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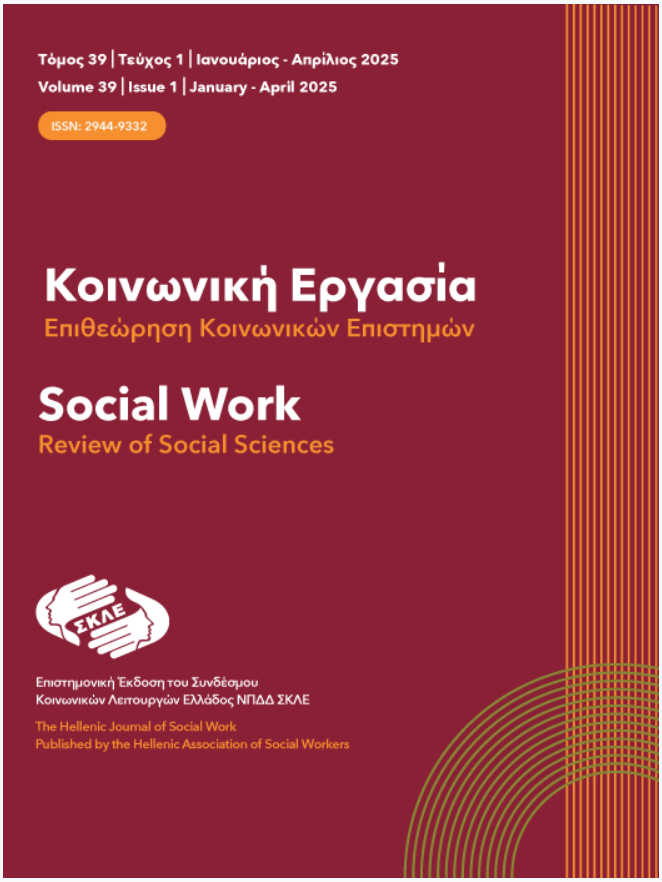

The Role of Animals in Depressive Symptoms and Loneliness in Older Adults: A Mixed-Methods Systematic Review

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The Role of Animals in Depressive Symptoms and Loneliness in Older Adults: A Mixed-Methods Systematic Review

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ABSTRACT

Demographic ageing, the challenges of active ageing, and increasing rates of depressive symptoms and loneliness among older adults, are challenging experts to discover innovative forms of support for older people. A proposal with promising results that concerns modern international literature is the role of animals. The main purpose of this review is to examine the role of animals in depressive symptoms and loneliness among older adults using a mixed methods systematic design. This paper follows the PRISMA (2020) guidelines and checklist for systematic reviews. A literature search was conducted for relevant English research articles from 2019 until 03/29/2024 in international multi-disciplinary databases (PubMed, Scopus, ScienceDirect) which provided information on the subject reviewed. The selection and screening of articles was made using the PRISMA (2020) flow chart guidelines for systematic reviews. For the quality assessment of the included studies the Mixed Methods Appraisal Tool was used (MMAT). By following this process, 856 articles emerged across all databases, from which, after removing duplicates and screening the title and abstract, 13 remained. Out of the 13 articles that formed the main body of the review, 5 were qualitative studies and 8 quantitative. Even though some mixed results emerged from the analysis, specifically regarding pet ownership and depressive symptoms which require further research, in most cases, animals play a crucial role in alleviating depressive symptoms and reducing loneliness in older adults. This research suggests more opportunities for new practical applications in the future, even outside the care facility environment.

Key-words: Animals, Older Adults, Depressive Symptoms, Loneliness, Systematic Review

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Introduction

Demographic ageing is a rising phenomenon that experts have discerned since the late 20th century. In the period between 2004 and 2014, the percentage of people who were 65 years old and over greatly surpassed 30% in a lot of USA states (Administration on Aging, 2016). While looking at the rest of the world, the worldwide percentage of older adults (60+) is expected to reach 21% (2 billion) by the year 2050 (UNDESA, 2013). As years go by, the modern world accepts this new reality and tries to cover the special needs of that population.

As demographic aging becomes a significant phenomenon, so does the increasing need for mental health support in older populations. According to the Institute of Medicine (2012), more than 8,6 million Americans aged 65 and older suffer from some type of mental illness. One of the most prevalent is depression (Reynoldset al., 2015). Depression is "a common and serious mental disorder that negatively affects how you feel, think, act, and perceive the world" (American Psychiatric Association, 2024), ranging between 4% and 7% in older populations (Reynolds et al., 2015). However, this percentage may be greater due to the difficulty in diagnosing older adults (Akincigil et al., 2011; Federal Interagency Forum, 2016; Institute of Medicine, 2012). Depression symptomatology typically includes fatigue, sadness, feelings of emptiness, excessive or insufficient sleep, and a loss of interest or pleasure in daily activities(American Psychiatric Association, 2024).

In addition, loneliness is a significant issue among older adults due to its severe repercussions on mortality and well-being (Holt-Lunstad et al., 2015; Leigh-Hunt et al., 2017). Furthermore, it is strongly linked to depression, serving as an important factor in the mental health of older populations (Chou & Chi, 2005). Loneliness is "an affective and cognitive discomfort or uneasiness from being or perceiving oneself to be alone or otherwise solitary" (American Psychological Association, 2024). Hawkley and Cacioppo (2013), defined loneliness as the perceived social isolation that can make people feel threatened in social scenarios. This perception creates cognitive biases, which in turn reduce social interactions. Thus, it is more about feeling disconnected from social interactions, even in the presence of others.

