Canines Utilised For Therapeutic Purposes In The Physical And Social Health Of Older People In Long Term Care

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Bachelor Health Sciences (Hons)

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Contents

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Key to Abbreviations

AAAs	Animal-Assisted Activities
AAIs	Animal-Assisted Interventions
AAT	Animal-Assisted Therapy
ACTUARI	Analysis of Cost, Technology and Utilisation Assessment and Review Instrument
CAAs	Canine-Assisted Activities
CAIs	Canine-Assisted Interventions
CAT	Canine-Assisted Therapy
CReMS	Comprehensive Review Management System
EBHC	Evidence-Based Health Care
EBM	Evidence-Based Medicine
EBP	Evidence-Based Practice
JBI	Joanna Briggs Institute
MAStARI	Meta Analysis of Statistics, Assessment and Review Instrument
NOTARI	Narrative, Opinion and Text Assessment and Review Instrument
QARI	Qualitative Assessment and Review Instrument
RCT	Randomised Controlled Trial
SUMARI	System for the Unified Management of Assessment and Review Instrument

Abstract

Background

Interactions between animals and humans have been examined over many years giving rise to the belief that animals can act as therapeutic entities. Canines are the most common animal utilised due to their domestication and trainability. With the population now living longer there has been an influx of people residing in long term care facilities. The potential benefits of such interactions (referred to as canine-assisted interventions [CAIs]) for older people span across physical, emotional and social outcomes. To date the literature on this area examining the efficacy or otherwise of CAIs has been confounded by poor methodological design and variation in interventions in terms of setting, patient population, and outcomes used.

Aims

This thesis explored through the systematic review of existing literature, the role of canines as therapeutic tools in the health and social care of the older population who reside in long term care facilities. More specifically the questions addressed were:

- What international literature exists in regards to the use of canines as therapeutic interventions in the health and social care of older people?
- How feasible are CAIs in the health and social care of older people?
- How appropriate are CAIs in the health and social care of older people?
- What is the meaningfulness of CAIs in the health and social care of older people?
- What are the effects of CAIs in the health and social care of older people?

Method

The research questions were addressed by reviewing and synthesising the available international literature. This approach stems from the evidence-based movement, in particular through the development of the systematic review of evidence and its developing methodologies. Systematic reviews use transparent procedures to find, evaluate and synthesise the results of relevant research on a particular topic.

Results

Four systematic reviews were conducted to determine whether CAIs were effective, meaningful, appropriate and feasible for older people in long term care. Limited in-depth analysis was undertaken across all of the reviews due to the lack and methodological quality (design and reporting) of the available research. A fifth paper was developed to describe the common limitations associated with the current research in this area and to recommend strategies for undertaking further CAI studies.

Conclusions

CAIs may provide some short term benefits on a physical, social and emotional level for residents of long term care facilities. This systematic review of existing literature has highlighted a dearth of evidence-based material to support these benefits and considered ways in which rigorous data and evidence might be collected in future research.

Thesis Declaration

I, Cindy Stern certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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- Stern, C. and 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.*

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- Stern, C. and Chur-Hansen A. Ensuring and sustaining the integrity of animal-assisted interventional research: An aged care example *Paper currently a manuscript for publication*

Signed:_____

Date: _____

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Finally I would like to dedicate this to my Grandpa who I did not realise at the time, inspired me to choose this topic. In his later years Pop suffered from the debilitating effects of Alzheimer's disease and there were many times when he didn't remember who his family and friends were but every time he saw Inca his German Shepherd (who we took in after he moved into a nursing home) there was no doubt that he recognised her and reminisced about his past Shepherds. Inca had an effect on Pop that never faltered.

Man himself cannot express love and humility by external signs, so plainly as does a dog, when with drooping ears, hanging lips, flexuous body, and wagging tail, he meets his beloved master.

Charles Darwin

Chapter One: Introduction (Exegesis)

The idea for this thesis stemmed from working for an international research organisation that focuses on promoting and supporting evidence-based health care (EBHC) principles to researchers, clinicians and students. Although the transition in using evidence to make health care decisions has evolved dramatically in a relatively short period, it is increasingly evident that many people are still unaware of the considerations one should take into account to ensure a fully informed decision for a patient/resident/client, whether that be for a family member, friend or even themselves. Many still believe that all papers that are published are credible or that reading a single article on a particular intervention means they are making an evidence-based decision. Although it is a start, there are many more factors to consider.

This chapter aims to describe the provenance of the EBHC movement, introduce the systematic review and its emerging methodologies and then explain how this methodology can be applied to the area of animal-assisted interventions (AAIs). Finally the aims of the thesis will be defined and the composition of the subsequent chapters outlined.

The EBHC Movement

Pearson, Field and Jordan 2007[1] describe the EBHC movement as one which aims to capture and summarise the masses of available information and subsequently distill from such a mass, useable information to inform health care practitioners when they make clinical decisions. Thus its focus is to improve patient care by highlighting the need for health care practitioners to use interventions/therapies that are supported by current evidence or available knowledge.

The beliefs regarding the value of using evidence in the context of health care primarily originates from the field of medicine. One of the most frequently citied definitions of evidence-based medicine (EBM)

developed by David Sackett and colleagues 1996[2] describes EBM as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients, in other words integrating individual clinical expertise with the best available external clinical evidence from systematic research.”[p. 71]

Pearson et al 2005[3] break down the key components of EBHC as incorporating 1) the best available evidence, 2) the clinical knowledge of the practitioner and 3) the preferences of the patient. They emphasise the importance of considering each factor when making decisions about the care and treatment of a patient. Sackett et al 1996[2] agree and state “either alone is not enough, without current best evidence, practice risks becoming rapidly out of date to the harm of the patient, without clinical expertise even if evidence is excellent it may be inappropriate for an individual patient.”[p. 71]

Pioneers in the establishment of EBM were physicians Thomas Beddoes, Pierre Louis (both in the eighteenth century) and Archie Cochrane (over a century later). Beddoes criticised the state of his profession and advocated for the systematic collection and indexing of medical facts, as well as the dissemination of this knowledge to other physicians.[4] Louis followed on from Beddoes and performed the first known chart review proving blood-letting was ineffective in treating fever. Over a century later Cochrane observed that there was in fact evidence available, but it was disconnected from the people who needed to use it.[4] He famously wrote "It is surely a great criticism of our profession that we have not organised a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomised controlled trials (RCTs)."[p. 9][5] His legacy was later honoured in the establishment of the Cochrane Collaboration, an international organisation that centres on developing these ‘critical summaries’ referred to as systematic reviews.

