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Dog-assisted interventions and outcomes for older adults in residential long-term care facilities: A systematic review and meta-analysis

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Abstract

Objective: To comprehensively review studies on dog-assisted interventions (DAIs) among older people in residential long-term care facilities (RLTCFs) and to provide an overview of their interventions, outcomes and methodological quality.

Method: We searched 18 electronic databases to identify English articles (published January 2000–December 2019) reporting on well-defined DAIs targeting older adults (≥65 years) in RLTCF. Data were extracted by two independent reviewers. Descriptive statistics were produced for quantitative studies, with key themes identified among qualitative studies. Where possible, estimates were pooled from randomised controlled trials using random effects meta-analyses.

Results: Forty-three relevant studies (39 quantitative; 4 qualitative) were identified. The majority of quantitative studies were assessed as low-quality according to the MMAT criteria (n = 26, 67%). Almost half of the quantitative studies (n = 18, 46%) found no significant changes over time or between groups across outcomes measured. The most salient intervention effects included improved social functioning (n = 10), reduced depressive symptoms (n = 6) and loneliness (n = 5). A random-effects meta-analysis revealed a medium effect in favour of DAT on reducing depressive or loneliness symptoms (pooled SMD: 0.66, 95%CI 0.21–1.11; I^2 = 50.5; five trials), relative to treatment as usual. However, compared to treatment as usual, no overall effect of DAI on activities of daily living was detected (p = .737). Key themes from qualitative studies included (a) animals as effective transitional objects, (b) the therapeutic value of pets and (c) the significance of the care environment and stakeholders in facilitating DAI.

Implications for practice: The findings of this review indicate that while DAI has value for older people in RLTCF, challenges remain in accurately measuring its impact to provide a stronger evidence-base. Standardisation of DAI service design, delivery and

evaluation is required for future research and practice in providing holistic care for older adults.

KEYWORDS
long-term care, quality of life, therapeutic nursing, well-being

1 | INTRODUCTION

Older adults living in residential long-term care facilities (RLTCFs) (Siegel et al., 2019), including nursing homes (Sanford et al., 2015), represent one of the largest high dependency care populations worldwide (Chatterji, Byles, Cutler, Seeman, & Verdes, 2015). In England, approximately 400,000 adults aged 65 years and over currently live in care homes (Care Quality Commission, 2018). The impact of long-term conditions, multimorbidities and reduced opportunities for social contact in a closed environment often creates a complex range of needs and requires a comprehensive holistic approach (World Health Organization, 2015). Meeting these care needs is the responsibility of a great number of professionals, including RLTC staff and a range of visiting healthcare professionals. It is also important to improve partnership working between RLTCF and health care at individual, organisational and system levels to improve outcomes that matter most to residents and their relatives. Some research has started to explore the pivotal role of creating a culture in RLTCF that genuinely thinks about different and diverse ways of maximising resources and finding ways to support care so that it meets the needs of the care community (Killett et al., 2013).

Animal-assisted interventions (AAIs), which can include both animal-assisted activities (AAAs) and animal assisted therapy (AAT) (Society for Companion Animal Studies, 2019), have been identified as one complementary method of support that offers purposeful engagement and easy implementation as part of existing treatment programmes. Studies have shown that AAIs have a wide range of benefits on well-being (Bernabei et al., 2013), specifically in improving psychosocial and physiological functioning (Allen, Blascovich, & Mendes, 2002). Some studies have also highlighted the benefit of AAI in reducing stress, depression and compassion fatigue commonly experienced by carers of people with dementia (Coleman, 2016b; Islam, Baker, Huxley, Russell, & Dennis, 2017; Zimmerman et al., 2005). The research findings also hint at how AAI may facilitate connectedness between residents, relatives and staff in a RLTCF as an important part of good practice in addition to clinical effectiveness. Research and practice in RLTCF, however, needs to also include ways of valuing and supporting people working together, through interaction and shared activity that helps to develop meaningful relationships between people both inside and outside of the care community (Killett et al., 2013). Family carers can feel overwhelmed when their loved one moves into a RLTCF, and the care providers need to find ways

What does this research add to existing knowledge in gerontology?

- There is a paucity of high-quality empirical research on dog-assisted interventions (DAIs) in residential long-term care facilities (RLTCF) internationally and a lack of qualitative research that includes the experiences of older people themselves.
- Almost half (n = 18, 46%) of the 39 quantitative studies did not find any significant changes over time, or differences between experimental and control groups, among residents exposed to DAI.
- Twenty-one quantitative studies (54%) produced statistically significant findings on a range of benefits of DAI for residents, including improved social functioning, reduced depression and reduced loneliness.

What are the implications of this new knowledge for nursing care with older people?

- There is potential for older adults to benefit from the provision of DAI in RLTCF, yet the full extent of such benefits remains to be determined.
- RLTC providers should explore all avenues for providing high-quality, evidence-based care that is able to enhance the quality of life of residents through enriching personal and interpersonal relationships in their everyday experiences.

How could the findings be used to influence policy or practice or research or education?

- The findings support development of a standardised format for designing, implementing and evaluating DAI in RLTCF, which would promote stakeholder inclusion and consistent methodology to determine its benefits.
- This research contributes to the evidence base for developing further guidance on how to expand and improve the quality of RLTCF services more generally.
- The research could lead to further exploration of potential partnerships between providers of animal-assisted interventions, RLTC and local community pet owners working together to improve the lives of local residents.

to make them feel welcome and involved (Nolan, 2001), and involving animals is one way to bridge these relationships essential to maintaining people's identities.

Dog-assisted interventions (DAIs) are one of the most common forms of AAI, mainly due to dogs' well-established emotional connections with human beings and receptiveness to behavioural training (Wells, 2009). Despite its initial evidence base (Ernst, 2014), the impact of DAI on older adults in RLTCF is not well understood. Currently, most reviews rely on results from different types of AAIs, and with substantial heterogeneity across inclusions of populations. For example, several large AAI reviews have been published between 2006 and 2018 (study inclusion range: 14–52), with few specifically focusing on DAI in RLTCF and including the entire resident population with results from qualitative studies as well as quantitative studies (Bernabei et al., 2013; Brimelow & Wollin, 2017; Brodaty & Burns, 2012; Filan & Llewellyn-Jones, 2006; Gardiner, Geldenhuys, & Gott, 2018; Hu, Zhang, Leng, Li, & Chen, 2018; Perkins, Bartlett, Travers, & Rand, 2008; Stern, 2011; Stern & Konno, 2011; Stern, Pearson, & Chur-Hansen, 2011a, 2011b; Virués-Ortega, Pastor-Barriuso, Castellote, Población, & de Pedro-Cuesta, 2012; Wood, Fields, Rose, & McLure, 2017; Yakimicki, Edwards, Richards, & Beck, 2019). Given the substantial variation across settings and observed effect on human interaction between animals, these reviews therefore provide little relevance for RLTCF with a particular interest in the effects of DAI.

This review expands on these previous AAI reviews by comprehensively reviewing studies reporting on DAI in RLTC populations with a range of care needs. We are also interested in documenting how DAI programmes have been evaluated and what are considered to be appropriate methods and measures to inform future research. Hence, this systematic review aims to (a) describe the methods and outcome measures that have been used to measure the impact of DAI among older people in RLTCF; (b) synthesise the reported benefits of DAI among older people in RLTCF; and (c) assess the quality of existing empirical evidence on DAI for older people in RLTCF.

2 | METHODS

This is a mixed-design systematic review which integrates quantitative and qualitative studies to examine intervention outcomes in conjunction with 'real life' experiences (Mays & Pope, 2000). The inclusion of qualitative studies offers a more holistic approach to our attempt to understand how, why and what effect DAI can have given some of the challenges in 'measuring' it. This also has the potential for exploring aspects of care outside of causality and positivistic factors. The protocol was registered in the PROSPERO registry prior to full commencement (CRD 42,018,098,799), and the review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher, Liberati, Tetzlaff, & Altman, 2009) and the Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines (Stroup et al., 2000).

2.1 | Search strategy

A comprehensive search of the following 18 databases broadly relevant to medicine, social care and social sciences was conducted: MEDLINE, EMBASE, PsychINFO (Ovid), CINAHL, British Education Index, AMED, Social Policy and Practice, Web of Science, Social Care Online, SCOPUS, ERIC, Proquest, International Bibliography of the Social Sciences, Science Citation Index, Cochrane library (Wiley), PubMed, Google Scholar and Open Grey. We limited the search to English literature published between 1 January 2000 and 31 December 2019 to capture the most recent decade of increased interest in DAI research and the preceding decade of earlier foundational research. Reference lists of screened articles and selected journal with outputs relevant to elderly populations including *Occupational Therapy Journal*, *Journal of psychosomatic research*, *Annals of Internal Medicine*, *JAMA*, *the Lancet and the BMJ* were handsearched. The search comprised a comprehensive set of search terms for 'older people', 'dogs' and 'RLTCF' modified from previous reviews in conjunction with a librarian (Table S1). The last retrieval of studies occurred on 10 March 2020.

2.2 | Study selection

Using Covidence's online review software (Covidence, 2017), article titles, abstracts and full-texts were independently reviewed by at least two researchers (S.S, S.O'F and T.H-L). Any disagreements over study inclusions were reviewed by a third reviewer (B.J) and resolved through discussion with the team. Applying the PICO format, we included any quantitative or qualitative study reporting on older adults (aged 65 years and over), including those identified as having high dependency needs (e.g. physical and cognitive impairment) (population); participating in any well-defined dog-assisted intervention delivered individually or by group through any means, regardless of duration and number of treatment sessions (intervention); while residing in any residential setting where older aged individuals have access to on-site care services or personal care (context); and measuring any change in psychosocial well-being related to the dog-assisted therapy or any psychosocial health outcome measure or instrument used to measure benefits or effectiveness of dog-assisted therapies (outcomes). Case studies, study protocols, studies with non-living dogs as the primary intervention (e.g. robotic or synthetic) and other animal-assisted interventions were excluded. We did not exclude specific clinical populations or studies based on sample size, given the limited study inclusions of previous reviews (Bernabei et al., 2013), and due to our inclusion of qualitative studies.

2.3 | Data extraction and quality assessment

Using a piloted and standardised form, two reviewers (S.S and B.J.) extracted study information in duplicate, including study design, country, sample size, setting (as described by authors), main

type of disorder or health problems among population, study aims, primary outcome instrument/measure, recruitment strategy, response rate/attrition (%), demographics (mean age, gender, ethnicity), intervention descriptions, effect estimates and follow-up intervals. For qualitative studies, we followed the guidelines laid out by Thomas and Harden (2008) and extracted all themes and result sections relevant to each study. Missing data were requested from four authors and excluded if not received within one month (100% response rate).

In the light of the broad inclusion criteria, the overall quality of studies was evaluated using the mixed methods appraisal tool (MMAT) (Pluye et al., 2011). Qualitative and quantitative studies were assessed on four key areas: appropriateness of data collection (e.g. sample representativeness and sampling strategy), appropriateness of analysis and ascertainment method, appropriateness of study interpretations with clear relevance to practice, and adequate methodological reflexivity or response rate. Mixed design studies were assessed in three additional domains: the appropriateness of the overall design, adequate integration of qualitative and quantitative findings and appropriate consideration given to limitations. Each study received a maximum score of 4, with mixed design studies being assigned the lowest overall quality score of its study components (Pluye et al., 2011). Aligning with similar reviews, studies were classified into low-quality (<3 points) or moderate-/high-quality (3 ≥ points) studies.