The bottom line is that demographic ageing, mental health issues and loneliness among older adults, create an environment that requires the focus of more clinicians and researchers. This article aims to provide an in-depth review of a very specific innovative form of support for older adults which is animal interactions. The studies reviewed refer to older adults residing either in the community or in care facilities. For older adults living in care facilities, the findings relate to Animal Assisted Interventions (AAI) that use trained dogs. Animal Assisted Interventions can be defined as a planned and systematic approach that deliberately integrates animals into health, education, and human services (such as social work) with the aim of achieving therapeutic benefits for individuals (Jegatheesan et al., 2014). In contrast, for community-dwelling older adults, the findings relate to Pet Ownership as a form of support.

As highlighted in past reviews, both types of human-animal interactions have been noticed to reduce depressive (Hughes et al., 2020), among other, symptoms and loneliness in older populations (Gee &Mueller, 2019). On the other hand, some of the results are inconclusive and require further research (Cherniack, E. P. &Cherniack, A. R., 2014). Moreover, pet ownership may play a crucial role in understanding and providing support for older adults, as they face various challenges associated with maintaining it (Anderson et al., 2015). However, this field of research is promising, and it may rise new practical pathways to support older populations in both clinical and non-clinical settings (Hoy-Gerlach et al., 2019; Rauktis & Hoy-Gerlach, 2020).

Most recent systematic review papers have provided insights into either Animal Assisted Interventions or pet ownership, but not both (Batubara et al., 2022; Marks &McVilly, 2020; Maurice et al., 2022; Reniers et al., 2023). Others have focused on reviewing either qualitative or quantitative data (Batubara et al., 2022; Chen et al., 2022; Hughes et al., 2020; Reniers et al., 2023). Even those employing a mixed-methods design did not include data on both Animal Assisted Interventions and pet ownership (Marks &McVilly, 2020; Maurice et al., 2022).

For that reason, this review will adopt a mixed-methods approach that incorporates studies on both Animal Assisted Interventions and pet ownership. A mixed-methods approach is a process in which researchers combine both qualitative and quantitative data to achieve a more comprehensive understanding of a topic by integrating statistical trends with in-depth insights (Crosswell & Clark, 2017). In this context, the role of animals in depressive symptoms and loneliness in older adults will be examined. This perspective forms the foundation of the research problem.

The main purpose of this paper is to analyze the latest information (2019-2024) on depressive symptoms and loneliness associated with either pet ownership (for community-dwelling older adults) or Animal Assisted Interventions (for older adults in care facilities). The systematic mixed-methods design and the relationship between these types of animal support, and their different target populations, can offer a far broader approach to this review, while also yielding clearer conclusions.

Methods Of Review

A single reviewer conducted this review using the PRISMA (2020) guidelines and checklist for systematic reviews (see Figure 1). However, a specialist in the field cross-checked and validated every step of the process (including the inclusion and exclusion criteria, search strategy, study selection, data extraction, quality assessment, and result synthesis and interpretation) to ensure objectivity and accuracy.

The Department of Educational Sciences and Social Work (University of Patras, Greece) ethically approved this research (protocol number: 2817). A systematic approach was deemed necessary in the present study due to the importance of deriving more reliable conclusions. Systematic reviews involve a detailed and comprehensive plan and search strategy derived a priori, with the goal of reducing bias by identifying, appraising, and synthesizing all relevant studies on a particular topic (Uman, 2011). This type of review typically consists of seven main stages which for the current paper are the following (Aromataris & Pearson, 2014; Uman, 2011).

