seven were enrolled in the study and randomized to a treatment group; 55 completed the study. Reasons for non-participation and withdrawal are presented in Figure 1.

Procedure

Following consenting procedures, within each facility, participants were randomly assigned (names were drawn from a hat) to either a dog-assisted therapy group or a human-therapist-only group (control), with approximately 10 participants in each group. Prior to commencement of the study, basic demographic details were obtained from each participant (or their chart) including the length of time the participant had resided in the facility, psychotropic medications regularly taken (including antidepressants, benzodiazepines, cholinesterase inhibitors, antipsychotics and mood stabilizers), and whether they had owned a dog prior to entering the facility. Reasons for not owning a dog were also sought; no participant identified dog allergies

as a problem. The Modified Mini-Mental State Exam (MSE-3MS) (Teng and Chui 1987) was used to assess cognitive capacity and is a valid and reliable measure in patients with dementia (Bravo and He´bert 1997). MSE-3MS scores range from 0 to 100, and a cut-off score of 77 has been shown to have a sensitivity of 92% for differentiating impaired cognition (lower scores) and intact cognition (Tombaugh et al. 1996).

Questionnaire measures of quality of life, mood, and psychosocial functioning were also administered by the study psychologist one week before the study started and in the week following its completion. The psychologist was blinded regarding the intervention received by each resident. Records of participants' attendance at each therapy session were also maintained by the therapist to assess treatment fidelity.

Interventions

All therapy sessions were conducted by a therapist who was a veterinarian (JP) and who was also a registered psychiatric nurse with previous experience working with people with dementia and in conducting small group therapy sessions. Prior to implementing the interventions, the therapist received four days training in recreational therapy theory and techniques from a consultant recreational therapist experienced in conducting dog-assisted therapy for people with dementia living in residential aged care. To structure and standardize interventions, semi-structured session protocols were developed and implemented. Each therapy session involved an introductory activity, general discussion, the opportunity for each participant to individually interact with the dog through play, petting and/or feeding it, and concluded by reading a short story to the group (see Table 1 for details). The human-therapist-only intervention adopted the same format but instead of a dog, an article was brought into each therapy session to stimulate discussion (e.g., an unusual insect in a bottle, a plant cutting).

The interventions were conducted sequentially over an 18-month period. Although each intervention lasted only 11 weeks, additional time was required to establish relationships with each facility, to negotiate with them regarding the implementation of the interventions, and recruit and consent participants. Sessions were conducted three times a week in Facility A (the first facility in which the intervention was conducted). However, based on advice from staff in that facility that the time commitment with three sessions a week was too great for both residents and facility staff, the intervention consisted of two sessions per week in Facilities B and C.

Sessions were conducted on two non-consecutive days for 11 consecutive weeks, with each session lasting 40 to 50 minutes. Each facility provided a room in which to conduct the sessions, and while the control group therapy session was conducted, the therapy dog was housed in a covered crate in an adjoining secure area; control group participants did not have any contact with the dog.

Therapy Dogs

Three dogs (Miniature Poodle, Staffordshire Terrier, German Shepherd) owned by the therapist were used, and were either Delta Society (Australia) accredited (two dogs) or accredited by the consultant therapist. All dogs were fully vaccinated and in good physical health. Only one dog was present at a therapy session, and the dogs were used in a rotating order to minimize stress to the dogs. The dogs were kept on a lead for the duration of the dog-assisted therapy session, with the lead occasionally held by participants instead of the therapist, but always under the supervision of the therapist. Participants were advised to wear long sleeves and trousers to minimize the possibility of skin tears or bruising from dog contact.

Table 1. Example of a session plan: dog-assisted therapy and human-therapist-only interventions.*