2.4 | Data synthesis

For RCTs, we pooled estimates using fixed-effects (I^2 < 40%) or random-effects meta-analyses (I^2 > 40%) when at least four studies were available with similar control groups and outcomes. Estimates were pooled using the inverse variance method, applying the DerSimonian-Laird estimator for the random-effects models (Borenstein, Hedges, Higgins, & Rothstein, 2011). As several studies used different outcome scales, we converted estimates into the Hedges' g, allowing for a common effect size (standardised mean difference; SMD, 0.2 to <0.5 = small, 0.5 to <0.8 = moderate, ≥0.8 = large effect) (Borenstein et al., 2011; Higgins et al., 2019). Estimates were selected based on the end point of each study's primary outcome. When studies were based on the same sample, we included only the most comprehensive study (e.g. higher quality and larger sample size) to minimise pooling of non-independent samples. The between-study heterogeneity was evaluated using χ^2 test, the I^2 statistic (heterogeneity: 0%–40%=small, 30%–60%=moderate, >75%=considerable) (Borenstein et al., 2011) and prediction intervals (IntHout, Ioannidis, Rovers, & Goeman, 2016). We also investigated the impact of individual studies on the between-study heterogeneity by serially excluding each study from the overall estimate. Studies with significantly large effects in either direction were examined further and excluded in the overall analysis if deemed inappropriate for pooling. Subgroup analyses and examination of publication bias were not statistically possible due to the limited studies (Sterne, Gavaghan, & Egger, 2000). All analyses were conducted in R (R Core Team, 2013) (version 3.6.1) using the 'meta' package (Schwarzer, 2007).

For qualitative studies, we employed framework analysis (Gale, Heath, Cameron, Rashid, & Redwood, 2013) and followed the recommendations by Thomas and Harden (2008) to conduct thematic synthesis. This involved coding of text to develop 'descriptive themes', close to the original study and then the generation of 'analytical themes' where reviewers' interpretation attempts to generate new interpretive constructs, explanations or hypotheses. Accordingly, two reviewers (T.H-L and S. O'F) coded line by line of the extracted qualitative data to form initial categories of each study's content. Codes were compared and refined in conjunction with a third reviewer (B.J) to achieve triangulation and then grouped into higher-order themes with relevance to our research question. Any disagreements over study themes were resolved through discussion with the team.

3 | RESULTS

3.1 | Search results and study characteristics

In total, the search returned 5,773 records, with 43 studies (including four qualitative) meeting the eligibility criteria for inclusion (Figure 1). The publication year of studies was fairly evenly distributed across the study period (2000–2019), with a noticeable increase in experimental studies in the most recent 10 years (n = 28), compared to those published before 2009 (n = 15) (Table 1). The largest proportion of studies were conducted in the United States (n = 16, 36%), followed by Italy (n = 7, 16%). The study designs broadly fell into four categories: randomised control trials (n = 16); pre-/postdesign studies (n = 14); quasi-experimental studies (n = 9); and qualitative cross-sectional studies (n = 4). The study settings were described in the different studies as nursing homes (n = 18), long-term care (LTC) facilities (n = 13) and other settings (n = 12) including specialised dementia care units, assisted living facilities and residential aged care services. Sample sizes ranged from 4 to 101 residents, with a pooled mean of 31 participants. The mean age of participants was reported in 30 studies, ranging from 55 to 88 years, and a pooled mean age of 83 years. Based on studies that reported gender frequencies, the majority of participants were female (71%). Quality assessment was conducted on the 39 quantitative studies using the MMAT assessment criteria (Table 2), and it was found that the vast majority of studies were considered low quality (n=26, 67%).

3.2 | Interventions

Dog-assisted interventions shared some common elements across studies. For example, the most common breed of dog were Retrievers (n = 14) and Labradors (n = 6), with the remaining being of multiple different breeds, ranging from small- to medium-sized dogs. Dog visits most frequently occurred one day per week (n = 17), for an intervention period of between 1 and 52 weeks (pooled mean of 13.8 weeks).

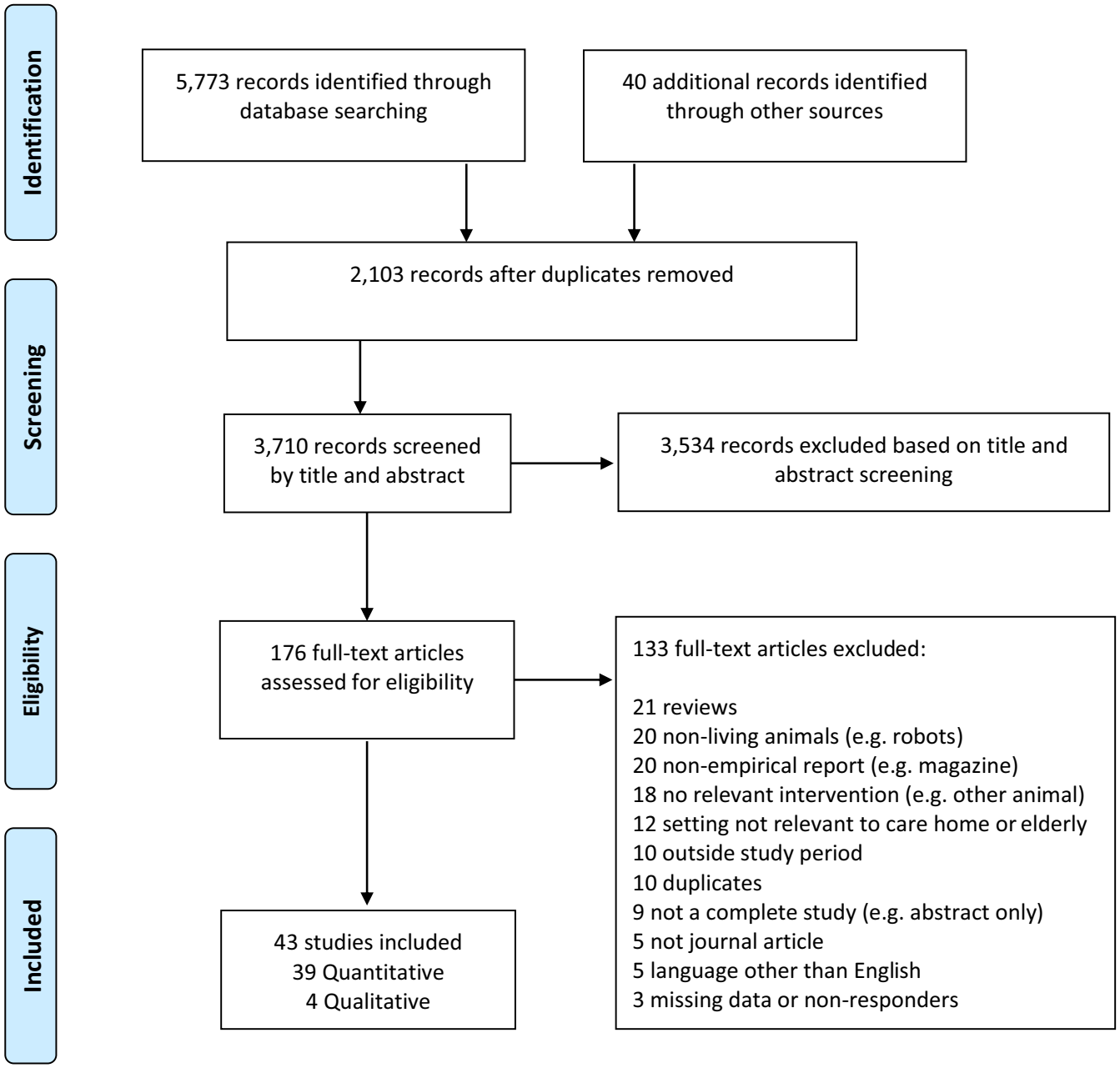

FIGURE 1 PRISMA flowchart

The duration of each visit ranged from 3 min (for individual one-on-one sessions) to 3 hr (for whole institution visits) across studies, with the most frequently used durations ranging from 30 to 90 min (n = 24). In most studies, the intervention group was compared to a control group (n = 28). The most frequently used control group was treatment as usual (n = 16), psychosocial group or social visits (n = 7) and interventions using robotic or plush toys (n = 4).

3.3 | Outcome measures and methods

The most common primary outcomes focused on reducing depression or low mood (n = 15), improving social functioning (n = 13) and improving overall cognitive functioning (n = 6). Some studies were more general and looked instead on resident's overall quality of life or the intervention's general effect on a range of health and social outcomes (n = 9). The most common ascertainment method was clinician or researcher interview (n = 18) using standardised tools such as the Mini-Mental State Exam (MMSE) (Folstein, Folstein, & McHugh, 1975), Geriatric Depression Scale (GDS) (Yesavage et al., 1982), Cohen Mansfield Agitation Inventory (CMAI) (Cohen-Mansfield & Billig, 1986) and the UCLA Loneliness Scale (Russell, 1996) (Table 1).

The results can be split into three groups based on study design: (a) postintervention outcomes compared to controls; (b) comparison of pre- and postoutcome for the same group; and (c) immediate

TABLE 1 Selected study characteristics of the included studies for this systematic review[a]