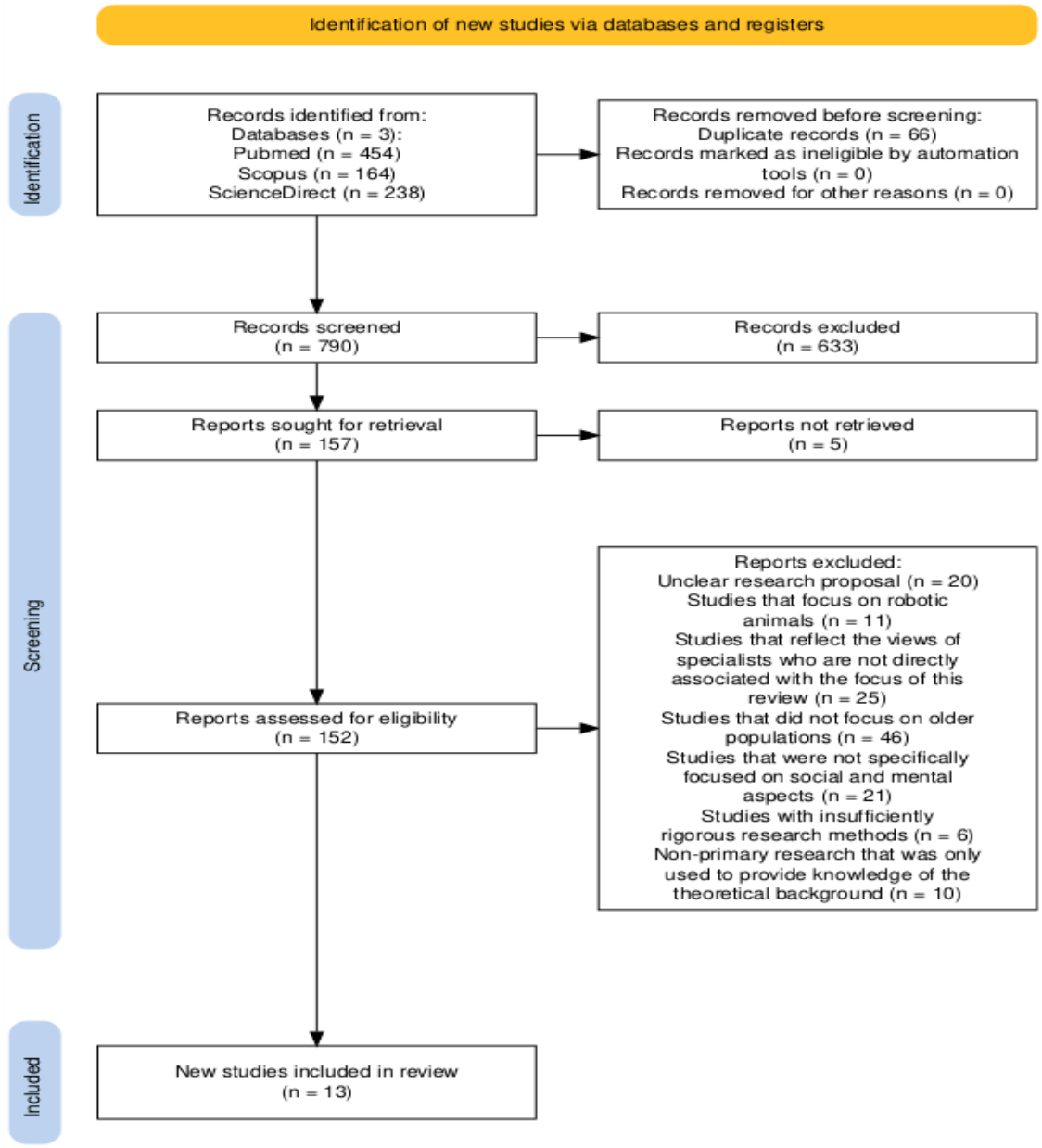
Stage 1: Identifying review questions

This systematic review focuses on examining the following review questions:

(1) What is therole of pet ownership in depressive symptoms and loneliness in older adults?
(2) What is the role of Animal Assisted Interventions in depressive symptoms and loneliness in older adults?
(3) What are the differences in the roles of pet ownership and Animal Assisted Interventions in depressive symptoms and loneliness in older adults?

These review questions were framed using the PICO framework, focusing on the Population (e.g., older adults), the Intervention (e.g., pet ownership and Animal Assisted Interventions), the Comparison (if applicable), and the Outcome (e.g., depressive symptoms and loneliness).

Figure 1
Prisma (2020) flow diagram



Stage 2: Inclusion and exclusion criteria

The primary inclusion criteria for this review included studies focusing on the population of older adults aged 60 and above, provided they addressed outcomes related to depressive symptoms and loneliness as defined in the Introduction. Exposure conditions had to involve animals in either Animal Assisted Intervention or pet ownership settings. Only articles published in English from 2019 onward were considered, with various methodologies considered, including both qualitative and quantitative designs.

Also, the exclusion criteria included conditions or states that did not directly address outcomes about the mental and social aspects of older adults, robot animal exposures, non-peer-reviewed articles, and non-primary research such as reviews or meta-analyses.

A broad scope was deemed necessary to provide answers to the research questions comprehensively. These criteria aimed to maintain the review's scope broad, aligning with the study's design.

Stage 3: Search strategy

A literature search was performed for relevant English language research articles published from 2019 through 03/29/2024 for this systematic review. For the reviewed subject, information was drawn from three international multi-disciplinary databases: PubMed, Scopus, and ScienceDirect. These databases were chosen because they fell into the scope of this review and provided mostly unrestricted access. The main limitation strategy for articles was the advanced search bar available in each database, using Boolean operators such as "AND", "OR".

Prior to this review, a more general search was performed to identify relevant terms, from which the most common signifiers for each category were drawn. Thus, a list of search terms was built, comprising three main categories: the animal signifiers, the older adult signifiers, the topic signifiers (see Table 1). This strategy provided 294 Boolean search algorithms. Those algorithms were used across the three Databases: PubMed, Scopus, ScienceDirect.

Table 1

Animal Signifier	AND	**Older Adult Signifier**	AND	**Topic Signifier**
"Animal" "Pet" "Dog" "Support animal/pet" "Assistance animal" "Companion animal"	OR	"Elderly" "Older adults" "Late life" "Aged care" "Geriatric" "Old age" "Aging/Ageing"	OR	"(Mental) health" "Social isolation" "Depression" "Dementia" "Loneliness" "Social support" "Well-being"

Search term algorithms

Stage 4: Selection

The screening and selection were conducted using the PRISMA (2020) flow chart guidelines for systematic reviews. After removing duplicates, articles remained for screening. Titles and abstracts were then screened for relevance. The relevance of each article was evaluated using a checklist developed using the inclusion criteria described earlier. After that, a full-text screening was conducted to ensure eligibility. Reasons for exclusion at this stage (e.g. methodological flaws and failure to address the research questions) can be found in Figure 1.