Dog-Assisted Therapy Session Plan:
Seat each participant and apply name tag,
Greet each participant by name, introduce myself (JP) and the dog,
Address the group and briefly state why I (JP) am here and they are helping me learn,
Take dog to each participant, and allow participant to offer small supplied food treat and pet and talk to dog,
Dog can remain either sitting with, or on lap of, a participant throughout the remainder of the session (rotate), depending on willingness of participants and dog,
Draw attention to the dog's name, mention how the dog got its name, and ask participant to name as many other dog names beginning with the same letter as they can,
Pass an item around e.g., gloves, scarf, hat. Ask "what is this item, tell me about one you had, and why is it useful?" Discuss,
Volunteer participants to dress-up dog with supplied outfit (e.g., super dog outfit, fur-lined small coat, jumper, scarf),
Dog's history/news e.g., pound dog, recent dog sporting competitions,
Display relevant dog breed from dog encyclopedia and briefly discuss breed attributes,
Read short story from "Chicken Soup for the Dog Lover's Soul" or poetry about dog(s) or human–animal relationships,
Writing poetry: for three participants, construct poem about their dog prompted by my lines e.g., "Golly (one of the therapy dog's names) is furry, (human therapist name) loves Golly, Golly likes to play ball ... what was your dog's name?" (any animal subject will suffice, or if no prior pet ownership, construct the participant's poem around a person they were close to),
Thank each participant by name for attending and remind them of the day and time of the next session.
Human-Therapist-Only Session Plan:
Seat each participant and apply name tag,
Greet each participant by name, introduce myself (JP) individually to each participant and touch them gently on the lower arm, if appropriate,
Address the group and briefly state why I (JP) am here and they are helping me learn,
Draw attention to my name, mention a nick-name, and ask participants to name as many other names beginning with the letter "J" as they can, and encourage them to offer some of their own nick-names and explain how those nick-names came about,
Mention my family or friend's history/news e.g., recent events, show relevant materials such as photos or other mementos. Invite participants to mention any recent special events (birthdays, anniversaries etc),
Pass an item around e.g., scarf, hat. Ask "what is this item, tell me about one you had and why is it useful?"
Display and pass around an interesting insect in a jar or fresh flower/plant cutting,
Display an impressive tree from tree encyclopedia and briefly discuss attributes,
Read short story from "Chicken Soup for the Soul" or poetry about human relationships,
Writing poetry: for three participants, construct poem about their loved ones prompted by my lines e.g., "Ron is my friend, JP loves Ron, Ron likes to go for walks and work with timber ... what was your friend's name?"
Thank each participant by name for attending and remind them of the day and time of the next session.

*All sessions adopted this format although topics and activities varied to maintain participant's interest.

Outcome Measures

Participants' quality of life (QOL) was assessed using the Quality of Life-Alzheimer's Disease (QOL-AD) (Logsdon et al. 1999), a brief, psychometrically sound, 13-item measure developed for use with individuals with dementia that can be reliably completed by individuals with a MMSE score of more than 10 (Logsdon et al. 2002). Issues assessed include relationships with

family and friends, physical health, mood, financial concerns, and overall QOL, and each item is rated using a 4-point scale, from 1 (poor) to 4 (excellent). Total scores range from 1 to 52, with higher scores indicating better QOL.

The Medical Outcomes Study 36-Item Short Form Health Survey Version 1.0 (SF-36; McHorney et al. 1994) was also administered to participants as a broader measure of self-reported health-related QOL. The SF-36 is a psychometrically sound, 36-item instrument with eight subscales: physical functioning, role limitations due to physical health problems, bodily pain, social functioning, general mental health (psychological distress and psychological well-being), vitality (energy/fatigue), role limitations due to emotional problems, and general health perceptions. Raw scale scores are transformed to a 0 to 100 scale, with higher scores reflecting better health status. The SF-36 has been used extensively and has been previously used with frail, older patients with dementia (Cohen et al. 2002). High levels of internal consistency ($\alpha = 0.8–0.9$; Shadbolt, McCallum and Singh 1997) and test-retest reliabilities for each subscale have been reported (Sanson-Fisher and Perkins 1998).

The Geriatric Depression Scale Short Form (GDS-SF; Sheikh and Yesavage 1996), a 15-item self-report measure of depression, was also administered. It is suitable for use in people with a MMSE of 14 or greater (Royal Australian College of General Practitioners 2006), and scores range from 0 to 15, with scores of 6 or more suggestive of depression. The GDS-SF has been found to correlate significantly with major depression ($p < 0.001$), and the sensitivity and specificity of the GDS-SF has been reported to be 81.5% and 75.4%, respectively, using a cut-off of 6 (Friedman, Heisel and Delavan 2005).

Residents' psychosocial functioning and behavior was measured using the Multidimensional Observational Scale for Elderly Subjects (MOSES; Helmes, Csapo and Short 1987). The scale consists of 40 items that yield five subscales measuring self-care (the ability to independently bathe and groom oneself), disoriented behavior, depressed/anxious moods, irritable behavior, and withdrawn behavior. Each item is rated on a 4-point Likert scale (1–4), with lower scores reflecting better functioning (subscale scores range: 1–32). The MOSES has sound psychometric properties, with inter-rater reliabilities of 0.58–0.97 and internal consistency reliabilities of 0.78–0.88 reported for the five subscales (Helmes, Csapo and Short 1987). Facility staff completed the MOSES for each participant. They were not blinded to participants' group status.