Since then, EBM has grown rapidly, particularly in terms of published works, led largely by David Sackett in the early 1990s.[6] It has also expanded to encompass other areas of health care (e.g. nursing and allied health) and is now commonly referred to as EBHC or evidence-based practice (EBP). The

fundamental feature of EBHC is that it recognises the challenges faced by busy practitioners from all areas of health care in keeping up to date with the ever growing literature and emphasises the importance of providing condensed information gathered through the systematic review of the international literature on a given topic.

Not all people are advocates of the EBHC movement. Criticisms revolve around practicality constraints and theoretical context.[1] Being able to access the evidence for example, may not always be possible. Some suggest that health care practitioners are already practicing EBHC ('i.e. EBHC is an old hat'),[2] however one could argue that if that were the case, less variability in current practice would be seen.[1] Others warn that EBHC is too prescriptive which could be dangerous and leads to 'cookbook' health care.[1,2] This notion seems perplexing since EBHC advocates for equal consideration towards the preference of the patient and the clinical expertise of the practitioner.

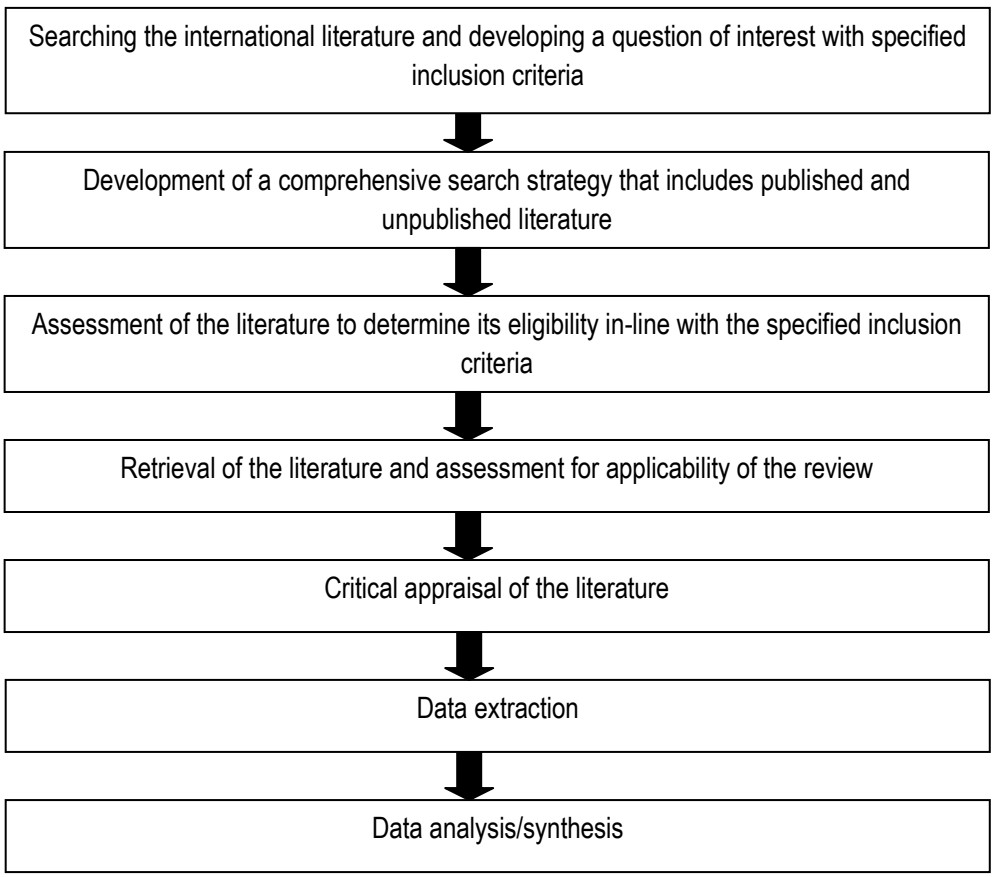
In terms of theory, there have been some suggestions that EBHC relies heavily on RCTs and meta-analyses and that it is unable to incorporate other types of evidence.[1] It is quite clear that the use of quantitative evidence is the dominant discourse in EBHC however as will be discussed further on in this chapter, the pooling of qualitative, economic and textual or opinion data has begun to emerge. Lastly it has been proposed that theory is more significant than evidence in guiding practice (i.e. there is greater significance in practice that is well grounded in theory compared to research) and that there is no evidence, particularly in the areas of nursing and allied health.[1] In response to these two criticisms, firstly EBHC does not suggest that practice should not be based on theory but it should be predicated on the 'best available evidence' to achieve the best outcomes and secondly, if there is no evidence or a lack of solid evidence, systematic reviews can play a role in identifying gaps which can lead to the conduct of further research (both primary and secondary).[1]

Although these criticisms have been made, in general terms the EBHC movement has been positively accepted. The arguments or criticisms surrounding EBHC have evolved and now currently focus on the

methodology and methods used in conducting a systematic review as well as defining what actually constitutes as evidence.[1] Currently no universal approach exists.