Stage 5: Data extraction

Data from selected studies were grouped into types: qualitative data or quantitative data (see Tables 2 and 3). Only information about the questions of this review was extracted. For each of the quantitative

Table 2
Characteristics of the quantitative studies included in this review

First Author (year)	Country	Design	Participants and age (*x̄ per group or total*)	Exposure group	Compara-tive group	Outcome measures of interest	Key results (effect size)
Opdebeeck (2021)	U.K.	Longitudinal cohort study	Community dwelling dementia patients (*n*=1,542), age=43–98 (76.35)	Pet owners (*n*=467)	Non-pet owners (*n*=1,075)	DJG-6, GDS-10	Dog owners involved in the dog's care have a 35% lower chance of loneliness than non-owners (*n*=1,397; *p*=.018). Pet owners not involved in its care were 1.8 times more likely to be depressed than non-owners (*n*=1,445; *p*=.004) and dog owners not involved in its care were 2.2 times more likely to be depressed than non-owners (*n*=1,444; *p*=.003).
Lu (2023)	China	Cross-sectional study	Community dwelling older adults (*n*=2,200), age=60-92 (69.34)	Pet owners (*n*=879)	Not Applicable	UCLA (ULS-6)	The single threshold effect of pet-owner relationships can alleviate the negative effect of loneliness (*n*=879; *p*=.000).
Baek (2020)	Korea	Nonequiva-lent control group pretest and post-test study	Dementia patients in care facilities (*n*=28), age= (82.1/82.3)	8-week DAT group (*n*=14)	8-week control group (*n*=14)	CSDD	AAT reduced the depressive symptoms in the intervention group (*n*=14; *p*<.01).
Ambrosi (2019)	Italy	Randomi-zed control study	Older adults in care facilities (*n*=31), age=65-90 (85/88)	10-week DAT group (*n*=17)	10-week control group (*n*=14)	GDS-15	A decrease of 33.5% was noted in GDS-15 score after DAT (*n*=17; *p*=.000007).
Carr (2021)	U.S.A.	Longitudinal study	Community dwelling older adults (n=466), age=60-92 (69.43)	Not explicitly specified	Not Applicable	UCLA	Individuals who faced significant social consequences from COVID-19 experienced notable increases in loneliness, however, those who walked their dogs at least once a day were able to avoid such increases (*p*<.05).

Table 2 (continued)

First Author (year)	Country	Design	Participants and age ($\bar{x}$ *per group or total*)	Exposure group	Comparative group	Outcome measures of interest	Key results (effect size)
Vegue Parra (2021)	Spain	Experimental randomized controlled clinical trial	Dementia patients in C.F. (*n* = 334), age=65+	32-week DAT group (*n*=171)	32-week control group (*n*=163)	CSDD	There was a significant improvement in depressive scores (intermediate evaluation *p*=.000; final evaluation *p*=.00). Those diagnosed with depression show a greater improvement (*p*= .022).
Sharpley (2020)	U.K.	Longitudinal cohort study	Community dwelling older adults (*n*= 7,617), age=55-77 (65)	Pet owners (*n*=2,575)	Non-pet owners (*n*=5,042)	CES-D	An increase of one symptom in the total CES-D score was associated with a 7% higher likelihood of dog ownership compared to having no pet (*p*<.001).
Fernandes (2024)	Portugal	Cross-sectional correlational study	Community dwelling older adults (*n*=250), age= (73.9)	Pet owners (*n*=130)	Non-pet owners (*n*=120)	GDS-4, SIS, S.P.o.L, LSNS-6, ESSS	Depressive symptoms were 1.4 times more common in pet owners (*p*=.032). No other significant results were found.

**Note.* $\bar{x}$ = sample mean;*n* = sample size; DJG-6 = De Jong Gierveld Scale (6-item); GDS-10 = Geriatric Depression Scale (10-item); *p* = statistical significance; UCLA (ULS-6) = The Chinese version of the University of Los Angeles (UCLA) Loneliness Scale Short-form (ULS-6); DAT = Dog Assisted Therapy; CSDD = Cornell Scale for Depression in Dementia; GDS-15 = Geriatric Depression Scale (15-item); ISEL-12 = Interpersonal Support Evaluation List-12 item; CES-D = Epidemiologic Studies Depression Scale; GDS-4 = Geriatric Depression Scale (4-item); SIS = Social Isolation Scale; SPoL = Self-Perception of Loneliness (a single question); LSNS-6 = Lubben's Brief Social Network Scale (6-item); ESSS = Satisfaction with Social Support Scale.

Table 3
Characteristics of the qualitative studies included in this review

First Author (year)	Country	Methods	Participants and age	Key themes of interest	Key positive impacts	Key negative impacts
Janevic (2020)	U.S.A.	Thematic analysis	Community dwelling older adult pet owners (*n*=25), age=70+	Mood management; Social activation	Mood boost, less loneliness, love, support, sense of purpose. Social activity, social relationships.	Finding care for the pet if the owner is unable to, pet health, pet related costs.
Hui Gan (2020)	Australia	Descriptive phenome-nological approach	Community dwelling older adult pet owners (*n*=14), age=65+	Feelings of comfort and safety; Social inclusion and participation	Better mood, unconditional love, less feeling of loneliness. Pets can help in the creation and maintenance of social networks, while also assigning active roles to their owner.	Pet loss, financial and personal sacrifices.
Cryer (2021)	Australia	Descriptive approach (thematic analysis)	Community dwelling older adult pet owners (*n*=14), age=65+	Attachment; Support; Social isolation	Pet attachment helps older adults cope with daily struggles. They give them a reason to get up from bed. Pets and PSP providers serve as companions. They don't need to worry about their pet's health due to the PSP providers. PSP providers keep them in touch with the outside world. Dog walking creates social networks.	----------
Jain (2021)	U.K.	Post-intervention focus groups design	Older adult DAI participants in care facilities (*n*=54), age=57-100	DAI benefits; Role and meaning of dog interactions; Social interactions facilitated and supported by DAI	Socialization, emotional stimulation. They trigger social interactions and uplift mood. DAI brings closer residents and staff. Dogs are a topic of conversation between residents, staff and also their relatives.	Care staff raised concerns about safety and hygiene. Not all residents were dog friendly.
Pérez-Sáez (2019)	Spain	Single-case experime-ntal design	Older adult DAT participants in care facilities (*n*=3), age=50-83	Social-behavioral aspects; Emotional aspects	Socialization and prosocial behaviors, dogs facilitate social connections. Increased positive emotions, no changes in negative.	----------

**Note.* *n* = sample size; DAI = Dog Assisted Intervention; DAT = Dog Assisted Therapy.

studies reviewed, the following information was extracted: authors, year of publication, country, participant details (including age), study design, exposure group, comparative group (if any), outcome measures of interest for the review, and key results, including effect size (see Table 2). Conversely, foreach qualitative study reviewed, the following information were extracted: authors, year of publication, participant details, including age, study methodology, key themes of interest, key positive and negative impacts (see Table 3).