Data Analyses

Outcome scores were treated as continuous (interval) data. For each measure, mean scores following therapy were compared between the two groups using multivariable linear regression, using Stata Version 11 (StataCorp, College Station, TX, USA), with facility fitted as fixed effect. Covariates were fitted and retained in the model if either the regression coefficient for therapy group changed and/or the standard error for this coefficient reduced by non-negligible amounts. When analyzing variables other than SF-36 measures, covariates assessed were the baseline value for the same measure, baseline MOSES depression subscale score, and marital status (currently married or not), in that order. When analyzing SF-36 measures, covariates assessed were the baseline value for that measure, baseline MOSES depression subscale score, marital status, and baseline SF-36 bodily pain subscale score, in that order. Once this model was finalized, to assess whether the effects of therapy differed by facility, interactions between therapy group and facility were assessed, with facility fitted as a fixed effect; both interaction terms (one for each of facilities B and C) were retained if the joint *p*-value based on a partial *F*-test was low. To assess whether the effects of therapy differed by baseline scores,

Table 2. Demographic and other key characteristics of the dog-assisted therapy and human-therapist-only groups at baseline.

	Dog-Assisted Therapy (*n* = 27)	Human-Therapist-Only Therapy (*n* = 28)
Age (years)	*M* = 84.9; *SD* = 6.1	*M* = 85.1; *SD* = 6.6
Gender		
Male	8 (29.6%)	4 (14.3%)
Female	19 (70.4%)	24 (85.7%)
Years in Facility	*M* = 2.5; *SD* = 2.2	*M* = 2.4; *SD* = 2.1
Number of Medications (average)	*M* = 9.2; *SD* = 3.5	*M* = 8.1; *SD* = 4.0
Number Regularly Taking Behavior Modifying Drugs	11 (40.7%)	11 (39.3%)
Number Regularly Taking:		
Cholinesterase inhibitors	2 (7.4%)	3 (10.7%)
Antidepressants	5 (18.5%)	6 (21.4%)
Benzodiazepines	5 (18.5%)	4 (14.3%)
Antipsychotics/mood stabilizers	1 (3.7%)	4 (14.3%)
Marital Status		
Widowed	17 (62.9%)	24 (85.7%)
Married	8 (29.6%)	2 (7.1%)
Divorced	0	1 (3.6%)
Never married	0	1 (3.6%)
No answer	2 (7.4%)	0
Level of Education		
Primary school	10 (37.0%)	7 (25%)
High school	15 (55.6%)	18 (64.3%)
Trade certificate	2 (7.4%)	3 (10.7%)
Previous Dog Ownership		
Yes	20 (74.1%)	21 (75%)
No	6 (22.2%)	4 (14.3%)
Don't know	1 (3.7%)	3 (10.7%)

the interaction between therapy group and baseline scores for the same measure fitted as continuous variables was then assessed in the same way with baseline scores also fitted as a main effect. As there was evidence of an interaction between baseline MOSES depression score and therapy group, effects of therapy (dog-assisted therapy relative to human-therapist-only therapy) were reported at three arbitrary depression scores to represent low (mean minus 1 *SD*), moderate (mean), and high baseline values (mean plus 1 *SD*) on this continuum while avoiding extreme values. Although the alternative hypothesis was a one-sided question, the possibility that dog-assisted therapy has adverse effects could not be eliminated, so two-sided *p*-values were used throughout.

Results

Participant Characteristics

Nineteen residents from Facility A, 16 from Facility B, and 20 from Facility C completed the study, and key characteristics of the two groups are presented in Table 2. The mean age of participants was 85 years, and they had lived in the facility an average of 2.45 years. Participants' baseline scores on measures of cognitive functioning, psychosocial functioning, and

Table 3. Baseline scores of the dog-assisted therapy and human-therapist-only groups on measures of cognition, quality of life, and psychosocial functioning (< indicates better function is associated with lower scores, and > indicates that higher scores are better).