The Systematic Review of Evidence

Put simply, systematic reviews use transparent procedures to locate, evaluate and synthesise the results of relevant research on a particular topic. These procedures are explicitly defined in advance, in order to ensure that the exercise is transparent and can be replicated.[7] The processes involved in a systematic review ensure the minimisation of bias (where possible) and these are documented within the review itself. Generally a rigorous and extensive search of the international literature on a given topic is undertaken following the formulation of a review question and pre-determined inclusion criteria. Once literature is retrieved it is then assessed for its applicability to the topic and appraised using standardised tools to ensure that only the results of the highest quality research are included.[8] Extraction and analysis of data follow leading to the development of a set of recommendations, for both practice and research. This process is outlined in the following Flow Chart:



Development of a set of recommendations for both practice and research based on the findings of the review

Flow Chart 1: Steps in the Systematic Review Process

The key benefit of the systematic review (as opposed to the more conventional narrative review) is that by following these processes it permits a more objective assessment of the evidence, compared to narrative reviews which can be manipulated by the author.[9] To ensure the quality of a review based on quantitative evidence, the aim is to reduce bias and increase validity, reliability and objectivity. In reviews containing qualitative evidence, quality aspects revolve around credibility, transferability, dependability and confirmability.

Many traditional systematic reviews focus predominantly on the systematic review of quantitative evidence and more specifically on RCTs to ascertain the effectiveness of a particular health care practice. Comprehensive systematic reviews, also known as mixed method reviews have now begun to emerge which include multiple types of evidence. Harden and Thomas 2005[10] note that "most research does not fit into 'neat categories' of qualitative and quantitative evidence"[p. 265] and when the focus of a review is exclusively on quantitative evidence, it may lack context and explanation. Importantly they also point out that "focusing on qualitative evidence exclusively may allude to strategies that might work, however there is no way of judging from them alone whether or not they would be effective in practice."[p. 266][10] Evans and Pearson 2001[11] also agree and argue that systematic reviews should include evidence through all forms of rigorous research as well as from RCTs, since health care practitioners are concerned with more than cause and effect questions. Some authors have likened the view of including only one type of evidence as 'wasteful' and 'potentially dangerous'.[12] In their review, Roberts et al 2002[12] investigated factors associated with immunising children and concluded that solely utilising qualitative or quantitative evidence would not have identified all related factors and would have

also skewed the importance of the identified factors which may lead to inappropriate development of recommendations for policy and practice.[12]

There are three main international not-for-profit organisations that specialise in the conduct and methodology surrounding systematic reviews. These are the Cochrane Collaboration (http://www.cochrane.org/), the Joanna Briggs Institute (JBI) (http://www.joannabriggs.edu.au) and the Campbell Collaboration (http://www.campbellcollaboration.org/). The Cochrane Collaboration focuses on the effects of health care interventions (largely through the analysis of RCTs) while the Campbell Collaboration focuses on the effects of social interventions related to education, crime and justice, and social welfare. Like Cochrane and Campbell the JBI focuses on the effects of health care interventions and practices, however it also utilises other approaches to pool the results of qualitative, economic and policy research.[13]

The broad approach that the JBI advocates relates to their views on what counts as evidence. Aside from determining the effectiveness of specific interventions and therapies, they acknowledge it is also equally important to determine the appropriateness, meaningfulness and feasibility of a health care intervention, therapy or practice (referred to as the JBI FAME scale).[8] In these circumstances other forms of evidence can be used to answer such questions. Their guiding principles consider good quality research studies that are grounded in any methodological position as more credible than anecdotal accounts or personal opinion. However when no studies exist expert opinion is considered as the 'best available' evidence.[8] They believe that systematic reviews that meet the information needs of professionals, patients, managers and administrators across a sector as diverse as health requires a broad yet robust conceptualisation of evidence as well as comprehensive, rigorous approaches to the systematic review of different forms of evidence.[13] The author of this thesis is an employee of the JBI, and utilises JBI methodologies and approaches.

The Pooling of Evidence

Commonly evidence is broken down into two categories: quantitative or qualitative. Quantitative evidence refers to data that follows statistical or mathematical techniques while qualitative evidence looks at gathering data related to cultural and social phenomena i.e. attempting to understand human behaviour and reasons that govern such behaviour.[13] Aside from quantitative and qualitative evidence, economic evidence and evidence-based on textual or opinion data have emerged as alternative sources of evidence. A key stage in undertaking a systematic review is the ability to analyse or pool information from multiple sources when data are suitably similar. Guidance on how to best pool data is required and depends on the review question and subsequently the type of evidence included in the review. The process of pooling data from a series of RCTs is different to pooling data from a series of ethnographic studies as the units of analysis are completely different. Numerical data are extracted from RCTs while observations or quotes from interviews or questionnaires are the units of analysis for ethnographic studies. The methodology behind the pooling of data in systematic reviews (also referred to as meta-analysis or meta-synthesis) is more established for quantitative evidence than the other types of evidence outlined.

Pooling of quantitative evidence involves meta-analytical techniques. Meta-analysis refers to "a statistical analysis of the results from independent studies, which generally aims to produce a single estimate of a treatment effect." [p. 5][9] When undertaking meta-analysis the effect size of each study (e.g. the direction and magnitude of the results) as well as its weight (e.g. how much information a study provides to the overall analysis when all studies are combined together) must be determined.[6] Deciding which summary statistic to use in a meta-analysis is up to the review authors however the following issues have been noted as significant: consistency of effect size, mathematical properties and ease of interpretation.[6]

Broadly two statistical assumptions are followed when conducting meta-analysis; fixed effects (assumes there is one true effect underlying the included studies undergoing analysis and differences in the data

are due to sampling error or chance within each study and there is no heterogeneity between studies) or random effects (assumes there could be other factors both within and across studies that may influence the data other than error/chance).[6,9] Heterogeneity describes the amount of variation in the characteristics of the included studies and although some level of variation will occur due to chance, heterogeneity occurs when there are significant differences between studies (commonly calculated using the Chi-square statistic) and meta-analysis is seen to be inappropriate.[6,9]

Different statistical methods for combining data exist and Egger et al 2001[9] suggest there is no single correct method. The technique utilised will depend on study type, the nature of the data extracted and the assumptions underlying the meta-analysis.[6] They recommend undertaking a sensitivity analysis to determine the robustness of combined estimates to different assumptions, methods and inclusion criteria as well as examining the possible influence of bias.[9] Although variation exists in meta-analysis, data can be re-calculated using alternative techniques to clearly demonstrate differences in results.