Stage 6: Study quality

To assess the quality of the studies reviewed, the Mixed Methods Appraisal Tool (MAAT) was used (Hong et al., 2018). This tool is mostly designed for researchers applying mixed-method review designs. Previous studies have shown strong agreement among reviewers when utilizing this tool (Pace et al., 2012).

First, in order for a study to be eligible for the assessment, two screening questions have to be answered: (1) are the research questions clear? and (2) do the data collected address the research questions? Then, depending on the study's design, five key criteria are used for its evaluation and the reviewer can select from three different responses: (1) "Yes", (2) "No", and (3) "Can't Tell" (Hong et al., 2018).

Stage 7: Analyse and interpret results

As mentioned, the reviews questions and aim dictate the use of a wide range of research designs. Thus, given the heterogeneity of the articles reviewed, a narrative synthesis approach was used to integrate the findings from both qualitative and quantitative studies (Popay et al., 2006).

In contrast to meta-analysis, narrative synthesis relies more on words and text to explain the findings rather than statistical data (Popay et al., 2006). In this context, following the review questions, the findings were categorized by the type of intervention (e.g., Animal Assisted Interventions and pet ownership) in order to identify common patterns and areas of discrepancy. The missing data were not taken into account, as they were not deemed necessary for the scope of this review and are reported in Tables 2 and 3.

Narrative synthesis and results of the review

Study selection

The combined search yielded 856 articles across all databases. After removing duplicates and screening the title, abstract, and full-text, 13 remained. These 13 articles met the inclusion criteria, addressed the reviews questions, and thus formed the main body of the review. The Prisma flow chart diagram (see Figure 1) provides a detailed summary of the screening and selection process.

General characteristics of the studies

A summary of the data extracted can be found in Table 2 and Table 3. The studies included in this review come from various countries around the world (U.K., China, Spain, Portugal, Korea, Italy, U.S.A., Australia). The most common country is U.K. (23.07%), followed by Australia (15.38%), Spain (15.38%), and U.S.A. (15.38%).

Various methodological designs and outcome measures were used by the reviewed studies (see Tables 2 and 3). The most prevalent measures were variations of the Geriatric Depression

Scale (GDS; Almeida, O. P., & Almeida, S. A., 1999; Santos et al., 2019; Yesavage et al., 1983) which were used in three (27.27%) out of 11 studies on depressive symptoms. Following GDS, UCLA Loneliness Scale (Russell et al., 1978; Zhou et al., 2012) and Cornell Scale for Depression in Dementia (CSDD; Alexopoulos et al., 1988) were each used twice, for studies on loneliness and depressive symptoms, respectively. Tables 2 and 3 provide a detailed showcase of the outcome measures used. Additionally, of the 13 studies, eight (61.54%) followed a quantitative approach (see Table 2), involving a total of 12,468 participants, while five (38.46%) were qualitative, involving 110 participants (see Table 3).

Nine studies (69%) provided insights on loneliness, and 11 studies (84%) focused on depressive symptomatology. Among the studies investigating the role of animals on loneliness, eight (88.88%) reported mostly positive outcomes, while one (11.1%) reported non-significant results. Regarding the effects of animals on depressive symptoms (e.g., persistent sadness, loss of interest in activities, fatigue, feelings of hopelessness, sleep disturbances, reduced ability to cope with daily struggles, and difficulty getting out of bed), seven studies (63.63%) reported positive outcomes, three (27.27%) reported negative outcomes, and one (9.09%) reported equivocal findings.

The role of pet ownership in depressive symptoms and loneliness

A total of eight studies (61.54%) addressed the first research question “What is the role of pet ownership in depressive symptoms and loneliness in older adults?” (Carr et al., 2021; Cryer et al., 2021; Fernandes et al., 2024; Hui Gan et al., 2020; Janevic et al., 2020; Lu et al., 2023; Opdebeeck et al., 2021; Sharpley et al., 2020). Specifically, seven studies (53.8%) provided insights into loneliness and six (46.2%) into depressive-related symptoms (see Tables 2 and 3).

Regarding loneliness, six (85.71%) out of the seven studies reported positive outcomes (Carr et al., 2021; Cryer et al., 2021; Hui Gan et al., 2020; Janevic et al., 2020; Lu et al., 2023; Opdebeeck et al., 2021), while one study (14.28%) reported non-significant results (Fernandes et al., 2024). Notably, four (57.14%) of the studies with positive outcomes indicated that the effect of pets on loneliness can be influenced by the pet-owner relationship (e.g., dog walking, involvement in pet care, pet attachment; Carr et al., 2021; Cryer et al., 2021; Lu et al., 2023; Opdebeeck et al., 2021).

In contrast, of the six studies on depressive-related symptoms, three (50%) reported negative outcomes (Opdebeeck et al., 2021; Sharpley et al., 2020; Fernandes et al., 2024), two (33.33%) positive (Cryer et al., 2021; Hui Gan et al., 2020), and one (16.67%) found mixed results (Janevic et al., 2020). All negative findings were associated with quantitative research methods.