Measure	Dog-Assisted Therapy (*n* = 27) Mean (*SD*)	Human-Therapist-Only Therapy (*n* = 28) Mean (*SD*)
MSE-3MS (>, scale 0–100)	58.1 (19.8) Range = 28–93	59.8 (17.2) Range = 24–88
QOL-AD (>, scale 13–52)	34.9 (5.7)	37.0 (4.8)
GDS-SF (<, scale 0–15)	4.1 (3.5)	2.6 (2.2)
MOSES Subscales (<, scale 8–32)		
Self-care	18.1 (5.7)	16.6 (6.2)
Disoriented	16.4 (5.2)	17.3 (6.7)
Depression	14.5 (6.1)	15.3 (4.7)
Irritability	11.4 (3.5)	11.4 (4.5)
Withdrawn	17.6 (6.3)	17.1 (5.3)
SF-36 Subscales (>, scale 0–100)		
Physical functioning	23.7 (25.1)	28.0 (26.5)
Role limitations due to physical health problems	54.6 (44.9)	70.5 (43.1)
Bodily pain	71.9 (25.5)	71.7 (25.8)
General health perceptions	66.0 (25.9)	71.0 (20.3)
Vitality	53.3 (26.3)	58.0 (24.6)
Social functioning	76.9 (30.8)	83.0 (24.8)
Role limitations due to emotional problems	80.3 (36.1)	77.4 (41.6)
Mental health	75.3 (24.2)	84.3 (12.6)

QOL are presented in Table 3. MSE-3MS scores were indicative of mild-moderate cognitive impairment, and the GDS-SF indicated low levels of depression. Participants' scores on the SF36 physical functioning subscale were low relative to Australian age-based population norms (Australian Bureau of Statistics 1995), indicating poor physical functioning (the normative SF36 physical functioning score was 53/100 for Australian adults aged 75 years and older, compared with means of 24 and 28 for participants in the dog-assisted and human-therapist-only groups, respectively). Their remaining subscale scores were consistent with mean scores for their age group (Australian Bureau of Statistics 1995). Their MOSES subscales scores indicated that, on average, both groups required some supervision with self-care activities, had mild-moderate levels of withdrawn behavior and disorientation, and relatively low levels of irritability.

Attendance at Therapy Sessions

Attendance at therapy sessions of participants completing the study was high in both groups, with the percentage attendance averaging 88% for participants in the dog-assisted therapy group and 90% for those in the human-therapist-only intervention.

Effects of Dog-Assisted Therapy

Participants' post-therapy scores for each outcome measure, and estimated effects of dog-assisted therapy relative to human-therapist-only therapy are shown in Table 4. No adverse events (skin tears, bruising, skin irritation) were associated with dog-assisted therapy.

After therapy, the mean QOL-AD score in the dog-assisted therapy group was significantly higher (better) than in the human-therapist-only group ($p = 0.02$) in one facility (Facility B), but

Table 4. Post-therapy scores and estimated effects of dog-assisted therapy relative to human-therapist-only therapy. Participants' scores for each outcome measure, and estimated effects of dog-assisted therapy relative to human-therapist-only therapy are shown. Where there was a significant interaction between therapy group and baseline value, that is, the magnitude of change in scores differed depending on baseline value (with or without a difference in direction), separate estimated changes are shown, otherwise estimated changes pooled across all baseline values are shown. Adjusted estimates indicate how much better or worse participants were who received dog-assisted therapy compared with predicted scores if they had received human-therapist-only therapy.