Source	Design	Country	Main health problem	*N*	Mean age, years (*SD*)	No. of females (%)	DAI type, duration
Travers, Perkins, Rand, Bartlett, and Morton (2013)	RCT	Australia	Dementia	55	84.9 (6.1)	43 (78.2)	GDAI, 40–50 min
Thodberg, Sørensen, Christensen, et al. (2016)	RCT	Denmark	Dementia/physical health issues	100	85.5 (NR)	69 (69.0)	IDAI, 10 min
Thodberg, Sørensen, Videbech, et al. (2016)[b]	RCT	Denmark	Dementia/physical health issues	101	85.5 (NR)	69 (68.3)	IDAI, 10 min
Bono et al. (2015)	RCT	Italy	Minor/mild AD	24	82.1 (6.2)	8 (33.3)	IDAI, 60 min
Sollami et al. (2017)	RCT	Italy	Mild cognitive impairment	28	NR	NR	IDAI, 60 min
Ambrosi, Zaiontz, Peragine, Sarchi, and Bona (2019)	RCT	Italy	Dementia	31	86.5 (NR)	29 (93.5)	GDAI, 30 min
Olsen et al. (2016)	RCT	Norway	Dementia	58	84.2 (NR)	32 (55.2)	GDAI, 30 min
Olsen, Pedersen, Bergland, Enders-Slegers, and Ihlebæk (2019)	RCT	Norway	Dementia/physical health issues	49	84.8 (NR)	26 (53.1)	GDAI, 30 min
Le Roux and Kemp (2009)	RCT	South Africa	Physical health issues	16	NR	8 (50)	GDAI, 30 min
Briones, Pardo-Garcia, and Escribano-Sotos (2019)	RCT	Spain	Dementia	34	88.71 (1.05)	25 (73.5)	GDAI, 50 min
Banks and Banks (2002)	RCT	USA	Physical health issues	45	NR	36 (80)	IDAI, 30 min
Banks and Banks (2005)	RCT	USA	Cognitive dysfunctions	33	80 (NR)	19 (57.6)	IDAI, 30 min
Banks et al. (2008)	RCT	USA	No history of dementia	38	NR	NR	IDAI and IDAI + Robot dog, 30 min
Barak et al. (2001)	RCT	USA	Chronic schizophrenia	20	79.1 (7.4)	14 (70)	GDAI, 180 min
Friedmann et al. (2015)	RCT	USA	Dementia/physical health issues	40	80.7 (9.1)	29 (72.5)	IDAI, 60–90 min
Lutwack-Bloom, Wijewickrama, and Smith (2005)	RCT	USA	NR	68	69.9 (NR)	40 (58.8)	GDAI, 15–20 min
Majic, Gutzmann, Heinz, Lang, and Rapp (2013)	QE	Germany	Dementia	54	81.7 (9.4)	38 (70.4)	IDAI, 45 min
Wesenberg, Mueller, Nestmann, and Holthoff-Detto (2019)	QE	Germany	Dementia	17	85.65 (4.83)	13 (76.5)	GDAI, 45 min
Berry et al. (2012)	QE	Italy	Dementia/physical health issues	19	85.0 (NR)	13 (68.4)	IDAI + Physical therapy, 60 min
Menna et al. (2016)	QE	Italy	Mild/moderate AD	50	75.0 (6.0)	37 (74)	IDAI + ROT therapy, 45 min
Moretti et al. (2011)	QE	Italy	Dementia/depression	21	84.7 (9.9)	20 (95.2)	IDAI, 90 min
Kanamori et al. (2001)	QE	Japan	Dementia	27	79.4 (6.1)	NR	IDAI
Hall and Malpus (2000)	QE	USA	Multiple psychiatric conditions	10	NR	NR	GDAI, 90 min

No. of weekly visits/No. of weeks	Comparator intervention	Primary outcome (ascertainment type)[c]	Main findings
2–3/11	Psychosocial group	Mood, quality of life and psychosocial functioning (CI)	No significant differences between groups across outcomes
1 (bi-weekly)/6	Toy cat and Robot seal	Behavioural/social engagement (AVR)	Significantly improved interaction during intervention compared to controls
2/6	Toy cat and Robot seal	Sleep, depression and cognitive capacity (CI)	No significant differences between groups across outcomes
1/32	TAU	Cognitive function (CI)	Significantly improved ADAS, Cornell and Barthel index scores postintervention compared to controls
2/16	TAU	Depression, anxiety and loneliness (SR)	Significantly improved depression and cognitive scores postintervention compared to controls
1/10	TAU	Depression, anxiety, and illness perception (CI)	Significant decrease in depression among intervention group, no significant difference in anxiety between groups.
2/12	TAU	Depression and agitation (RI)	Significantly improved CSDD scores post-intervention compared to controls
2/12	GDAI at day centre	Social engagement (AVR)	Few behavioural differences found between intervention and control group, despite significant baseline differences in degree of dementia, use of psychotropic medications and social contact.
3/6	TAU	Depression and anxiety (SR)	No significant differences across outcomes.
1/36	TAU	Quality of life (SR)	Increase in quality of life in both groups, but only significant for control group.
1–3/6	Intensive IDAI and TAU	Loneliness (SR)	Significantly reduced loneliness scores post-intervention compared to TAU
1/6	GDAI	Loneliness (SR)	No significant differences between groups across outcomes
1/8	TAU	Loneliness (SR)	Significantly reduced loneliness scores post-intervention compared to TAU
1/52	Psychosocial group	Social adaptiveness (CI)	Significantly improved SAFE Scores (i.e. social functioning) postintervention compared to controls
2/12	Psychosocial group	Biopsychosocial functioning (O)	Significantly improved depression scores postintervention relative to the controls.
3/24	TAU	Depression and anxiety	No significant differences across outcomes.
1/10	TAU	Depression and agitation/aggression (RI)	No significant differences between groups across outcomes
1/26	Psychosocial group	Social interaction, emotional, behavioural and psychological expressions (AVR)	Significantly longer and more frequent periods of positive emotions and social interaction were detected during intervention compared to control.
2/20	TAU	Quality of life (AVR)	No significant differences between groups across outcomes
1/36	TAU	Depression and cognitive function (RI)	Significantly improved GDS and MMSE scores postintervention compared to controls
4/6	TAU	Cognitive function, mood and quality of life (RI)	No significant differences across outcomes
1 (bi-weekly)/6	TAU	Cognitive function and problem behaviours (RI)	Between-group differences not compared
7/2	TAU	Social interaction (O)	Between-group differences not compared

(Continues)

TABLE 1 (Continued)

Source	Design	Country	Main health problem	*N*	Mean age, years (*SD*)	No. of females (%)	DAI type, duration
Kramer, Friedmann, and Bernstein (2009)	QE	USA	Dementia	8	NR	8 (100)	IDAI
Marx et al. (2010)	QE	USA	Dementia	56	87.0 (NR)	44 (78.6)	IDAI, 3–15min
Prosser, Townsend, and Staiger (2008)	PP	Australia	Physical health issues	18	85.1 (10.1)	16 (88.9)	GDAI, 90 min
Vrbanac et al. (2013)	PP	Croatia	NR	21	80.5 (6.6)	17 (80.9)	GDAI, 90 min
Mossello et al. (2011)	PP	Italy	Severe cognitive impairments	10	79 (6.0)	4 (40.0)	GDAI, 100 min
Kawamura, Niiyama, and Niiyama (2007)	PP	Japan	Dementia	10	Range: 75–95	9 (90)	IDAI, 120 min
Motomura, Yagi, and Ohyama (2004)	PP	Japan	AD	8	84.8 (7.0)	8 (100)	GDAI, 60 min
Karefjard and Nordgren (2018)	PP	Sweden	Alcohol related-dementia	59	Range: 61–82	34 (57.6)	IDAI
Nordgren and Engstrom (2014)	PP	Sweden	Dementia	20	Range: 58–88	12 (60.0)	IDAI, 45–60 min
Nordgren and Engstrom (2014)	PP	Sweden	Dementia	33	81 (NR)	12 (36.4)	IDAI, 45–60 min
Tournier, Vives, and Postal (2017)	PP	Switzerland	Dementia	11	82.9 (NR)	10 (90.9)	IDAI, 60 min
Bernstein et al. (2000)	PP	USA	Socially isolated	33	Range: 70–80	29 (87.9)	IDAI + activities, 60–120 min
McCabe, Baun, Speich and Agrawal (2002)	PP	USA	Dementia	22	83.7 (NR)	15 (68.2)	GDAI, 24 hr
Phelps, Miltenberger, Jens, and Wadeson (2008)	PP	USA	Elderly residents	5	84.2 (NR)	3 (60.0)	IDAI, 5–10
Richeson (2003)	PP	USA	Dementia	15	86.8 (NR)	14 (93.3)	GDAI
Sellers (2006)	PP	USA	Dementia	4	87.0 (NR)	3 (75.0)	IDAI, 15 min

Abbreviations: AD, Alzheimer's disease; AVR, audio visual recordings; CI, clinical interview; GDAI, group sessions of dog-assisted intervention; IDAI, individual dog-assisted intervention; N/A, not applicable; NR, not reported; O, observation; PP, pre-/postdesign; QE,quasi-experimental design; RCT, randomised controlled trial; RI, researcher interview; SR, self-report; TAU, treatment as usual.

[a]Studies are sorted by study design and alphabetically by country.

[b]Study linked to Thodberg, Sørensen, Christensen, et al. (2016) and Olsen et al. (2016), respectively.

[c]Method of outcome ascertainment (e.g. self-report, observer ratings, clinical interview).

effects of interaction with the dog on older adults detected during the intervention.

In the first group of studies, DAI was found to reduce depression (Friedmann et al., 2015; Menna, Santaniello, Gerardi, Di Maggio, & Milan, 2016; Olsen et al., 2016; Sollami, Gianferrari, Alfieri, Artioli, & Taffurelli, 2017); reduce loneliness (Banks & Banks, 2002; Banks, Willoughby, & Banks, 2008; Sollami et al., 2017); and improve social functioning (Barak, Savorai, Mavashev, & Beni, 2001; Hall & Malpus, 2000; Kaiser, Spence, McGavin, Struble, & Keilman, 2002; Sollami et al., 2017) in older adults living in RLTCF, compared to a control group who did not receive DAI.

Of nine RCTs with measures on depressive or loneliness symptoms, five RCTs provided adequate data for a meta-analysis (Figure 2). The pooled results showed a moderate significant effect of DAI on reducing depressive or loneliness symptoms immediately postintervention (SMD: 0.66, 95% CI: 0.21, 1.11; p = .004), relative to treatment as usual (TAU). There was moderate between-study heterogeneity (I^2 = 50.5%, Q = 8.1, τ^2 = 0.129, p = .004). We excluded one RCT with longer follow-up (8 months) from the main analysis, as substantially affected the overall between-study heterogeneity (I^2 = from 50% to 85%; Table S2). Similarly, three RCTs used active control groups including therapist or psychosocial interventions,

No. of weekly visits/No. of weeks	Comparator intervention	Primary outcome (ascertainment type)[c]	Main findings
1/3	Dog handler only and robot dog	Social interaction (AVR)	No significant differences across outcomes
1/1	Different dog-related activities	Intervention engagement	Significantly less time spent engaging with a small dog and the colouring activity relative to the puppy video and medium-/large-sized dogs
1/6	N/A	Depression (SR)	No significant differences between groups across outcomes
3/24	N/A	Loneliness (SR)	Significantly improved loneliness scores compared to baseline
3/3	Plush dog	Depression, anxiety and cognitive function (O)	Significantly reduced anxiety compared to baseline
1–2/52	N/A	Cognitive and social functioning (O)	No significant differences across outcomes at 12-month follow-up
4/1	N/A	Depression and cognitive function (RI)	No significant differences between groups across outcomes
1–2/10	N/A	Quality of life (CI)	Significantly improved quality of life scores compared to baseline
1/10	N/A	Quality of life (CI)	Significantly improved quality of life compared to baseline
1–2/26	TAU	Cognitive function (NR)	No significant differences between groups across outcomes
1/20	N/A	Cognitive function (O)	No significant differences between groups across outcomes
1/10	N/A	Social stimulation (O)	Significantly improved social interaction during visits compared to controls
7/4	N/A	Problem behaviours (O)	Significantly reduced problem behaviours during day time compared to baseline
1/6	N/A	Depression and social interaction (SR)	No significant differences between groups across outcomes
5/9	TAU	Cognitive function, agitation and social interaction (O)	Significantly reduced agitation scores and improved social interaction compared to baseline
5/5	N/A	Social interaction and agitation (AVR)	Significantly reduced agitation scores and improved social interaction compared to baseline

precluding reliable comparisons with estimates based on DAI versus TAU.

However, a further eight studies comparing postintervention outcomes found no significant differences between the intervention group and control group. Based on data from four RCTs, we found no overall effect of DAI on increasing activities of daily living or physical functioning three to eight months postintervention (SMD: −0.11, 95% CI: −0.74, 0.52; p = .737), compared to TAU (Figure 3).