The role of Animal Assisted Interventions in depressive symptoms and loneliness

A total of five studies (38.46%) addressed the second research question “What is the role of Animal Assisted Interventions in depressive symptoms and loneliness in older adults?” (Ambrosi et al., 2019; Baek et al., 2020; Jain et al., 2021; Pérez-Sáez et al., 2020; Vegue Parra et al., 2021). In particular, two (40%) of these studies provided insights into loneliness and five (100%) into depressive-related symptoms (see Tables 2 and 3). Concerning loneliness, the outcomes for loneliness-related symptoms were positive (Jain et al., 2021; Pérez-Sáez et al., 2019). As for depressive-related symptoms, no negative outcomes were reported (Ambrosi et al., 2019; Baek et al., 2020; Jain et al., 2021; Pérez-Sáez et al., 2019; Vegue Parra et al., 2021). All of the studies on Animal Assisted Interventionsemployed dogs as the intervention.

The differences in the roles of pet ownership and Animal Assisted Interventions in depressive symptoms and loneliness in older adults

All 13 studies included in the review provided insights into the third research question "What are the differences in the roles of pet ownership and Animal Assisted Interventions in depressive symptoms and loneliness in older adults?" (Ambrosi et al., 2019; Baek et al., 2020; Carr et al., 2021; Cryer et al., 2021; Fernandes et al., 2024; Hui Gan et al., 2020; Jain et al., 2021; Janevic et al., 2020; Lu et al., 2023; Opdebeeck et al., 2021; Parra et al., 2021; Pérez-Sáez et al., 2019; Sharpley et al., 2020). When comparing Animal Assisted Interventions and pet ownership based on their findings, most studies (88.88%) examining loneliness-related symptoms reported positive outcomes (Carr et al., 2021; Cryer et al., 2021; Fernandes et al., 2024; Hui Gan et al., 2020; Jain et al., 2021; Lu et al., 2023; Opdebeeck et al., 2021; Pérez-Sáez et al., 2019;), except for one (11.1%) with mixed results (Janevic et al., 2020).

However, findings from the eleven studies on depressive symptoms were more complex and inconsistent. The total amount of positive outcome studies was seven (63.64%), while three (27.27%) reported negative outcomes, and one (9.09%) mixed results (see Tables 2 and 3). For pet ownership, only two (33.33%) of the six studies reported exclusively positive results (Cryer et al., 2021; Hui Gan et al., 2020). In contrast, all five Animal Assisted Intervention studies (100%) on depressive symptoms came back positive (Ambrosi et al., 2019; Baek et al., 2020; Jain et al., 2021; Pérez-Sáez et al., 2019; Vegue Parra et al., 2021).

Quality assessment of the included studies

A summary of the results from the Mixed Methods Appraisal Tool can be seen in Table 4. All qualitative studies received a score of 5 out of 5. The one quantitative descriptive study received a score of 3 out of 5. Additionally, the two randomised control trials got a score of 3 out of 5 and 4 out of 5. Lastly, four quantitative non-randomised studies got a score of 5 out of 5 and one got a score of 4 out of 5. Overall, all studies achieved at least a 3 out of 5 quality score.

Discussion

This review presents promising findings regarding the role of animals in mitigating depressive symptoms and loneliness among older populations. The mixed-methods design and broad scope of the review contributed to valuable insights in the field of human-animal interaction research. However, some of the results are mixed, reflecting the complexity of this area of study. Future researchers can build upon this complexity to develop new methodologies and theoretical frameworks. Although the findings suggest a need for further research, this field holds significant potential for practical applications.

In relation to the first research question "What is the role of pet ownership in depressive symptoms and loneliness in older adults?", the results suggest that pet ownership may reduce loneliness in older adults, aligning with previous studies (Gee &Mueller, 2019; Reniers et al., 2023). The reduction in loneliness seemed to be influenced by the nature of the human-animal relationship, including factors such as dog walking, involvement in pet care, and pet attachment (Carr et al., 2021; Cryer et al., 2021; Lu et al., 2023; Opdebeeck et al., 2021). Carr et al. (2021) found that individuals who walked their dogs at least once a day were able to prevent the significant increase in loneliness caused by the social consequences of COVID-19. In particular, dog walking can enhance the social aspects of older adults by facilitating the formation of new social relationships (Reniers et al., 2023). Additionally, Opdebeeck et al. (2021) found that dog owners involved in the dog's care are 35% less likely to experience loneliness than non-dog owners.

In contrast, Fernandes et al. (2024) pointed out that those taking care of a pet had no significant differences in feelings of loneliness compared to those who did not. However, this could be attributed to the presence of protective factors (e.g., 65.6% were married and 59.6% were cohabiting; Fernandes et al., 2024) that are able to reduce the negative feelings of loneliness (Dahlberg et al., 2021).

Nevertheless, the importance of the human-animal relationship and its effects on loneliness is consistent across previous studies (Krause-Parello, 2008; Krause-Parello et al., 2019). Additionally, it should be noted that pet ownership is a common way for people, especially women, to alleviate the subjective feeling of loneliness (Pikhartova et al., 2014).