The pooling of qualitative evidence in a systematic review is significantly more contentious than quantitative pooling. Quantitative researchers question the very subjective nature of qualitative evidence itself, whereas qualitative researchers suggest synthesis is impossible because of the ideological, philosophical and methodological differences across the qualitative research traditions.[13] Others are in support of qualitative synthesis but as yet there is no agreement on appropriate guidance for systematic reviews of qualitative evidence. Thomas et al 2004[14] state that there appears to be a lack of certainty about how to include qualitative research within systematic reviews with more literature available on mixed methods approaches in primary compared to secondary research.

The two main views that characterise the ongoing debate surrounding the pooling of qualitative evidence focus on the process of integration (or aggregation) versus interpretation.[13] Integration/aggregation does not involve the re-interpretation of findings but extracts findings and illustrations from studies and links 'like' findings together to form categories. Where possible the findings

are then synthesised. Interpretation aims to develop new theoretical understandings from constructing interpretations from studies. JBI utilises an aggregative approach although it acknowledges the usefulness of interpretative approaches but suggests they do not seek to provide guidance for action. Meta-aggregation is therefore used to develop recommendations for action.[13]

Economic evidence in the context of health care is important since the majority of health care interventions/therapies/practices undertaken have a direct or indirect impact on resources utilised or required. Currently different types of analyses exist such as cost-benefit, cost-effectiveness, cost-minimisation and cost-utility and all have different theoretical origins. The decision on which one to use depends on the purpose of the evaluation and the perspective from which it was conducted[6, 9] Unfortunately guidance on pooling data from economic evaluations is limited and less developed than other areas.[9,13] Jefferson et al 1996 quote "economists have not yet developed a formal methodology for reviewing and summing up evidence from individual economic evaluations…or indeed for assessing whether systematic reviews are possible in this context."[p. 425][9] Currently a number of working groups have been established to develop clearer guidance on methodology and it is anticipated this will materialise in the upcoming years.

Finally the synthesis of text and opinion based data (that is data empirically derived and mediated through the cognitive processes of practitioners who have been typically trained in scientific method) within systematic reviews is not well recognised in mainstream EBHC and it is acknowledged that efforts to appraise the often conflicting opinions are tentative.[6] However in the absence of research studies, the use of a transparent systematic process to identify the best available evidence drawn from text and opinion can provide practical guidance to practitioners and policy makers.[6] Like qualitative systematic reviews that follow an integrative/aggregative approach, systematic reviews of text and opinion also follow the same approach. This involves assembling conclusions, categorising these conclusions into similar or like groups and then aggregating these categories into a set of statements that represent that integration.[6]

Although the debate on what constitutes evidence and subsequently, what should be included in a systematic review and the methodological approach to follow continues, the need for up-to-date reliable information on each health care intervention/therapy/practice remains. For this reason the JBI approach to conducting systematic reviews was chosen. Following this approach permits the synthesis and analysis of data that may not have been undertaken if traditional approaches were followed, enabling health care practitioners and consumers of health care to be aware of and consider the current 'best available' evidence to assist in their decision-making. The JBI has developed theories, methodologies and processes for the critical appraisal and synthesis of these diverse forms of evidence (i.e. quantitative evidence, qualitative evidence, the results of economic analyses and expert opinion and text) in order to aid clinical decision-making in health care.

This methodology can thus be applied to any health care intervention, therapy or practice and the chosen topic of this thesis was animal-assisted interventions (AAIs).

The Use of Animals in Health Care

Interactions between animals and humans have been examined over many years giving rise to the belief that animals can act as therapeutic entities. The terminology used to describe interactions involving animals is varied. Currently AAIs is the most agreed upon term and this covers 'any therapeutic processes that intentionally includes or involves animals as part of the process".[p. 1][15] AAIs broadly consist of:

- Animal-assisted therapy (AAT) – "a goal directed intervention directed and/or delivered by a health/human service professional with specialised expertise, and within the scope of practice of his/her profession."[p. 1][16] It is generally delivered on an individual basis and uses trained

therapy animals and incorporates activities such as brushing a dog with a stroke-affected limb to improve functioning and muscle strength.[17]

- Animal-assisted activities (AAAs) - cover the more non-specific "casual 'meet and greet' activities that involve pets or animals visiting people".[p. 1][16] This is frequently delivered in a non individualised group format.

- Service animals - Trained animals used to assist people including the blind, the hearing impaired or those with disabilities other than blindness or deafness.

For this thesis AAIs will refer to AAAs and AAT only. AAT and AAAs may measure different outcomes however the overall goal of improving health and well-being is the same.

AAIs are commonly delivered as an adjunct to other therapies and are used across health care, rehabilitation and educational settings. The holistic nature of AAIs suggests potential benefits may extend across the physical, emotional and social spectrum. For these reasons they are utilised in a range of situations with people of all ages and conditions. However most of the literature in this field has focused on institutional settings.[18] With the population now living longer there has been an influx of people residing in long term care facilities who suffer from complex conditions.[19] Thus the need for providing care and practices which are effective, meaningful, appropriate, and feasible are needed. Introducing animals into these settings may provide residents with the opportunity to improve functioning and improve well-being by reducing boredom, depression and loneliness and increasing happiness and socialisation.

As with any intervention there are a variety of concerns raised when a program using animals is implemented including its effectiveness, peoples' experiences, infection control concerns, potential risks, cost and responsibilities, and the welfare of the animals utilised. Although used frequently in

health and other care settings its efficacy/value has not been established. To date the literature on this area examining the efficacy or otherwise of AAIs has been confounded by poor methodological design and variation in interventions in terms of setting, patient population, and outcomes used.[20,21] Limited analysis (predominantly quantitative) has been undertaken. Two systematic reviews assessing effectiveness have been conducted[20,21] whereas no qualitative or economic systematic reviews were located. It would therefore seem justifiable to investigate whether this intervention is a credible health care treatment.