Similarly, in the second group of studies that compared pretest to post-test results for the same group of older adults who had received DAI, 10 studies also found no significant changes. Among studies that did detect significant changes from pretest to post-test, DAI was found to reduce loneliness (Banks, 2005; Vrbanac et al., 2013); reduce agitation (Richeson, 2003; Sellers, 2006); improve social functioning (Sellers, 2006); and improve quality of life (Karefjard & Nordgren, 2018; Nordgren & Engstrom, 2014) for older adults living in RLTCF.

The final group of four studies found that the primary immediate effect of DAI for older adults during the intervention was increased social interaction or social behaviours (Bernstein, Friedmann, & Malaspina, 2000; Berry et al., 2012; Thodberg, Sørensen,

TABLE 2 Quality assessment (MMAT)

References	Study design	Sampling	Representativeness	Comparisons	Data completeness	Total score	Quality assessment (low=<3; good = 3+)
Bernstein et al. (2000)	1. Descriptive	0	0	1	0	1	Low
Hall and Malpus (2000)	1. Descriptive	1	0	1	1	3	Good
Karefjard and Nordgren (2018)	1. Descriptive	0	1	1	1	3	Good
Schwarzer (2007)	1. Descriptive	0	0	1	1	2	Low
Marx et al. (2010)	1. Descriptive	0	0	1	0	1	Low
McCabe et al. (2002)	1. Descriptive	0	0	1	1	2	Low
Mossello et al. (2011)	1. Descriptive	0	0	1	1	2	Low
Motomura et al. (2004)	1. Descriptive	0	0	0	0	0	Low
Nordgren and Engstrom (2014)	1. Descriptive	0	0	1	1	2	Low
Nordgren and Engstrom (2014)	1. Descriptive	1	1	1	0	3	Good
Phelps et al. (2008)	1. Descriptive	0	0	1	1	2	Low
Prosser et al. (2008)	1. Descriptive	0	0	1	1	2	Low
Richeson (2003)	1. Descriptive	0	0	1	1	2	Low
Sellers (2006)	1. Descriptive	0	0	1	1	2	Low
Tournier et al. (2017)	1. Descriptive	0	0	1	0	1	Low
Vrbanac et al. (2013)	1. Descriptive	0	0	1	1	2	Low

References	Study design	Sampling	Representativeness	Comparisons	Data completeness	Total score	Quality assessment (low=<3; good = 3+)
Berry et al. (2012)	2. Non-randomised	0	1	1	0	2	Low
Kanamori et al. (2001)	2. Non-randomised	0	1	1	0	2	Low
Kramer et al. (2009)	2. Non-randomised	0	0	1	1	2	Low
Majic et al. (2013)	2. Non-randomised	0	1	1	1	3	Good
Moretti et al. (2011)	2. Non-randomised	0	1	1	1	3	Good
Menna et al. (2016)	2. Non-randomised	0	1	1	1	3	Good
Wesenberg et al. (2019)	2. Non-randomised	0	1	1	1	3	Good

References	Study design	Randomisation	Allocation concealment	Blinding participant	Blinding researcher	Data completeness	Drop-out	Total score	Quality assessment (low=<3; good = 3+)
Ambrosi et al. (2019)	3. RCT	1	1	0	0	1	0	3	Good
Banks and Banks (2002)	3. RCT	0	0	0	0	0	0	0	Low
Banks and Banks (2005)	3. RCT	0	0	0	0	1	1	2	Low
Banks et al. (2008)	3. RCT	0	0	0	0	1	1	2	Low
Barak et al. (2001)	3. RCT	0	0	0	0	1	1	2	Low
Bono et al. (2015)	3. RCT	1	1	0	0	0	0	2	Low

(Continues)

TABLE 2 (Continued)

References	Study design	Randomisation	Allocation concealment	Blinding participant	Blinding researcher	Data completeness	Drop-out	Total score	Quality assessment (low=<3; good = 3+)
Briones et al. (2019)	3. RCT	1	1	0	0	0	0	2	Low
Friedmann et al. (2015)	3. RCT	1	0	0	0	1	1	3	Good
Le Roux and Kemp (2009)	3. RCT	0	0	0	0	1	1	2	Low
Lutwack-Bloom et al. (2005)	3. RCT	0	0	1	1	1	1	4	Good
Olsen et al. (2016)	3. RCT	1	0	0	0	1	1	3	Good
Olsen et al. (2019)	3. RCT	0	0	0	0	0	0	0	Low
Sollami et al. (2017)	3. RCT	0	0	0	0	1	1	2	Low
Thodberg, Sørensen, Christensen, et al. (2016)	3. RCT	1	0	0	0	1	1	3	Good
Thodberg, Sørensen, Videbech, et al. (2016)	3. RCT	1	0	0	0	1	1	3	Good
Travers et al. (2013)	3. RCT	1	0	0	0	1	0	2	Low

Christensen, et al., 2016; Thodberg, Sørensen, Videbech, et al., 2016).

Overall, almost half of the quantitative studies (n=18, 46%) found no statistically significant changes over time or differences between groups across outcomes. Of those that did detect significant results, the main impacts for older adults as a result of the DAI included improved social functioning (n = 10), reduced depression (n = 6), and reduced loneliness (n = 5).

3.4 | Findings from qualitative synthesis

The four qualitative studies (Coleman, 2016a; Gundersen & Johannessen, 2018; McCullough, 2014; Swall, Ebbeskog, Lundh Hagelin, & Fagerberg, 2015) explored attitudes or feelings towards the presence of animals among older people and their carers. Despite their different contexts and target population, our thematic synthesis revealed three common key themes across the studies (Figure 4).

3.4.1 | Theme 1: Animals as effective transitional objects

Animals were often described as effective transitional objects to supplement missing interaction by either 'filling a void' or supplementing other human interactions and bonds (p.154) (Coleman, 2016a). There were references to dogs providing a stimulus for conversation or 'talking stick' (p.72) (McCullough, 2014) which triggered life review (Coleman, 2016a), storytelling (McCullough, 2014), offered an opportunity for resident's to express affection (McCullough, 2014) and facilitated revelation of residents personalities. These opportunities provided carers with unknown glimpses into the older person's personal life experiences (Gundersen & Johannessen, 2018) and enhanced reciprocity. As a result, cross-communication was facilitated between individuals that did not usually come together (the resident, dog, handler/volunteer, caregiver, family member), in a joyful manner (McCullough, 2014). McCullough (2014) spoke about how this ensured that the older person was the focal point of the interaction and the importance of directing DAI towards the resident for their benefit and enjoyment. Time spent with a dog enabled an opportunity for others to be able to reach the person on a cognitive level rather than simply responding in a reactionary manner to physical care needs (Swall et al., 2015). The potential offered through these developments to enhance and focus communication with the older people and towards a more person-centred approach to their care were posited as significant benefits and a means of addressing or rebalancing well-documented unequal power relations in institutions. Reminiscence was frequently reported as an outcome of DAI (Coleman, 2016a; Gundersen & Johannessen, 2018; McCullough, 2014; Swall et al., 2015), and the presence of a dog was reported to act as memory triggers and evoked feelings from 'time and places retold'. These memories could also be triggers for other

memories that open up and are reflected upon in a coherent way (Swall et al., 2015). Swall et al.'s study of people with Alzheimers suggested that the dog provoked feelings of confidence and strength through its presence, and a means of promoting self-esteem where they acted to protect, care and take responsibility for the dog (Swall et al., 2015). These recollections and feelings could be negative as well as positive and occurred in the moment through senses and memories which served to enhance 'one's past and present existence' through an emotionally connected experience of living (p.19) (Swall et al., 2015).

3.4.2 | Theme 2: The value of pets as therapy and the nature of that therapeutic value

While many of the impacts of DAI described constituted 'naive' descriptions (p.21) (Swall et al., 2015), impacts such as reducing stress, spiritual connection, being in the moment and 'create a good moment' for those with affected cognitive function (Gundersen & Johannessen, 2018) were all cited as observed or perceived benefits for those who were not able to sustain other relationships. Sensatory comfort was described as significant in the absence of carers being able to meet some of the older person's unspoken needs such as personal loss and the need for physical comforting, particularly at the end of life (Coleman, 2016a). Existential perspectives on life and living (Swall et al., 2015) were attributed with the use of such words as 'love' (p.78) (McCullough, 2014) and 'communion' (p.1) (Swall et al., 2015) and 'harmony' (p.13) (Swall et al., 2015). These sensations provided a sense of release and tears (McCullough, 2014) and were observed to provoke heightened sensitivity in the dogs themselves. These were expressed through changed voice and body language as well as through facial expressions (Swall et al., 2015). By focusing on the physical interaction (cuddling, touching, stroking) and the responsiveness of the dog and recipients of therapy, there were constant references which anthropomorphised the love that the dogs show and how they act it out and the independence of dogs in deciding who they approach. In addition to physical effects, several handlers described the emotional release that affection with their therapy dog can generate. This positioned the dog as a co-therapist. Participants' comments described the enduring connection of the human–animal bond, as well as the non-judgemental relationship that seemed to exist between therapy animals and the people they encounter. Participants also spoke about the seeming inherent ability for the animals to identify those individuals who need their attention the most (Coleman, 2016a). Two of the studies specifically addressed caregiver insights into the value of DAI (Coleman, 2016a; Gundersen & Johannessen, 2018; Swall et al., 2015) and the impact on their own roles and well-being. The need for psychosocial stimulation was specifically noted as a challenge to focus on in their otherwise busy day and the rewards where some were able to observe benefits such as calmer moods and behaviour (Coleman, 2016a; Gundersen & Johannessen, 2018; Swall et al., 2015). Two studies focused on the role of the dog handler (Gundersen & Johannessen, 2018; McCullough, 2014).

The studies reported some theorising about why and how DAI was of value—and reflected on how the methodologies enabled demonstration of this. Two domains of supportive behaviour were found to be commonly exhibited by the dogs during their visits: 'interest' and 'affection'. Swall et al. (2015) used a lifeworld approach and reflected on the use of phenomenological hermeneutics in which the researcher 'enters the hermeneutical circle with an ongoing movement between the parts and the whole in the text' (p.22) (Swall et al., 2015). They discussed how their structural analysis validated the naïve readings, and with the aim of the study in mind, the analysis moved back and forth to get a deeper understanding of the phenomenon to interpret the lived experience of the person with dementia in their encounters with a dog.