Table 4
Results of the Mixed Methods Appraisal Tool

Study Reviewed	Research Design	QA1	QA2	QA3	QA4	QA5	Summary
Opdebeeck (2021)	QNRS	Y	Y	Y	Y	Y	5/5
Lu (2023)	QNRS	Y	Y	Y	Y	Y	5/5
Baek (2020)	QNRS	Y	Y	Y	CT	Y	4/5
Ambrosi (2019)	QRCT	CT	Y	Y	N	Y	3/5
Carr (2021)	QNRS	Y	Y	Y	Y	Y	5/5
Vegue Parra (2021)	QRCT	CT	Y	Y	Y	Y	4/5
Sharpley (2020)	QNRS	Y	Y	Y	Y	Y	5/5
Fernandes (2024)	QDS	CT	Y	Y	CT	Y	3/5
Janevic (2020)	QS	Y	Y	Y	Y	Y	5/5
Hui Gan (2020)	QS	Y	Y	Y	Y	Y	5/5
Cryer (2021)	QS	Y	Y	Y	Y	Y	5/5
Jain (2021)	QS	Y	Y	Y	Y	Y	5/5
Pérez-Sáez (2019)	QS	Y	Y	Y	Y	Y	5/5

**Note.* QA = Quality Assessment; QNRS = Quantitative Non-Randomized Study; Y = Yes; CT = Can't Tell; QRCT = Quantitative Randomized Controlled Trail; N = No; QDS = Quantitative Descriptive Study; QS = Qualitative Study.

Regarding depressive symptoms, this review reported mixed results, aligning with previous research (Gee & Mueller, 2019; Maurice et al., 2022). The impact of the pet-owner relationship seemed to be variable of interest once again. Opdebeeck et al. (2021) found that pet owners who were not actively involved in their pet's care were 1.8 times more likely to experience depression

compared to non-pet owners, and dog owners with limited involvement in their pet's care were 2.2 times more likely to be depressed than non-dog owners. These findings align with previous research (Branson et al., 1989). Nonetheless, limited data is available on pet-owner relationship and depressive symptoms in older adults, and further research is needed.

Moreover, two out of six studies found that depressive symptoms are more common in pet owners (Fernandes et al., 2024; Sharpley et al., 2020). This might not directly suggest that pets cause depressive symptoms but rather that those with depressive symptoms tend to attain pets as a way to alleviate their negative feelings (Mueller et al., 2018). However, this requires further research, with a mixed methods design that could address these inconsistences. In contrast, Janevic et al. (2020) reported that while pets can improve mood and provide a sense of purpose in older adults, the negative impacts are typically related to pet health, costs, and care.

All of these negative outcomes on depressive symptoms were associated with quantitative research methods (see Tables 2 and 3). These findings can be interpreted through the ability of qualitative research methods to reveal human behaviour and emotion at a deeper level (Foley & Timonen, 2015), or they may reflect differences in how depressive symptoms are measured across different methodologies, further emphasizing the need for additional research in this area.

In relation to the second research question “What is the role of Animal Assisted Interventions in depressive symptoms and loneliness in older adults?”, this review concludes that Animal Assisted Interventions can help alleviate the negative effects of depressive symptoms and loneliness in older adults living in care facilities. These results corroborate previous research (Batubara et al., 2022; Gee & Mueller, 2019). Moreover, all studies on Animal Assisted Interventions involved dogs, likely because dogs are the species most commonly used in Animal Assisted Interventions due to their ease of training, availability, and suitability for the role (Glenk & Foltin, 2021).

Lastly, regarding the third research question, “What are the differences in the roles of pet ownership and Animal Assisted Interventions in depressive symptoms and loneliness in older adults?”, a distinction was observed between pet ownership and Animal Assisted Interventions in terms of depressive symptoms. As mentioned, some of these inconsistences may be attributed to the fact that negative outcomes related to pet ownership and depressive symptoms do not necessarily imply that pets cause depressive symptoms. Rather, individuals with depressive symptoms are more likely to acquire pets as a way of coping with their negative emotions (Mueller et al., 2018).

However, the higher number of positive findings related to Animal Assisted Interventions could also suggest that probably, due to the strict and organized nature of the Animal Assisted Interventions (Jegatheesan et al., 2014), positive outcomes are more easily achieved and controlled. Additionally, the absence of negative impacts associated with pet ownership (e.g., pet loss, costs, and care; Janevic et al., 2020), could also play a significant role. This suggests that Animal Assisted Interventions could be beneficial for older adults who are unable to provide daily care for their pets, such as those transitioning from a home environment to a care facility, offering them the psychosocial benefits of human-animal interactions without the responsibility of pet care (Gee & Mueller, 2019). Nevertheless, further research is needed to better understand the differences between the roles of Animal Assisted Interventions and pet ownership in addressing depressive symptoms.

Strengths and limitations

This systematic review, has some weaknesses that might affect the final conclusions. Because of limited accessibility, the literature search was restricted to three databases (PubMed, Scopus, and Science Direct). A wider search might have brought in additional studies, adding to the understanding of how animals contribute to depressive symptoms and loneliness among older adults.

Another limitation refers to the closed start date that was chosen for this review. The present review tried to find the latest research; therefore, it targeted documents from 2019 to 2024, which consequently influenced the selection of older documents. However, this selection criterion was necessary, given that it would help in ensuring the review did not stray from current research results but instead gave new directions for the development of future studies. This means that it might as well have increased its scope in regard to practical application.

This review was synthesized by one reviewer, though, in order to overcome the risk of the bias, all the steps —inclusion and exclusion criteria, strategy of searching, studies selection, data extraction, the quality assessment, synthesizing, and results' interpretation— were double-checked with a specialist in the area for raising the degree of reliability. By diminishing the risk of the bias, a greater degree of confidence on the findings was achieved.

Moreover, the diversity of the methodological approaches and research tools for the assessment of depressive symptoms and loneliness makes the comparison of the results difficult. However, the purpose of the review was the synthesis of both qualitative and quantitative studies by a narrative approach since it was considered the best way to address the review questions.