Measure	Post-Therapy Scores Mean (*SD*)		Effect of Dog-Assisted Therapy (Relative to Human-Therapist-Only Therapy)	
	Dog-Assisted Therapy (*n* = 27)	Human-Therapist-Only Therapy (*n* = 28)	Adjusted Estimate (95% CI)	*p*-value
QOL-AD (>, scale 13–52)				
Facility A	34.0 (7.2)	38.9 (5.9)	–1.6 (–6.1 to 3.0)*	0.49
Facility B	38.1 (4.4)	33.2 (5.3)	5.6 (0.8 to 10.3)*	0.02
Facility C	34.7 (4.9)	39.6 (6.1)	–4.8 (–8.9 to –0.8)*	0.02
GDS–SF (<, scale 0–15¥¥)	4.0 (2.9)	2.6 (2.1)	0.3 (–0.7 to 1.4)**	0.51
MOSES Subscales (<, scale 8–32)				
Self-care	17.5 (6.5)	17.4 (6.1)	–0.8 (–2.9 to 1.2)¶	0.42
Disoriented	15.9 (6.6)	16.8 (6.4)	0.4 (–2.1 to 2.8)¶¶	0.75
Depression				
Baseline score¥:	12.5 (3.7)	14.6 (3.9)		
9.51 (mean minus 1 *SD*)			0.4 (–2.1 to 2.9)	0.75
14.91 (mean)			–1.6 (–3.4 to 0.1)	0.07
20.31 (mean plus 1 *SD*)			–3.6 (–6.1 to -1.1)	< 0.01
Irritability	10.0 (3.6)	11.1 (3.9)	–0.1 (–2.1 to 1.8)¶¶¶	0.88
Withdrawn	16.0 (4.5)	16.6 (5.2)	–0.1 (–2.7 to 2.4)¶¶¶¶	0.91
SF36 Subscales (>, scale 0–100)				
Physical functioning	24.8 (20.5)	23.6 (22.3)	1.0 (–10.3 to 12.3)#	0.86
Role limitations due to physical health problems	66.7 (41.0)	51.8 (41.9)	19.2 (–3.1 to 41.5)##	0.09
Bodily pain	68.0 (25.3)	70.9 (29.4)	–4.9 (–19.2 to 9.3)###	0.49
General health perceptions	62.3 (24.6)	71.4 (18.6)	–7.8 (–17.5 to 2.0)####	0.12
Vitality	57.0 (24.5)	69.1 (21.7)	–7.8 (–17.4 to 1.8)^	0.11
Social functioning	80.1 (24.1)	81.7 (24.4)	3.6 (–9.5 to 16.8)^^	0.58
Role limitations due to emotional problems	87.7 (32.2)	85.7 (33.3)	8.6 (–9.0 to 26.2)^^^	0.33
Mental health	76.6 (18.9)	76.9 (18.3)	1.7 (–7.8 to 11.3)^^^^	0.72

*Adjusted for baseline QOL-AD and baseline MOSES depression subscale; **adjusted for baseline GDS-SF.

¶Adjusted for baseline MOSES self-care subscale; ¶¶ adjusted for baseline MOSES disoriented subscale; ¶¶¶adjusted for baseline MOSES irritability subscale and current marital status; ¶¶¶¶adjusted for baseline MOSES withdrawn subscale and current marital status.

#Adjusted for baseline SF-36 physical functioning and bodily pain subscales and current marital status; ##adjusted for baseline SF-36 physical health problems and bodily pain subscales and current marital status; ###adjusted for baseline SF-36 bodily pain subscale, baseline MOSES depression subscale and current marital status; ####adjusted for baseline SF-36 general health perceptions and bodily pain subscales and current marital status.

^Adjusted for initial SF-36 vitality and bodily pain subscales, baseline MOSES depression subscale and current marital status; ^^adjusted for baseline SF-36 social functioning and bodily pain subscales, baseline MOSES depression subscale and current marital status; ^^^adjusted for baseline SF-36 role limitations due to emotional

problems and bodily pain subscales and current marital status; ^^^^adjusted for baseline SF-36 mental health subscale, baseline MOSES depression subscale and current marital status.

¥Significant interaction between therapy group and baseline score so effects of therapy were assessed at mean baseline value (14.91) minus one *SD* (5.40), at the mean value, and at the mean value plus one *SD*.

<Indicates better function is associated with lower scores, and > by higher scores; Adjusted estimates indicate how much better or worse participants were that received dog-assisted therapy compared to predicted scores if they had received human only therapy (that is, adjusted estimates do not indicate how much better participants would have been from their initial baseline scores).

¥¥Scores greater than 6 are suggestive of depression and scores greater than 10 indicate that depression is likely.

was significantly lower ($p = 0.02$) in another (Facility C; significance of interaction $p < 0.01$). Importantly, there was an outbreak of gastroenteritis in Facility C in the final week of the intervention (week 11) that affected many of the participants and may have negatively influenced their outcome scores.

Relative to the human-therapist-only intervention, MOSES depression subscale scores following therapy were moderately lower (better) in participants in the dog-assisted therapy group with higher (worse) baseline scores, but not in those with low baseline scores ($p = 0.03$) (see Table 4). No significant differences post-therapy between the dog-assisted and the human-therapist-only interventions were observed for any of the remaining measures (see Table 4).

Discussion

This RCT of dog-assisted therapy for people with dementia living in aged care facilities demonstrated that participants who received dog-assisted therapy had better depression scores on one measure of depression in those with worse baseline depression scores, and improved QOL scores in one facility (Facility B) but worse in another (Facility C). Importantly, there was an outbreak of gastroenteritis in Facility C in week 11 of the intervention, and this may have negatively affected participants' QOL-AD scores, although it is not known which participants were affected by the illness.