3.4.3 | Theme 3: The significance of the care environment and its stakeholders in facilitating dog-assisted interventions

Purposive induction to the reasons, procedure and desired outcomes for visits from dogs and their handlers were found to contribute to a more positive environment in which they took place (Coleman, 2016a; Gundersen & Johannessen, 2018). Other enabling factors included continuity, involvement of staff, staff

Source	No. DAI/TAU	Instrument	Follow-up	SMD (95% CI)	Weight, %
Ambrosi, 2019	17/12	GDS	IP (10-weeks)	1.42 (0.59, 2.25)	17.1
Banks, 2002	15/15	UCLA-LS	IP (7-weeks)	1.02 (0.23, 1.82)	17.8
LeRoux, 2009	8/8	BDI	IP (6-weeks)	0.42 (−0.57, 1.41)	13.7
Lutwack-Bloom, 2005	42/26	GDS	IP (6-months)	0.60 (0.09, 1.11)	26.8
Olsen, 2016b	22/25	CSDD	3-months	0.08 (−0.49, 0.66)	24.5
Pooled estimate:	104/86			0.66 (0.21, 1.11)	
Prediction interval:				[−0.70, 2.02]	

Heterogeneity: I^2 = 50.5%, Q = 8.1, τ^2 = .129, p = .004

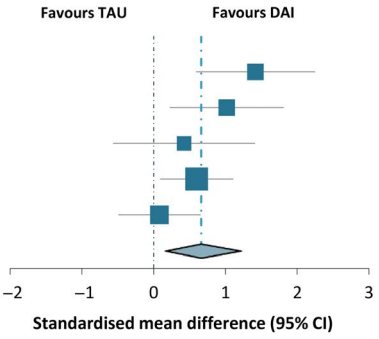

FIGURE 2 Effect of dog-assisted intervention (DAI) versus treatment as usual (TAU) on depressive or loneliness symptoms among older adults in residential long-term care facilities

Source	No. DAI/TAU	Instrument	Follow-up	SMD (95% CI)	Weight, %
Barak, 2001	10/10	SAFE	12-months	−1.12 (-2.13, −0.11)	19.7
Bono, 2015	12/12	BI	8-months	−0.32 (−1.17, 0.53)	23.0
Friedmann, 2015	19/18	BI	3-months	0.62 (−0.06, 1.30)	27.0
Travers, 2013	27/26	SF-36-Sub	IP (11-weeks)	0.06 (−0.49, 0.61)	30.3
Pooled estimate:	68/66			−0.11 (−0.74, 0.52)	
Prediction interval:				[−2.71, 2.50]	

Heterogeneity: I^2 = 64.5%, Q = 8.4, τ^2 = 0.263, p = .0375

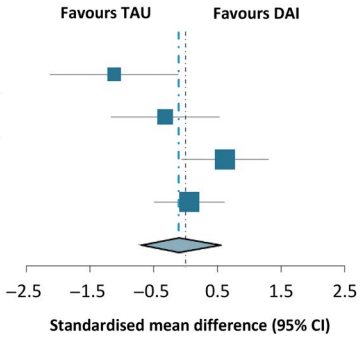

FIGURE 3 Effect of dog-assisted intervention (DAI) versus treatment as usual (TAU) on activities of daily living or physical functioning among older adults in residential long-term care facilities

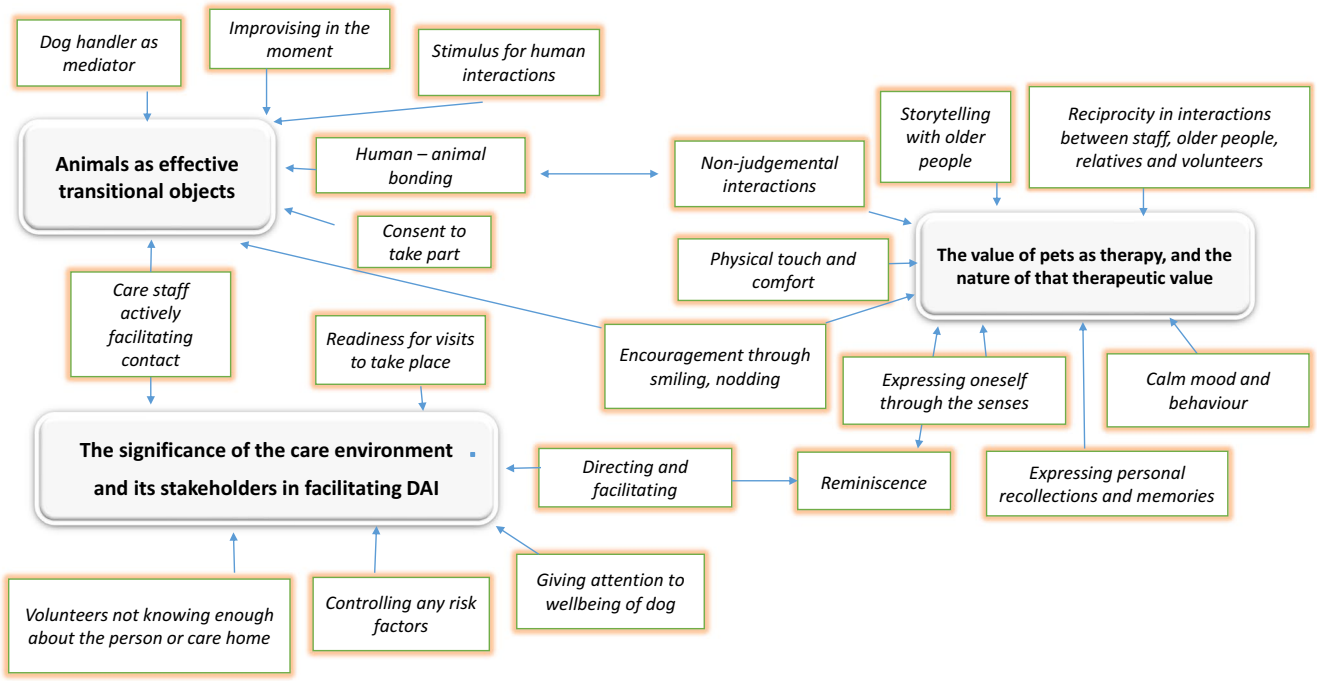

FIGURE 4 Conceptual map of thematic synthesis from qualitative studies

awareness of the potential, being invested and recognition of confidentiality.

For the dog handlers/volunteers, positive responses and engagement from nursing home leaders and nurses were of considerable importance. Care staff were described as having a significant role in facilitating, for example, by preparing the room, thinking about groups size or the optimum time for individuals, with afternoon being the best time (Gundersen & Johannessen, 2018). Knowledge and professional confidence were acknowledged as buffers to maximise success of visits. The need for both structure and flexibility was emphasised. The need for both structure and flexibility was emphasised in order for residents to get the most out of the dog visits. This included the structure provided by knowing that their visits were being included in the environmental routine, and having the cooperation and collaboration with care staff, and the flexibility for dog-handlers to apply their own personal approach. This also depended on the experience and confidence of dog handlers and being able to focus on the quality of their visits. The facilitation and improvisation skills of the dog handler were commented on significantly (Gundersen & Johannessen, 2018; McCullough, 2014), for example, to scan the environment, to guide older people if they were not active and to ensure the dogs welfare. The dog handler needed to tailor the dog's interaction to the older person by observing responsiveness and ensuring a supportive interaction is appropriate at a particular point in time with a particular individual. This could be passive such as nodding, smiling and giving encouragement as well as giving more active or directive encouragement by giving compliments or praise to the older person and the dog as interaction takes place, or elaborating on how the person could enhance the interaction and physically helping them to do this and also by contributing their own personal comments such as conveying good wishes for the person's health (McCullough, 2014).

Environmental conditions also included the provision of training and certification programmes from the DAI provider organisation and collaborative support from other dog handlers (Coleman, 2016a; Gundersen & Johannessen, 2018). Volunteers talked about the need for induction for volunteers on conditions such as dementia so that they could respond better to older residents behaviour (Gundersen & Johannessen, 2018). They also faced barriers if they had insufficient information about residents. All of the studies referred to controlling potential risk factors such as hygiene and allergens which were attended to, and none of these were seen to present any challenges.

Ethical issues were reflected upon such as the importance of reciprocity and mutually beneficial interaction for the dogs and need for ethical standards for the use of dogs in the field to ensure the dog's well-being during DAI and rest and recuperation after visits (McCullough, 2014). Also, in the research process itself, proxy consent was used when some participants were not able to consent either to the visit or to the observations. All of the studies had been given ethical approval.

4 | DISCUSSION

4.1 | Summary of findings

This systematic review identified 43 peer-reviewed research articles examining the impact of DAI on older people living in RLTCF published between 2000 and 2018. The majority (~70%) of these were classified as low-quality studies according to the MMAT criteria. The paucity of high-quality empirical research is surprising given the popularised use of DAI in RLTCF in many countries. Anecdotally, and perhaps quite obviously, a dog visiting an older person in a RLTCF is generally considered to be a good thing that makes people happy, and as such is often used as the go-to 'good news story' for local media (Oksman, 2015). Communities are now beginning to accept and formalise these assertions by developing protocols to support organisations considering working with dogs in care settings and allied health environments (Royal College of Nursing, 2018). A next logical step would be to identify how such protocols assist in the evaluation of DAIs as the challenge faced thus far, and has been illustrated by this review, is the variation in how DAI programmes are designed and delivered. Better quality evaluation may be possible when the practice becomes more formalised.

Almost half of the quantitative studies evaluating the impact of DAI for older people in RLTCF found no significant changes over time, or differences between experimental and control groups, in the outcomes measured. Most likely, this finding reflects the high proportion of low-quality studies in the field, coupled with the challenges associated with designing and conducting research in RLTCF (S. Hall, Longhurst, & Higginson, 2009; Lam et al., 2018). The remaining 21 quantitative studies did identify improved social functioning; reduced depression; and reduced loneliness as significant benefits of DAI for residents. In particular, the strongest impact of DAI seemed to be conferred through improved social functioning, observed both during the intervention and postintervention. It is also likely that these effects are correlated in some way or at least have a 'flow-on' effect. In other words, if an older person participates in DAT, they will likely benefit from positive social interaction with the dog, the handler, care staff and possibly other residents which in turn may help to alleviate their feelings of loneliness and depression. While this review has highlighted studies that have identified statistically significant benefits of DAI for older adults in RLTCF, it is important not to overstate these or to ignore the many studies that have been unable to produce significant results.

The surprisingly limited amount of qualitative research published in this area provides additional insight into how and why DAI may produce such benefits for older adults. With dogs operating as 'effective transitional objects', DAI provides an opportunity for staff to connect with residents outside of the usual care routine (primarily focused on addressing basic physical care needs) and begin to address their emotional care needs as well. With the many challenges faced for RLTC staff such as time constraints and high turnover rates, this can mean that there is significant value in finding community-based interventions that are low cost and compliment traditional care relationships and settings. While the qualitative studies did not address this issue directly, most implied the need for more creativity and support for staff in how care is organised and delivered, with residents' needs kept at the forefront. The qualitative studies also highlighted the 'therapeutic value' of DAT, as perceived by observers and stakeholders. This is supported by the 18 quantitative studies that found significant social and health benefits of engaging in DAI. Despite increased interest in social prescribing within health and social care, particularly in relation to sustainability in care services (Hoy, 2014; The Kings Fund, 2017), there remains insufficient evidence on the efficacy, efficiency and cost benefits of DAI for people in RLTCF. Hence, there is a need to actively engage the support of community initiatives such as general practices, voluntary and third sector organisations to move this agenda forward. This involves mapping local assets, groups and activities; developing ways to find and use information about local sources of support; collecting evaluation data; and developing local plans for demonstrating what AAI has to offer. With regard to the current state of evidence and competing priorities in ageing care, it will be important to strengthen our understanding of holistic interventions that contribute to enhanced well-being and enrichment of the experience of older residents of RLTCF and their continued connectedness to community. This is important for the biopsychosocial health of this group. Finally, the studies highlighted that the care provider and staff have an extremely important role to play in the success of DAI. The irony for staff is the recognition that their role is central to resident quality of life and that the relationship between the resident and caregiver is a central feature of this quality (Bowers, Esmond, & Jacobson, 2000).