Rationale of this Thesis

An examination into the area of AAIs revealed there was literature available in this field. However there seemed to be a lot of variation in what interventions were conducted and their methodology. A need for a solid evidence base to guide practice was clear; therefore the aim of this thesis was to review and synthesise the available international literature in order to explore the knowledge base of the efficacy of AAIs.

Since AAIs are employed across varying age groups, with multiple conditions, and with people who are housed in a range of settings this research focused on one type of animal (canines), one population (older people) and one setting (long term care). Although a range of animals are employed canines are the most common due to their domestication and trainability.[20] The above descriptions can thus be adapted from AAIs, AAAs and AAT to canine-assisted interventions (CAIs), canine-assisted activities (CAAs) and canine-assisted therapy (CAT).

Thus this thesis explored the role of canines as potential therapeutic tools in the health and social care of older people who reside in long term care facilities. More specifically the questions addressed were:

- What international literature exists in regards to the use of canines as therapeutic interventions in the health and social care of older people?
- How feasible are CAIs in the health and social care of older people?
- How appropriate are CAIs in the health and social care of older people?
- What is the meaningfulness of CAIs in the health and social care of older people?
- What are the effects of CAIs in the health and social care of older people?

A deliberate decision was made to limit the thesis to one animal, one setting and one population to avoid making sweeping generalisations that would not be valid or practical. This was based on the following assumptions: 1) the initial scan of the literature showed that the majority of papers utilised canine interventions, 2) most of the literature focused on the institutionalised elderly and 3) it was felt that the interaction between human and animal would vary depending on the species of animal used (e.g. the level of attachment a person can feel with a dog may be quite different to a fish). It was also felt that it would be difficult to compare different populations (e.g. elderly and children) and different settings (e.g. at home compared to an acute hospital ward) due to the complexities associated with each situation such as the level of care required, the ability to interact with others as well as animals, and predisposing conditions. Where possible the aim was to ascertain information from three different perspectives: the client receiving the CAIs, the health care staff, family, friends or significant others that care for the client receiving the CAIs and the people involved in delivering CAIs.

A series of four systematic reviews were undertaken. Reviews were conducted using the JBI System for the United Management, Assessment and Review Instrument (SUMARI) online software. This software is composed of five modules which enable users to conduct systematic reviews containing qualitative, quantitative and/or economic data as well as text and opinion. A secondary reviewer is a requirement when conducting a systematic review but for the purpose of these reviews, they were only used to critically appraise papers that met inclusion requirements.

Ethics was not needed for this thesis since it did not include any primary research involving animals or humans; only secondary data were utilised.

Composition of This Thesis

This thesis is organised into seven chapters and has been undertaken through a series of publications. Chapter One (this chapter) serves as an exegesis in that it introduces the area in terms of topic and methodology as well as outlining the aims and the composition of this thesis. Chapters Two to Five comprise the four systematic reviews following the JBI methodology. Four systematic reviews were conducted to determine whether CAIs are effective, meaningful, appropriate and feasible (utilising the JBI FAME scale). Each review has been peer reviewed and subsequently published in the JBI Library of Systematic Reviews. Chapter Six stems from the findings of the four systematic reviews and is a discussion of the methodological issues surrounding conducting research in the area of CAIs. It also includes practical recommendations for those undertaking this research as well as the readers of this area of research. Chapter Six is currently being submitted for publication in a peer-reviewed journal. Finally a conclusion is provided in Chapter Seven.

The contribution to knowledge this thesis brings is two-fold. Firstly the conduct of four scholarly systematic reviews that have not previously existed in this area. These reviews have followed rigorous methods to collect and analyse data in order to generate new knowledge based on the results of the included data and are a fundamental component of EBHC. Secondly a piece describing the methodological challenges associated with CAIs, which has also not previously been conducted to this level of detail or informed using EBHC priniciples. Recommendations for future practice and research are provided to serve as a guide for others to follow for different settings, populations and animals. It is hoped that the recommendations made will lead to more rigourous results in future research, thus adding to the evidence-based literature on the efficacy of CAIs for the physical and social health of older people in long term care.

Chapter Two: Paper One – Published

The Effects of Canine-Assisted Interventions (CAIs) on the Health and Social Care of Older People Residing in Long Term Care: A Systematic Review

Cindy Stern and Rie Konno (2011) The Joanna Briggs Institute, The University of Adelaide, JBI Library of Systematic Reviews, 9 (6): 146-206

Statement of Contributions

Ms Cindy Stern (Candidate)

I was responsible for the overall creation of this paper. As the primary author I developed the protocol, conducted the literature searches, retrieved papers, and assessed each paper for their eligibility. I subsequently undertook critical appraisal, data extraction and data analysis. I was also responsible for responses to reviewers and revisions to the paper. The review was conducted using tools provided by the Joanna Briggs Institute.

Signed:_____ Date: _____

Dr Rie Konno (Secondary reviewer/author)

The development of the idea for this systematic review, the collection of data and its subsequent analysis was the work of Ms Stern. Ms Stern was responsible for writing this paper. My role was to assess each retrieved paper independently to determine if it met the predetermined inclusion criteria. If a paper was included I also undertook critical appraisal using to appropriate tool (dependant on study design) provided by the Joanna Briggs Institute. I hereby give my permission for this paper to be incorporated in Ms Stern's submission for the degree of Doctor of Philosophy from the University of Adelaide.