Overall, these findings are compatible with the hypothesis that dog-assisted therapy addressed some of the unmet needs of participants by providing meaningful activity, stimulation, pleasurable social interaction, and comfort through physical contact. This theory is supported by one participant who commented: "Seeing the dog makes me feel good; not so lonely." Enjoyment and engagement in novel, stimulating activity may account for the improved depression scores in participants in the dog-assisted therapy group which may in turn, underlie the observed improvement in QOL-AD scores in Facility B. Addressing unmet needs through the introduction of a novel, mentally stimulating activity and attention from the therapist may also account for the improvement in vitality scores in the human-therapist-only group, and the finding that empathic human attention provides therapeutic benefits in this population has been documented previously (Cohen-Mansfield and Werner 1997). It is likely that the two interventions addressed a range of needs that varied among participants, and those who really liked dogs might have derived more enjoyment and benefited more from dog-assisted therapy than other participants, while the human-therapist-only intervention might have suited other participants better. Previous studies have demonstrated marked differences in the responses of patients with dementia to psychosocial interventions, with interventions specifically tailored to address the recipient's specific preferences being more effective than those that do not (O'Connor et al. 2009).

The variability in findings across facilities in the present study also suggests that the facility in which the intervention is implemented may have important modifying effects. For example,

participants in the dog-assisted therapy group showed improved QOL scores in Facility B, but declined on this measure in Facility C. Hence, facility characteristics should be considered in further studies of this kind, and further research is required to identify features of facilities that may influence the effectiveness of a therapeutic intervention.

Strengths of the Study

The strengths of this study include its large sample size relative to previous studies of dog-assisted therapy in this population, and the random allocation of participants to the interventions, allowing the treatment to be rigorously evaluated without risk of confounding by factors that may vary across time, a major limitation of test-retest studies. Additional strengths of this study include the assessment of potentially confounding variables including the use of psychotropic medications that may influence mood and functioning, previous dog ownership, and other important demographic and psychological variables. In addition, validated measures of mood, psychosocial functioning, and QOL were used, and were administered by a psychologist who was blinded regarding group allocation. With the exception of the dog, both groups received a standardized semi-structured intervention delivered by the same therapist, and a high level of attendance at therapy sessions by participants suggests a high level of treatment fidelity. The possibility of contamination effects were minimized by ensuring the human-therapist-only group did not have any dog contact.

Limitations of the Study

The outbreak of gastroenteritis that occurred in Facility C during week 11 of the intervention is an important threat to the validity of the treatment delivered and may have influenced the results. Participants may have engaged less in therapy sessions if they felt unwell, and although illnesses such as this regularly occur in residential aged care facilities, it was outside our control. In hindsight, it may have been better to reschedule the final session to another time; this highlights the importance of being flexible when conducting interventions in this setting.

There is the possibility of selection bias, as approximately 10% of participants were lost to follow-up. However, as the proportions of participants that withdrew or were lost to follow-up were similar for both groups, we consider the impact of any such bias to be relatively small. The non-blinding of facility staff who completed the MOSES questionnaire for participants may have also introduced some measurement bias. For instance, staff may have subconsciously expected improvement in participants' behavior from participating in a therapeutic activity, and consequently perceived improvement. However, it was imperative that the MOSES be completed by someone with good knowledge of participants' functioning and behavior. Finally, it is possible that we failed to detect some true effects of dog-assisted therapy relative to human-therapist-only therapy due to imprecise effect estimates, insensitivity of the measures used, or insufficient power to detect treatment effects (if they existed). In addition, the relatively low prevalence of behavioral problems including depression and irritability in participants at baseline may have limited the potential for improvement. However, resource limitations precluded undertaking a larger study. Additional studies, ideally using larger sample sizes (although challenging in this population) are required to further assess the effects of dog-assisted therapy in this population and to assess the validity of our findings, which, if confirmed, have important implications for both residents with dementia and aged care facility staff, as even a slight reduction in residents' care requirements is likely to reduce the burden of care experienced by staff.

Conclusions

We conclude that dog-assisted therapy appears to be beneficial for some residents of aged care facilities with mild to moderate dementia. The results have important implications for both residents with dementia and staff in aged care facilities. Because of the importance of identifying effective treatments for patients with dementia, especially those with severe behavioral and psychological symptoms, further investigation of dog-assisted therapy for this population is warranted. This will assist in better identifying those who are most likely to benefit, so that the intervention can be tailored for, and directed to, this group. The impact of therapy also appeared to be influenced by facility characteristics; this requires further investigation.

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