In addition to identifying the benefits of DAI, this research was also interested in the design of DAI which typically involved a 30- to 90-min visit from a small- to medium-sized dog accompanied by a handler once a week for a period of 13 weeks. Despite these

commonalities, there was significant variation in how DAI is administered in RLTCF and how it has been evaluated. This leads to an unclear and somewhat patchy picture of how social care practice contributes to positive outcomes and how best practice models can be developed.

4.2 | Strengths and limitations

To our knowledge, this is the most comprehensive and contemporary systematic review on DAI for older people living in RLTCF conducted to date. This review focused on DAI in RLTCF, yet no limitation was placed on the population within this setting, allowing us to identify and synthesise results from a considerable number of relevant studies in comparison with previous reviews (Bernabei et al., 2013;Lundqvist, Carlsson, Sjodahl, Theodorsson, & Levin, 2017; Yakimicki et al., 2019). In addition, the inclusion of qualitative studies provided an opportunity for further insight into what actually occurs during the DAI sessions: the role the dogs play, the value of this experience for residents, and in some cases, for staff themselves, and the importance of the care environment and its stakeholders in successfully facilitating DAI sessions.

Limitations of the systematic search include that articles were restricted to those that were peer-reviewed and published in the English language. This means relevant articles published in other languages or from other sources may not have been captured, although this is unlikely to have significantly altered the overall findings of the review. Further, we placed no restrictions on study design, sample size or outcome measures for included studies. The wide array of symptoms measured and variation in study design resulted in difficulty comparing results across studies. Quality assessment was conducted using the MMAT to be able to identify and acknowledge low-quality studies.

We have not discussed the psychometric properties of any of the measurement tools used in the quantitative studies identified here. For example, the GDS was originally developed as a screening tool but has also been used as an outcome measure and the review has not been able to take account of these potential differences in relation to assessing the outcome of the interventions evaluated including the relevance and challenges in using these tools with people living with dementia and other cognitive dysfunctions which was present for many of the included studies participants. It may be that measures in current use to assess the impact of DAT were not able to pick up these nuances. They are also just one of multiple measures of mental health and quality of life among older people living in RLTCF where there are complex needs.

Given there were only four qualitative studies, it is difficult to generalise and say anything concrete about our understanding of the context and sequence of the actual interactions described. This knowledge gap is detrimental to the field of DAI as it restricts a fuller analysis of these types of interactions and thus limits the development of best practices to maximise the effectiveness of these interventions.

Implications for practice

- The findings of this review have implications for policy and practice (of both care providers and organisations offering DAI services), research and for older people themselves. Research in RLTCF is a growing field of inquiry, and there is currently a poor understanding of interventions that may improve the experience for people living in them (National Institute for Health Research, 2017). Highlighting the themes from reviewing interventions involving DAI may contribute to the evidence needed for developing further guidance on how to expand and improve the quality and range of support currently provided in many RLTCF. This is particularly important in the context of significant challenges for making further resources available and to develop tools and approaches to strengthen formal and informal caregivers' relationships with older people living in hidden communities. This includes identifying interventions that foster capacity building in RLTCF that expand and encourage the use of broader social roles in the local community (Hafford-Letchfield & Lavender, 2015). Some of the themes from the review captured the unexplored potential of partnerships with DAI provider agencies and local community members coming in with their pets and that there may be wider benefits for those involved. These may reflect a more local approach dependent on community relationships and the move towards developing initiatives that facilitate person-centred care. However, as illustrated in this review, there is insufficient evidence to support a policy and commissioning response around AAT. While the evidence from the qualitative synthesis has demonstrated some positive impacts, much more work needs to be done to research and understand these impacts in such a way that any evidence can inform a more structured approach to commissioning AAI within RLTCF and to explore any specific therapeutic effects. Based on initial studies (Dayson & Bennett, 2016; Kimberlee, Jones, & Powell, 2013), there appear to be some synergies between older adults in RLTCF and patients who benefited through improvements in their quality of life and emotional well-being, mental and general well-being and levels of depression and anxiety (The Kings Fund, 2017). Supporting community partnerships with RLTCF at individual, organisational and system levels may be key to achieving the outcomes that matter most to residents and their relatives and capitalise on the pivotal role of the RLTCF manager in creating a culture in homes that enables engagement and change (National Institute for Health Research, 2017).

- Due to the variation in study designs and outcome measures used, it is still difficult to determine which components of DAI are most effective. An internationally recognised and standardised format for designing, implementing and evaluating DAI in RLTCF would not only assist in determining its benefits through consistent methodology but would also help to ensure that the needs and wishes of all stakeholders (i.e. dogs, handlers/volunteers, older people, care staff, care providers) are taken into account and are reflected in practice. In addition, further research is needed on older peoples own role in being collaborators or advisors in research (Backhouse et al., 2016) as many studies did not address this. The current review documents the methods and measures that have been used in studies to design and deliver DAI in RLTCF and assess relevant outcomes, which can be used to help formulate a standardised approach to the design, delivery and evaluation of DAI in these settings in future.
- Moving to a RLTCF in later life frequently involves significant life changes. These include shifts in roles and social positions and the need to deal with personal loss (including of close relationships) and to develop and sustain a new sense of self (Sullivan & Williams, 2017). For some residents, this may also include the loss of a companion animal when RLTCF will not accept pets (McNicholas, 2008), heightening the value of AAI programmes. Some findings from the review highlighted the contribution of DAI to helping older people bridge the making of new relationships, to enrich existing care relationships and to tailor support. The World Health Organization asserts the aspirations of older people, particularly those in institutional long-term care settings, to experience support for their well-being and respect regardless of declines in physical and mental capacity (World Health Organization, 2015). As such, older people living in RLTCF who have experienced significant issues impacting on their health and well-being and increased dependencies are entitled to receive the care and support of others consistent with their basic rights, fundamental freedoms and human dignity. It is incumbent upon those responsible for their care to explore all avenues and develop a strong evidence base for providing high-quality care that not only meets the basic needs of residents but exceeds expectations by enhancing quality of life.

CONFLICT OF INTEREST

The authors confirm they have no conflict of interests to declare.

AUTHOR CONTRIBUTIONS

BJ was responsible for study conception and design, data collection and analysis, drafting and final approval of the manuscript and team coordination. SS was hired as an external contractor to assist with the design and conduct of the review, including data collection and analysis, initial drafting of the methods and results, critical revisions and final approval of the manuscript. THL was responsible for study conception and design, data collection and analysis, initial drafts of the introduction and discussion, critical revisions and final approval of the manuscript. SOFP was responsible for study conception, elements of data collection, critical revisions and final approval of the manuscript.

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REFERENCES

Allen, K., Blascovich, J., & Mendes, W. (2002). Cardiovascular reactivity and the presence of pets, friends, and spouses: The truth about cats and dogs. *Psychosomatic Medicine*, *64*(5), 727–739. https://doi.org/10.1097/01.PSY.0000024236.11538.41

Ambrosi, C., Zaiontz, C., Peragine, G., Sarchi, S., & Bona, F. (2019). Randomized controlled study on the effectiveness of animal-assisted therapy on depression, anxiety, and illness perception in institutionalized elderly. *Psychogeriatrics*, *19*(1), 55–64. https://doi.org/10.1111/psyg.12367

Backhouse, T., Kenkmann, A., Lane, K., Penhale, B., Poland, F., & Killett, A. (2016). Older care-home residents as collaborators or advisors in research: A systematic review. *Age and Ageing*, *45*(3), 337–345. https://doi.org/10.1093/ageing/afv201

Banks, M. R., & Banks, W. A. (2002). The effects of animal-assisted therapy on loneliness in an elderly population in long-term care facilities. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *57*(7), M428–M432. https://doi.org/10.1093/gerona/57.7.M428

Banks, M. R., & Banks, W. A. (2005). The effects of group and individual animal-assisted therapy on loneliness in residents of long-term care facilities. *Anthrozoös*, *18*(4), 396–408. https://doi.org/10.2752/089279305785593983

Banks, M. R., Willoughby, L. M., & Banks, W. A. (2008). Animal-assisted therapy and loneliness in nursing homes: Use of robotic versus living dogs. *Journal of the American Medical Directors Association*, *9*(3), 173–177. https://doi.org/10.1016/j.jamda.2007.11.007

Barak, Y., Savorai, O., Mavashev, S., & Beni, A. (2001). Animal-assisted therapy for elderly schizophrenic patients: A one-year controlled trial. *American Journal of Geriatric Psychiatry*, *9*(4), 439–442. https://doi.org/10.1097/00019442-200111000-00013

Bernabei, V., De Ronchi, D., La Ferla, T., Moretti, F., Tonelli, L., Ferrari, B., … Atti, A. R. (2013). Animal-assisted interventions for elderly patients affected by dementia or psychiatric disorders: A review. *Journal of Psychiatric Research*, *47*(6), 762–773. https://doi.org/10.1016/j.jpsychires.2012.12.014

Bernstein, P. L., Friedmann, E., & Malaspina, A. (2000). Animal-assisted therapy enhances resident social interaction and initiation in long-term care facilities. *Anthrozoös*, *13*(4), 213–224. https://doi.org/10.2752/089279300786999743

Berry, A., Borgi, M., Terranova, L., Chiarotti, F., Alleva, E., & Cirulli, F. (2012). Developing effective animal-assisted intervention

programs involving visiting dogs for institutionalized geriatric patients: A pilot study. *Psychogeriatrics*, *12*(3), 143–150. https://doi.org/10.1111/j.1479-8301.2011.00393.x

Bono, A. V., Benvenuti, C., Buzzi, M., Ciatti, R., Chiarelli, V., Chiambretto, P., … Valena, E. (2015). Effects of animal assisted therapy (AAT) carried out with dogs on the evolution of mild cognitive impairment. *Journal of Gerontology and Geriatrics*, *63*, 32–36.

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2011). *Introduction to meta-analysis*. John Wiley & Sons.

Bowers, B. J., Esmond, S., & Jacobson, N. (2000). The relationship between staffing and quality in long-term care facilities: Exploring the views of nurse aides. *Journal of Nursing Care Quality*, *14*(4), 55–64; quiz 73–55. https://doi.org/10.1097/00001786-200007000-00009

Brimelow, R. E., & Wollin, J. A. (2017). Loneliness in old age: Interventions to curb loneliness in long-term care facilities. *Activities, Adaptation & Aging*, *41*(4), 301–315. https://doi.org/10.1080/01924788.2017.1326766

Briones, M. A., Pardo-Garcia, I., & Escribano-Sotos, F. (2019). Effectiveness of a Dog-Assisted Therapy Program to Enhance Quality of Life in Institutionalized Dementia Patients. *Clin Nurs Res*, 1054773819867250, https://doi.org/10.1177/1054773819867250

Brodaty, H., & Burns, K. (2012). Nonpharmacological management of apathy in dementia: A systematic review. *American Journal of Geriatric Psychiatry*, *20*(7), 549–564. https://doi.org/10.1097/JGP.0b013e31822be242

Care Quality Commission (2018). *The State of Health and Adult Social Care 2018*. Retrieved from https://www.cqc.org.uk/sites/default/files/20171011_stateofcare1718_report.pdf

Chatterji, S., Byles, J., Cutler, D., Seeman, T., & Verdes, E. (2015). Health, functioning, and disability in older adults–present status and future implications. *Lancet*, *385*(9967), 563–575. https://doi.org/10.1016/s0140-6736(14)61462-8

Cohen-Mansfield, J., & Billig, N. (1986). Agitated behaviors in the elderly. I. A conceptual review. *Journal of the American Geriatrics Society*, *34*(10), 711–721. https://doi.org/10.1111/j.1532-5415.1986.tb04302.x

Coleman, C. (2016a). *The experience of hospice caregivers providing animal-assisted therapy to hospice patients*. (Doctor of Philosophy), Cappella University, ProQuest.