Signed: Date: _____

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
Joanna Briggs Institute Library of Systematic Reviews, v.9 (6), pp. 146-206

Chapter Three: Paper Two – Published

The Meaningfulness of Canine-Assisted Interventions (CAIs) on the Health and Social Care of Older People Residing in Long Term Care: A Systematic Review

Cindy Stern (2011) The Joanna Briggs Institute, The University of Adelaide, JBI Library of Systematic Reviews, 9 (21): 727-790

Statement of Contributions

Ms Cindy Stern (Candidate)

I was responsible for the overall creation of this paper. As the sole author I developed the protocol, conducted the literature searches, retrieved papers, and assessed each paper for their eligibility. I subsequently undertook critical appraisal, data extraction and data analysis. I was also responsible for responses to reviewers and revisions to the paper. The review was conducted using tools provided by the Joanna Briggs Institute. There were two papers located that met the inclusion criteria therefore a secondary reviewer was required for critical appraisal of these two papers

Signed:_____ Date: _____

Note:

Dr Rie Konno was the secondary reviewer for this review. Her role involved critical appraisal of the two included papers only and as such was not considered as an author. Her role was recognised in the acknowledgements section of the paper.

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
Joanna Briggs Institute Library of Systematic Reviews, v. 9 (21), pp. 727-790

Chapter Four: Paper Three – Published

The Appropriateness of Canine-Assisted Interventions (CAIs) on the Health and Social Care of Older People Residing in Long Term Care: A Systematic Review

Cindy Stern (2011) The Joanna Briggs Institute, The University of Adelaide, JBI Library of Systematic Reviews, 9 (33): 1367-1392

Statement of Contributions

Ms Cindy Stern (Candidate)

I was responsible for the overall creation of this paper. As the sole author and primary reviewer I developed the protocol, conducted the literature searches, retrieved papers, and assessed each paper for their eligibility. I subsequently undertook critical appraisal, data extraction and data analysis. I was also responsible for responses to reviewers and revisions to the paper. The review was conducted using tools provided by the Joanna Briggs Institute. There were no papers located that met the inclusion criteria therefore a secondary reviewer was not required.

Signed:_____ Date: _____

Note:

Dr Rie Konno was asked to be the secondary reviewer for this review, the role involving critical appraisal of any included papers. Since this review was an 'empty review' such that no papers met the inclusion criteria she was not considered an author.

Stern, C. (2011) The Appropriateness of Canine-Assisted Interventions (CAIs) on the Health and Social Care of Older People Residing in Long Term Care: A Systematic Review
Joanna Briggs Institute Library of Systematic Reviews, v. 9 (33), pp. 1367-1392

Chapter Five: Paper Four – Published

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

Cindy Stern (2011) The Joanna Briggs Institute, The University of Adelaide, JBI Library of Systematic Reviews, 9 (32): 1341-1366

Statement of Contributions

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Joanna Briggs Institute Library of Systematic Reviews, v. 9 (32), pp. 1341-1366

Chapter Six: Paper Five – Paper currently a manuscript for publication

Methodological Considerations in Designing and Evaluating Animal-Assisted Interventions

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Statement of Contributions

Ms Cindy Stern (Candidate)

I was responsible for the overall creation of this paper. As the primary author I developed the content and structure of the paper as well as responding to feedback from the co-author.

Signed:_____ Date: _____

Prof Anna Chur-Hansen (co-author)

As Ms Stern's secondary supervisor I have been involved in refining the direction of her research. Ms Stern was responsible for writing this paper; my role was to comment on drafts, make suggestions on the presentation of material in the paper and to provide editorial input.

I hereby give my permission for this paper to be incorporated in Ms Stern's submission for the degree of Doctor of Philosophy from the University of Adelaide.

Signed:_____ Date: _____

Abstract

Objective

This paper explores the literature base in the area of animal-assisted interventions. It describes issues surrounding its current methodological quality and some of the reasons pertaining to these limitations.

Methods

This paper describes some of the common variations in design, conduct and reporting by drawing on the work of four systematic reviews focusing exclusively on the use of canine-assisted interventions for older people residing in long term care.

Results

Although the literature base has grown in volume since its inception, it still predominantly consists of anecdotal accounts and reports. Experimental studies have been undertaken however most are hindered in aspects of design, conduct and reporting. There are also few qualitative studies available leading to the inability to draw definitive conclusions with further work required.

Conclusions

Future research must be more rigorous and approaches must be more uniform when designing and evaluating animal-assisted interventions. Checklists for quantitative and qualitative research designs are offered to guide future research. It is clear that due to the complexities associated with these interventions not all weaknesses can be eliminated. However, there are basic methodological weaknesses that can be addressed in future studies in the area.

Keywords: aged care, animal-assisted interventions, canines, evidence, methodology

Introduction

It is widely accepted that animals can play a role in the physical and social health of some humans however the degree in which they do this remains uncertain. This is primarily due to the current lack of rigorous scientific research that has been undertaken to validate and support these assertions. A number of authors have outlined the existing weaknesses in current research and the ways in which these weaknesses hamper the evidence for the role animals might play in human mental, physical and social health.[63,112,142,188] This paper seeks to explore the current literature base, discuss issues surrounding its methodological quality, to suggest reasons to why these weaknesses continue to occur and to provide recommendations to ensure future research progresses and surpasses current standards. This stems from the findings (or more precisely the lack of findings) of a series of four systematic reviews recently undertaken that focused solely on older people residing in long term care who received canine-assisted interventions (CAIs).[115,146,157,176] To provide some context this paper firstly introduces the long term care environment and the theory of CAIs.

The Realities of Long Term Care

Across the globe (but particularly in developed countries) the ageing of the population continues to occur. Kinsella and Velkoff 2001[189] predicted that following 2010, the numbers and proportions of elderly individuals will rise rapidly in most developed and many developing countries. The looming 'aged care crisis' in Australia has been well documented with predictions that almost all of the growth in the population will occur in the older age group over the approaching three decades[173] indicating a major increase in the demand for care accommodation for older Australians.