Even so, the review contributed to the literature on human-animal interaction. The mixed-method approach and the inclusion of the studies on both Animal Assisted Interventions and pet ownership helped extend the understanding of previous research findings about depressive symptoms and loneliness among older adults. This review thus provides a base for recommendations for future studies and hence the advancement of the field of human-animal interactions.

Practical implications

While a decent amount of practical implications in this field of research are about Animal Assisted Interventions, very few make use of pet ownership. Real-world applications could aim to provide support and reduce loneliness in older adults, through the facilitation of new social networks. Various dog walking groups can be formed so that older adults can meet new people through their pets. Also, more elderly pet support programs, like the one presented by Cryer et al. (2021), could be created in order to assist older adults in taking care of their pets when, due to various issues, they are unable to. This could solve many of the negative outcomes associated with pet ownership (e.g., pet care). On another note, new protocols regarding the support of older adults facing pet related issues should be formed. Mental health and elder care specialists should be informed about these negative effects of pet ownership (e.g., pet loss) and be able to provide support to older adults facing them. These specialists should also combine the knowledge on human-animal interactions and raise awareness in public settings about pet-related negative outcomes (e.g., pet loss, pet costs, pet care), while also suggesting solutions. On the other hand, Animal Assisted Interventions should continue advancing as new research is uncovered, thus providing better support to older adults in need.

Conclusions

This systematic review succeeded in providing data on the role of animals with regard to depressive symptoms and loneliness among older adults. The mixed findings indicate that the relation between humans and animals is complex. In particular, the findings on Animal Assisted Interventions are quite definite while those on pet ownership appear to be a rather diverse area of study. In any case, this review also manages to present useful findings and, despite its limitations, outlines a future research agenda for the area. Such research would be of immense value in terms of how various specialists and clinicians working within the areas of mental health and elder care understand human-animal interactions and their implications for older adults. Such research may also further encourage more opportunities for new practical applications in the future even outside the care facility environment.

Conflict of interest

The authors declare that there are no conflicts of interest that could influence the research presented in this paper.

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Ο Ρόλος των Ζώων στα Καταθλιπτικά Συμπτώματα και τη Μοναξιά στα Άτομα Μεγαλύτερης Ηλικίας: Μία Μικτής Μεθόδου Συστηματική Ανασκόπηση

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ΠΕΡΙΛΗΨΗ

Η δημογραφική γήρανση, οι προκλήσεις της ενεργού γήρανσης, και τα αυξανόμενα ποσοστά καταθλιπτικής συμπτωματολογίας και μοναξιάς στα άτομα μεγαλύτερης ηλικίας, πιέζουν τους ειδικούς να ανακαλύψουν καινοτόμες μορφές υποστήριξης για τα άτομα μεγαλύτερης ηλικίας. Μία πρόταση με ελπιδοφόρα αποτελέσματα, η οποία και απασχολεί τη διεθνή ερευνητική κοινότητα, είναι ο ρόλος των ζώων. Ο κύριος σκοπός της παρούσας ανασκόπησης είναι να εξετάσει των ρόλο των ζώων στα καταθλιπτικά συμπτώματα και τη μοναξιά ατόμων μεγαλύτερης ηλικίας, αξιοποιώντας μία μικτή συστηματική μεθοδολογίας. Το άρθρο αυτό ακολουθεί τις οδηγίες και τη λίστα ελέγχου PRISMA (2020) για συστηματικές ανασκοπήσεις. Αναζήτηση πραγματοποιήθηκε για συναφή ερευνητικά άρθρα στην αγγλική γλώσσα από το 2019 έως τις 03/29/2024 σε διεθνείς βάσεις δεδομένων (PubMed, Scopus, ScienceDirect)οι οποίες παρείχαν πληροφορίες για το εξεταζόμενο θέμα. Η επιλογή και διαλογή των άρθρων έγινε με την αξιοποίηση των οδηγιών του διαγράμματος ροής PRISMA (2020) για συστηματικές ανασκοπήσεις. Για την αξιολόγηση της ποιότητας των συμπεριλαμβανομένων άρθρων εφαρμόστηκε το MixedMethodsAppraisalTool (MMAT).Ακολουθώντας αυτή τη διαδικασία, 856 άρθρα προέκυψαν από όλες τις βάσεις, από τα οποία, μετά την αφαίρεση διπλότυπων και τον έλεγχο συνάφειας σε τίτλο και περίληψη, 13 τελικά επιλέχθηκαν. Τα 8 ακολουθούσαν ποσοτικό σχεδιασμό και τα 5 ποιοτικό. Αν και προέκυψαν μικτά αποτελέσματα από την ανάλυση, ειδικά όσον αφορά την κατοχή κατοικίδιων και τα συμπτώματα κατάθλιψης που απαιτούν περαιτέρω έρευνα, στις περισσότερες περιπτώσεις, τα ζώα διαδραματίζουν καθοριστικό ρόλο στην ανακούφιση των συμπτωμάτων κατάθλιψης και στη μείωση της μοναξιάς στα άτομα μεγαλύτερης ηλικίας. Η έρευνα αυτή υποδηλώνει περισσότερες ευκαιρίες για νέες πρακτικές εφαρμογέςακόμα και εκτός του περιβάλλοντος της ιδρυματικής φροντίδας.

Λέξεις-κλειδιά:Ζώα,Άτομα Μεγαλύτερης Ηλικίας, Καταθλιπτικά Συμπτώματα, Μοναξιά, Συστηματική Ανασκόπηση

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