Coleman, E. A. (2016b). Family caregivers as partners in care transitions: The caregiver advise record and enable act. *Journal of Hospital Medicine*, *11*(12), 883–885. https://doi.org/10.1002/jhm.2637

Covidence (2017). *Covidence systematic review software*. Melbourne, Australia: Veritas Health Innovation. Retrieved from www.covidence.org

Dayson, C., & Bennett, E. (2016). *Evaluation of the Rotherham Mental Health Social Prescribing Pilot*. Retrieved from https://www4.shu.ac.uk/research/cresr/sites/shu.ac.uk/files/eval-rotherham-mental-health-social-prescribing.pdf

Ernst, L. (2014). Animal-assisted therapy: An exploration of its history, healing benefits, and how skilled nursing facilities can set up programs. *Annals of Long-Term Care: Clinical Care and Aging*, *22*(10), 27–32.

Filan, S. L., & Llewellyn-Jones, R. H. (2006). Animal-assisted therapy for dementia: A review of the literature. *International Psychogeriatrics*, *18*(4), 597–611. https://doi.org/10.1017/s1041610206003322

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, *12*(3), 189–198. https://doi.org/10.1016/0022-3956(75)90026-6

Friedmann, E., Galik, E., Thomas, S. A., Hall, P. S., Chung, S. Y., & McCune, S. (2015). Evaluation of a pet-assisted living intervention for improving functional status in assisted living residents with mild to moderate cognitive impairment: A pilot study. *American Journal of Alzheimer's Disease & Other Dementiasr*, *30*(3), 276–289. https://doi.org/10.1177/1533317514545477

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, *13*, 117. https://doi.org/10.1186/1471-2288-13-117

Gardiner, C., Geldenhuys, G., & Gott, M. (2018). Interventions to reduce social isolation and loneliness among older people: An integrative review. *Health and Social Care in the Community*, *26*(2), 147–157. https://doi.org/10.1111/hsc.12367

Gundersen, E. D., & Johannessen, B. (2018). What motivates arrangements of dog visits in nursing homes? Experiences by dog handlers and nurses. *Complement Ther Clin Pract*, *31*, 104–110. https://doi.org/10.1016/j.ctcp.2018.02.007

Hafford-Letchfield, T., & Lavender, P. (2015). Quality improvement through the paradigm of learning. *Quality in Ageing and Older Adults*, *16*(4), 195–207. https://doi.org/10.1108/QAOA-02-2015-0009

Hall, P. L., & Malpus, Z. (2000). Pets as therapy: Effects on social interaction in long-stay psychiatry. *British Journal of Nursing*, *9*(21), 2220–2225. https://doi.org/10.12968/bjon.2000.9.21.5425

Hall, S., Longhurst, S., & Higginson, I. J. (2009). Challenges to conducting research with older people living in nursing homes. *BMC Geriatrics*, *9*(1), 38. https://doi.org/10.1186/1471-2318-9-38

Higgins, J., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M., & Welch, V. (Eds). (2019). *Cochrane Handbook for Systematic Reviews of Interventions version 6.0 (updated July 2019)*. Retrieved from www.training.cochrane.org/handbook: Cochrane, 2019.

Hoy, C. (2014). *Ageing Better: Social prescribing and older people: Guide to developing development project plans*. Retrieved from Social Care Institute for Excellence: www.scie.org.uk

Hu, M., Zhang, P., Leng, M., Li, C., & Chen, L. (2018). Animal-assisted intervention for individuals with cognitive impairment: A meta-analysis of randomized controlled trials and quasi-randomized controlled trials. *Psychiatry Research*, *260*, 418–427. https://doi.org/10.1016/j.psychres.2017.12.016

IntHout, J., Ioannidis, J. P. A., Rovers, M. M., & Goeman, J. J. (2016). Plea for routinely presenting prediction intervals in meta-analysis. *British Medical Journal Open*, *6*(7), e010247. https://doi.org/10.1136/bmjopen-2015-010247

Islam, M. S., Baker, C., Huxley, P., Russell, I. T., & Dennis, M. S. (2017). The nature, characteristics and associations of care home staff stress and wellbeing: A national survey. *BMC Nursing*, *16*(1), 22. https://doi.org/10.1186/s12912-017-0216-4

Kaiser, L., Spence, L. J., McGavin, L., Struble, L., & Keilman, L. (2002). A dog and a "happy person" visit nursing home residents. *Western Journal of Nursing Research*, *24*(6), 671–683. https://doi.org/10.1177/019394502320555412

Kanamori, M., Suzuki, M., Yamamoto, K., Kanda, M., Matsui, Y., Kojima, E., … Oshiro, H. (2001). A day care program and evaluation of animal-assisted therapy (AAT) for the elderly with senile dementia. *Am J Alzheimers Dis Other Demen*, *16*(4), 234–239. https://doi.org/10.1177/153331750101600409

Karefjard, A., & Nordgren, L. (2018). Effects of dog-assisted intervention on quality of life in nursing home residents with dementia. *Scandinavian Journal of Occupational Therapy*, *1–8*, https://doi.org/10.1080/11038128.2018.1467486

Kawamura, N., Niiyama, M., & Niiyama, H. (2007). Long-term evaluation of animal-assisted therapy for institutionalized elderly people: a preliminary result. *Psychogeriatrics*, *7*(1), 8–13. https://doi.org/10.1111/j.1479-8301.2006.00156.x

Killett, A., Bowes, A., Brooker, D., Burns, D., Kelly, F., La Fontaine, J., … Wilson, M. (2013). *What makes a real difference to resident experience? Digging deep into care home culture: The CHOICE (Care Home Organisations Implementing Cultures of Excellence) research report*. Retrieved from https://core.ac.uk/download/pdf/18488413.pdf

Kimberlee, R., Jones, M., & Powell, J. (2013). *Measuring the economic impact of the wellspring healthy living centre's social prescribing wellbeing programme for low level mental health issues encountered by GP services*. Retrieved from http://eprints.uwe.ac.uk/23222

Kramer, S. C., Friedmann, E., & Bernstein, P. L. (2009). Comparison of the Effect of Human Interaction, Animal-Assisted Therapy, and AIBO-Assisted Therapy on Long-Term Care Residents with Dementia. *Anthrozoös*, *22*(1), 43–57. https://doi.org/10.2752/175303708X390464

Lam, H. R., Chow, S., Taylor, K., Chow, R., Lam, H., Bonin, K., … Herrmann, N. (2018). Challenges of conducting research in long-term care facilities: A systematic review. *BMC Geriatrics*, *18*(1), 242–242. https://doi.org/10.1186/s12877-018-0934-9

Le Roux, M. C., & Kemp, R. (2009). Effect of a companion dog on depression and anxiety levels of elderly residents in a long-term care facility. *Psychogeriatrics*, *9*(1), 23–26. https://doi.org/10.1111/j.1479-8301.2009.00268.x

Lundqvist, M., Carlsson, P., Sjodahl, R., Theodorsson, E., & Levin, L. A. (2017). Patient benefit of dog-assisted interventions in health care: A systematic review. *BMC Complementary and Alternative Medicine*, *17*(1), 358. https://doi.org/10.1186/s12906-017-1844-7

Lutwack-Bloom, P., Wijewickrama, R., & Smith, B. (2005). Effects of Pets versus People Visits with Nursing Home Residents. *Journal of Gerontological Social Work*, *44*(3–4), 137–159. https://doi.org/10.1300/J083v44n03_09

Majic, T., Gutzmann, H., Heinz, A., Lang, U. E., & Rapp, M. A. (2013). Animal-assisted therapy and agitation and depression in nursing home residents with dementia: a matched case-control trial. *Am J Geriatr Psychiatry*, *21*(11), 1052–1059. https://doi.org/10.1016/j.jagp.2013.03.004

Marx, M. S., Cohen-Mansfield, J., Regier, N. G., Dakheel-Ali, M., Srihari, A., & Thein, K. (2010). The impact of different dog-related stimuli on engagement of persons with dementia. *Am J Alzheimers Dis Other Demen*, *25*(1), 37–45. https://doi.org/10.1177/1533317508326976

Mays, N., & Pope, C. (2000). Assessing quality in qualitative research. *BMJ*, *320*(7226), 50–52. https://doi.org/10.1136/bmj.320.7226.50

McCabe, B. W., Baun, M. M., Speich, D., & Agrawal, S. (2002). Resident dog in the Alzheimer's special care unit. *West J Nurs Res*, *24*(6), 684–696. https://doi.org/10.1177/019394502320555421

McCullough, A. (2014). *Social Support and Affectionate Communication in Animal-assisted Interventions: Toward a Typology and Rating Scheme of Handler/Dog Messages*. (Doctor. of Philosophy), University of Denver. Retrieved from https://digitalcommons.du.edu/etd/417

McNicholas, J. (2008). *Pets and older people in residential care*. Retrieved from Society for Companion Animal Studies: http://www.scas.org.uk/wp-content/uploads/2013/03/SCAS_PFMA_petsandolderpeopleeport_summary-1.pdf

Menna, L. F., Santaniello, A., Gerardi, F., Di Maggio, A., & Milan, G. (2016). Evaluation of the efficacy of animal-assisted therapy based on the reality orientation therapy protocol in Alzheimer's disease patients: A pilot study. *Psychogeriatrics*, *16*(4), 240–246. https://doi.org/10.1111/psyg.12145

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Moretti, F., De Ronchi, D., Bernabei, V., Marchetti, L., Ferrari, B., Forlani, C., … Atti, A. R. (2011). Pet therapy in elderly patients with mental illness. *Psychogeriatrics*, *11*(2), 125–129. https://doi.org/10.1111/j.1479-8301.2010.00329.x

Mossello, E., Ridolfi, A., Mello, A. M., Lorenzini, G., Mugnai, F., Piccini, C., … Marchionni, N. (2011). Animal-assisted activity and emotional status of patients with Alzheimer's disease in day care. *Int Psychogeriatr*, *23*(6), 899–905. https://doi.org/10.1017/s1041610211000226

Motomura, N., Yagi, T., & Ohyama, H. (2004). Animal assisted therapy for people with dementia. *Psychogeriatrics*, *4*(2), 40–42. https://doi.org/10.1111/j.1479-8301.2004.00062.x