Canines as Therapy

Animals have been used to improve the health and wellbeing of humans for many years and its use continues to increase.[190] The current term used to define this phenomena is animal-assisted interventions (AAIs), described as "any therapeutic process that intentionally includes or involves

animals as part of the process."[p. 264][22] AAIs can be further classified as either animal-assisted activities (AAAs) (the utilisation of animals that meet specific criteria to provide participants with opportunities for motivational, educational, and/or recreational benefits to enhance quality of life)[p. 1][66] or animal-assisted therapy (AAT) (a goal-directed intervention directed and/or delivered by a health/human service professional with specialised expertise, and within the scope of practice of his/her profession).[p. 1][16] Canines are the most common animal employed because of their availability, trainability and consequently predictability and hence the terminology described above can be modified to canine-assisted interventions (CAIs), canine-assisted activities (CAAs) and canine-assisted therapy (CAT).

Most research on CAIs, CAAs and CAT has focused on the use of canines with the elderly, specifically those living in long term care facilities.[190] Interaction does not rely on a need for a high level of cognition; Marx et al 2010[26] puts forward that "AAT is well suited for nursing home residents with dementia as it provides social interaction that is not dependent on the resident's levels of cognitive functioning;[p. 1]" an animal will provide companionship regardless of a resident's state of awareness.[191] Perkins et al 2008[191] add that animals communicate better than humans with people with dementia because they rely more on body language. AAIs/CAIs also provide opportunities for tactile stimulation with another sentient being that residents may not experience much of, they can provide companionship and assist in social interactions. It is important to note however, that interventions with animals are not always accepted. Not all people have an affinity with animals, and thus introducing a dog to a person with a fear or dislike of dogs may cause distress. In addition, All et al 1999[107] suggest that it is often difficult to convince human service professionals of the value of using animals as a therapeutic modality and their use has frequently been met with skepticism and reluctance.

The Missing Link

Although animals as therapy in contexts such as residential aged care is becoming more common, little research has been conducted that examines the effects and experiences associated with their use. In

the health sciences, the common practice used to establish whether an intervention has an effect on an outcome (i.e. to prove causality) or to show at least an association between the intervention and the outcome involves the conduct of primary research in the form of experimental and observational studies. Performing this level of experimentation usually stems from anecdotal evidence and the undertaking of case reports and descriptive studies (i.e. progressing from hypothesis generating studies to hypothesis testing studies). Ideally a systematic review which permits the pooling of individual high-quality studies and provides a summary statistic should be one of the final steps in establishing a solid scientific base to validate or refute each potential intervention/therapy. Systematic reviews follow a strict, transparent process allowing it to be reproducible.

Although ideal, this progression does not always occur. This may be due to the lack of available funding in a particular area, it may not be seen as a priority focus or the research simply can not be conducted. This could be due to complexities surrounding the intervention itself or because of ethical or safety considerations that might occur as a result of undertaking this type of research. Neer et al 1987[192] state that it is ethically questionable, regardless of good intentions, to subject people already suffering from physical and mental illness to an untested form of activity.

Although animals have been utilised within long term care facilities as well as the broader health care spectrum for many years,[83] the published literature within this field has only emerged in the last 30 years. Like the process described above, it began with anecdotal or hearsay accounts about the benefits people saw in both residents and staff once an animal was introduced.[193] What followed were the expansion of case reports, observational studies without control groups, observational studies with control groups and eventually a small number of controlled studies.

The current standing of research in this field is such that the literature base has continued to grow but it largely remains at the anecdotal, descriptive or case report level.[142] Culliton 1987[194] wrote that a lot of research in the field is colored by ‘strong sentiment’ and the ‘aw’ factor, as in ‘aw, what a cute dog’ and

data to prove any benefit was scarce. In 1984 Beck and Katcher[187] reviewed the available literature at that time and concluded that animals had either no impact or produced relatively small therapeutic gains. The impressive therapeutic benefits outlined in the many descriptive case reports were not seen in any of the studies they located. They advised that the internal and external pressure for positive information about animals had resulted in distortions in the way research data were gathered, evaluated and reported.[187] The amount of controlled experiments that have been undertaken over the last 30 years is limited and often hampered by methodological limitations and biases. Koivusila and Ojanlatva 2006[195] noted that not all scientific explorations have been founded on proper applications of representative samples or statistically correct methodologies. Chur-Hansen et al 2010[4],[188] in a discussion of the methodological challenges in drawing conclusions about the efficacy or otherwise of AAIs, found that to date, the characteristics hampering studies three decades ago are still evident in current literature, a conclusion also made by Phelps et al 2008[190] in relation to elderly people specifically.

If the quantity of literature has continued to increase, why is it that the quality of this research has not continued to progress with it? Is this due to the field of inquiry being one that can not be verified through scientific research due to its associated complexities, or is it simply that current standards are poor and need to be refined? In order to answer this question it is necessary to first explore the current literature base to describe some of the common variations in design, conduct and reporting.

Pool of Knowledge

The pool of knowledge in the area of AAIs originates largely from the USA, however a number of papers from Australia, UK, Japan and Europe have also been published. Many studies in the literature have been written by nurses who have been involved in implementing some type of AAI and are recounting their experiences. The remaining papers come from academics, various health care clinicians and

[4] Paper included as Appendix XIX since candidate is an author and relates to this dissertation

workers and students undertaking postgraduate research. Papers are predominantly published in health-related and animal-related journals.

The Systematic Reviews

The four systematic reviews recently undertaken focused on the effectiveness,[115] meaningfulness,[146] appropriateness[176] and feasibility of CAIs[157] used in long term care settings. Eight studies were included in the effectiveness review with no statistical pooling possible. There was no restriction to the type of outcomes measured with the majority of studies focusing on emotional aspects as opposed to physical or social measures.[115] Two qualitative papers met the inclusion criteria for the review focusing on the experiences of being involved in CAIs. Limited meta-synthesis was possible and like the first review, it demonstrated some short term positive results.[146] The remaining two reviews[157,176] did not locate any papers meeting eligibility requirements even though they were both open to quantitative, qualitative and textual data. Of the literature that was available on these two topics, it was generalised and did not delineate between different age groups, settings or the animals used. Although the processes followed for this series of reviews was rigorous, the reviews were unable to solidly substantiate the assertions that animals improve health.