National Institute for Health Research (2017). *Advancing Care: Research with care homes*. Retrieved from https://www.dc.nihr.ac.uk/themed-reviews/care-home-research.htm

Nolan, M. (2001). Working with family carers: Towards a partnership approach. *Reviews in Clinical Gerontology*, *11*(1), 91–97. https://doi.org/10.1017/S0959259801011182

Nordgren, L., & Engstrom, G. (2014). Animal-assisted intervention in dementia: Effects on quality of life. *Clinical Nursing Research*, *23*(1), 7–19. https://doi.org/10.1177/1054773813492546

Nordgren, L., & Engstrom, G. (2014). Effects of dog-assisted intervention on behavioural and psychological symptoms of dementia. *Nurs Older People*, *26*(3), 31–38. https://doi.org/10.7748/nop2014.03.26.3.31.e517

Oksman, O. (2015). *Paws for thought: How pet therapy is gaining traction*. The Guardian. Retrieved from https://www.theguardian.com/lifeandstyle/2015/dec/30/animal-assisted-therapy-nih-veterinary-science-mental-health-american-heart-association

Olsen, C., Pedersen, I., Bergland, A., Enders-Slegers, M. J., Patil, G., & Ihlebaek, C. (2016). Effect of animal-assisted interventions on depression, agitation and quality of life in nursing home residents suffering from cognitive impairment or dementia: A cluster randomized controlled trial. *International Journal of Geriatric Psychiatry*, *31*(12), 1312–1321. https://doi.org/10.1002/gps.4436

Olsen, C., Pedersen, I., Bergland, A., Enders-Slegers, M.-J., & Ihlebæk, C. (2019). Engagement in elderly persons with dementia attending animal-assisted group activity. *Dementia*, *18*(1), 245–261. https://doi.org/10.1177/1471301216667320

Perkins, J., Bartlett, H., Travers, C., & Rand, J. (2008). Dog-assisted therapy for older people with dementia: A review. *Australasian Journal on Ageing*, *27*(4), 177–182. https://doi.org/10.1111/j.1741-6612.2008.00317.x

Phelps, K. A., Miltenberger, R. G., Jens, T., & Wadeson, H. (2008). An investigation of the effects of dog visits on depression, mood, and social interaction in elderly individuals living in a nursing home. *Behavioral Interventions*, *23*(3), 181–200. https://doi.org/10.1002/bin.263

Pluye, P., Robert, E., Cargo, M., Bartlett, G., O'Cathain, A., Griffiths, F., … Rousseau, M. C. (2011). *Proposal: A mixed methods appraisal tool for systematic mixed studies reviews*. Retrieved from http://mixedmethodsappraisaltoolpublic.pbworks.com/w/page/24607821/FrontPage

Prosser, L., Townsend, M., & Staiger, P. (2008). Older people's relationships with companion animals: a pilot study. *Nurs Older People*, *20*(3), 29–32. https://doi.org/10.7748/nop2008.04.20.3.29.c6496

R Core Team (2013). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from https://www.R-project.org/

Richeson, N. E. (2003). Effects of animal-assisted therapy on agitated behaviors and social interactions of older adults with dementia. *American Journal of Alzheimer's Disease & Other Dementiasr*, *18*(6), 353–358. https://doi.org/10.1177/153331750301800610

Royal College of Nursing (2018). *Working with Dogs in Health Care Settings: A protocol to support organisations considering working with dogs in health care settings and allied health environments*. Retrieved from https://www.rcn.org.uk/professional-development/publications/pdf-006909

Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment*, *66*(1), 20–40. https://doi.org/10.1207/s15327752jpa6601_2

Sanford, A. M., Orrell, M., Tolson, D., Abbatecola, A. M., Arai, H., Bauer, J. M., … Vellas, B. (2015). An international definition for "nursing home". *Journal of the American Medical Directors Association*, *16*(3), 181–184. https://doi.org/10.1016/j.jamda.2014.12.013

Schwarzer, G. (2007). meta: An R package for meta-analysis. *R News*, *7*, 40–45.

Sellers, D. (2006). The evaluation of an animal assisted therapy intervention for elders with dementia inLong-Term Care. *Activities, Adaptation & Aging*, *30*(1), 61–77. https://doi.org/10.1300/J016v30n01_04

Siegel, E. O., Backman, A., Cai, Y. I., Goodman, C., Ocho, O. N., Wei, S., … Xu, H. (2019). Understanding contextual differences in residential LTC provision for cross-national research: identifying internationally relevant CDEs. *Gerontology & Geriatric Medicine*, *5*, 2333721419840591. https://doi.org/10.1177/2333721419840591

Society for Companion Animal Studies. (2019). *Animal Assisted Interventions: SCAS Code of Practice for the UK*. Retrieved from http://www.scas.org.uk/animal-assisted-interventions/code-of-practice/

Sollami, A., Gianferrari, E., Alfieri, M., Artioli, G., & Taffurelli, C. (2017). Pet therapy: An effective strategy to care for the elderly? An experimental study in a nursing home. *Acta Biomed*, *88*(1s), 25–31. https://doi.org/10.23750/abm.v88i1-S.6281

Stern, C. (2011). The meaningfulness of Canine-Assisted Interventions (CAIs) on the health and social care of older people residing in long term care: A systematic review. *JBI Library of Systematic Reviews*, *9*(21), 727–790. https://doi.org/10.11124/jbisrir-2011-139

Stern, C., & Konno, R. (2011). The effects of Canine-Assisted Interventions (CAIs) on the health and social care of older people residing in long term care: A systematic review. *JBI Library of Systematic Reviews*, *9*(6), 146–206. https://doi.org/10.11124/jbisrir-2011-89

Stern, C., Pearson, A., & Chur-Hansen, A. (2011a). The appropriateness of canine-assisted interventions (CAIs) on the health and social care of older people residing in long term care: A systematic review. *JBI Library of Systematic Reviews*, *9*(33), 1367–1392. https://doi.org/10.11124/jbisrir-2011-169

Stern, C., Pearson, A., & Chur-Hansen, A. (2011b). The economic feasibility of canine-assisted interventions (CAIs) on the health and social care of older people residing in long term care: A systematic review. *JBI Library of Systematic Reviews*, *9*(32), 1341–1366. https://doi.org/10.11124/jbisrir-2011-167

Sterne, J. A., Gavaghan, D., & Egger, M. (2000). Publication and related bias in meta-analysis: Power of statistical tests and prevalence in the literature. *Journal of Clinical Epidemiology*, *53*(11), 1119–1129. https://doi.org/10.1016/s0895-4356(00)00242-0

Stroup, D. F., Berlin, J. A., Morton, S. C., Olkin, I., Williamson, G. D., Rennie, D., … Thacker, S. B. (2000). Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. *JAMA*, *283*(15), 2008–2012.

Sullivan, G. J., & Williams, C. (2017). Older adult transitions into long-term care: A meta-synthesis. *J Gerontol Nurs*, *43*(3), 41–49. https://doi.org/10.3928/00989134-20161109-07

Swall, A., Ebbeskog, B., Lundh Hagelin, C., & Fagerberg, I. (2015). Can therapy dogs evoke awareness of one's past and present life in persons with Alzheimer′s disease? *International Journal of Older People Nursing*, *10*(2), 84–93. https://doi.org/10.1111/opn.12053

The Kings Fund (2017). *What is social prescribing?*. Retrieved from The Kings Fund website: https://www.kingsfund.org.uk/publications/social-prescribing

Thodberg, K., Sørensen, L. U., Christensen, J. W., Poulsen, P. H., Houbak, B., Damgaard, V., … Videbech, P. B. (2016). Therapeutic effects of dog visits in nursing homes for the elderly. *Psychogeriatrics*, *16*(5), 289–297. https://doi.org/10.1111/psyg.12159

Thodberg, K., Sørensen, L. U., Videbech, P. B., Poulsen, P. H., Houbak, B., Damgaard, V., … Christensen, J. W. (2016). Behavioral responses of nursing home residents to visits from a person with a dog, a robot seal or a toy cat. *Anthrozoös*, *29*(1), 107–121. https://doi.org/10.1080/08927936.2015.1089011

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*, 45. https://doi.org/10.1186/1471-2288-8-45

Tournier, I., Vives, M.-F., & Postal, V. (2017). Animal-assisted intervention in dementia: Effects on neuropsychiatric symptoms and on caregivers' distress perceptions. *Swiss Journal of Psychology*, *76*(2), 51–58. https://doi.org/10.1024/1421-0185/a000191

Travers, C., Perkins, J., Rand, J., Bartlett, H., & Morton, J. (2013). An Evaluation of Dog-Assisted Therapy for Residents of Aged Care Facilities with Dementia. *Anthrozoös*, *26*(2), 213–225. https://doi.org/10.2752/175303713X13636846944169

Virués-Ortega, J., Pastor-Barriuso, R., Castellote, J. M., Población, A., & de Pedro-Cuesta, J. (2012). Effect of animal-assisted therapy on the psychological and functional status of elderly populations and patients with psychiatric disorders: A meta-analysis. *Health Psychology Review*, *6*(2), 197–221. https://doi.org/10.1080/17437199.2010.534965

Vrbanac, Z., Zecevic, I., Ljubic, M., Belic, M., Stanin, D., Bottegaro, N. B., … Zubcic, D. (2013). Animal assisted therapy and perception of loneliness in geriatric nursing home residents. *Collegium Antropologicum*, *37*(3), 973–976.

Wells, D. L. (2009). The effects of animals on human health and well-being. *Journal of Social Issues*, *65*(3), 523–543. https://doi.org/10.1111/j.1540-4560.2009.01612.x

Wesenberg, S., Mueller, C., Nestmann, F., & Holthoff-Detto, V. (2019). Effects of an animal-assisted intervention on social behaviour, emotions, and behavioural and psychological symptoms in nursing home residents with dementia. *Psychogeriatrics*, *19*(3), 219–227. https://doi.org/10.1111/psyg.12385

Wood, W., Fields, B., Rose, M., & McLure, M. (2017). Animal-assisted therapies and dementia: A systematic mapping review using the lived environment life quality (LELQ) model. *American Journal of Occupational Therapy*, *71*(5), https://doi.org/10.5014/ajot.2017.027219

World Health Organization (2015). *World report on ageing and health*. Retrieved from https://www.who.int/ageing/events/world-report-2015-launch/en/

Yakimicki, M. L., Edwards, N. E., Richards, E., & Beck, A. M. (2019). Animal-assisted intervention and dementia: A systematic review. *Clinical Nursing Research Clinical Nursing Research*, *28*(1), 9–29. https://doi.org/10.1177/1054773818756987

Yesavage, J. A., Brink, T. L., Rose, T. L., Lum, O., Huang, V., Adey, M., & Leirer, V. O. (1982). Development and validation of a geriatric depression screening scale: A preliminary report. *Journal of Psychiatric Research*, *17*(1), 37–49. https://doi.org/10.1016/0022-3956(82)90033-4

Zimmerman, S., Williams, C. S., Reed, P. S., Boustani, M., Preisser, J. S., Heck, E., & Sloane, P. D. (2005). Attitudes, stress, and satisfaction of staff who care for residents with dementia. *Gerontologist*, *45*(1), 96–105. https://doi.org/10.1093/geront/45.suppl_1.96

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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