The aim of searching for papers for a systematic review is to locate all available work (both published and unpublished) that relate to the review question and to then assess each paper to determine whether they meet the pre-specified inclusion criteria. The following descriptions are based on papers that were included in the reviews as well as those that did not meet the inclusion criteria but were reviewed in the process. This section focuses on quantitative and qualitative research separately and where necessary is broken down into sub-headings.

Quantitative Research

Design and Conduct

The design and subsequent conduct of a research study is the pillar to undertaking a methodologically sound study. If time and resources permit, a pilot study is advocated in the literature as this can help avoid any potential issues that may arise and allows for modifications to be made to the design and procedure.[142] Ideally when attempting to determine the effect of an intervention on a certain population and a certain outcome, the gold standard is a randomised controlled trial (RCT). This infers that the selection of participants to either the intervention or the control group is purely by chance. While the RCT is considered to be the most rigorous study design it is difficult to randomly assign most species of animals to institutionalised individuals. Ensuring trials were truly random would require assigning residents to receive the animal intervention without some kind of screening for their feelings/fears towards the animal as well as their potential susceptibility towards allergies which would be unethical. Potential participants need to be screened and subsequently provide their consent. Interestingly, many studies do not report screening participants in this way, and nor is consent always reported.

If randomisation occurred after this process (i.e. following screening and consent) it could be at the facility level. Ideally a large number of facilities could be included in the study with the facility as the unit of randomisation i.e. each facility could be randomly assigned to either experimental or control groups.[17,196] Having the control group at a different facility to the intervention group potentially avoids the issue of controls knowing that the treatment is taking place which could impact on their results.[83]

If participants were not selected randomly and were self-selected (voluntary) it would be more likely that those people who had an interest in animals would want to be involved in the study compared to those who have never had an animal or had no interest in them, leading to an inaccurate representation of the population. Of the studies located that stated they were randomised, many did not describe how the randomisation process occurred.[50,51,72-74]

Closely related to randomisation is allocation concealment. Allocation concealment is another factor commonly not described in research studies. It was not clear in the majority of studies reviewed whether

allocation to treatment groups was concealed from the allocator since most did not clearly identify who the allocator was and the method that was used.[115]

Ensuring the sample is of a sufficient size is also important in designing a study, since one of the goals is to make inferences about a population from this sample. The sample should be large enough to produce sufficient power in order to undertake statistical analysis to detect an effect. Having a small sample size is one of the most common limitations noted in literature.[196] Sample sizes tended to average between 30 and 40, the largest sample size located was N=80.[51] Koivusilta and Ojanlatva 2006[195] note that samples have been small making multivariate analyses impossible. Within this chosen sample the outcomes of people who withdraw should also be described and included in any analysis. Again, this is not always done or reported.

Finally in this section is the ability to blind participants to treatment groups i.e. so they would not know if they are receiving the active treatment or control. This factor is impossible to control for. Some researchers have advocated to not advise the participants of the study prior to the introduction of the animal to minimise the chances that this would influence their responses.[178] Blinding the investigator may be possible but is dependant on whether they are responsible for measuring outcomes and if these outcomes are reliant on observation at the time of the intervention. The deliverer of the intervention cannot be blinded however – they cannot be unaware that they are bringing an animal to humans for therapeutic purposes.

Population Characteristics

Although the majority of studies in this field have focused on specific populations such as older people, their characteristics are often extremely complex making it difficult to generalise results. To give this some perspective, a study undertaken by Marx et al 2010[26] that utilised a group of people with dementia had an average of 7.2 medical diagnoses and received an average of 9.5 medications. These factors

would substantially impact on the ability to engage in the intervention thus making it difficult to find comparable groups.

There are other factors that may impact on the ability to participate in the intervention including mobility, exercise and activity level, level of care required, cognition, hearing and vision levels, past history/experience with animals, attitudes towards and attachment with animals including the animal involved in the intervention, types of activities undertaken in the facility and staffing levels.

Cognition levels are frequently described in the literature; however the majority of the others listed above are not. Past history/experience with animals[130,197] and medication usage[44,197] are two factors that were noted sporadically. Kongable et al 1989[130] was one of the few studies to mention physical problems of the population in the form of hearing impairment, physical restraint and chemical restraint in the context of impacting on interactions. Banks and Banks 2005[73] also note hearing impairment as a potential confounder. Few studies have commented on the effects of AAI programs for people who dislike animals or on the risks associated with such programs.[196] It is crucial for details of possible confounders to be mentioned and accounted for in any study undertaken.

Intervention

Sellers 2005[53] notes the disparity in language and foundational concepts used across studies in terms of the actual application of AAT. The use of words and phrases such as pets, companion animals, animals as therapy, and pet facilitated therapy are used as though they were interchangeable with the actual interventions provided often showing little comparability. The results of a quantitative review demonstrated that many papers classed the intervention as CAT however when it was described in the methods section all fitted under the definition used in the review for CAAs since interactions were unstructured.[115]

One of the most notable disparities in the literature in regards to the intervention is the lack of consensus on the standards for administering interactions. Some canines remain leashed at all times while others are let off the lead to interact with participants. Some studies simply do not provide this information.[50,51,74,75] The level of interaction with the animal can include an individual simply watching the animal move and interact with others, to someone quite 'hands-on' who is embracing the animal (patting, kissing, cuddling), or involved in grooming, walking or playing with the animal. It is often up to the discretion of the participant how little or how much they interact. In some cases the animal is owned by the researcher, members of staff or is part of an organisation that undertakes AAIs. Coinciding with this is the influence of the researcher and handler (which in some cases is one and the same) on the interaction. There was one instance noted in the literature whereby the dog became distracted during the intervention and wanted to interact with its handler.[75] Another study avoided this from potentially occurring by explicitly deciding not to use an animal that belonged to staff or residents.[178]

Many papers were unclear in describing who was present during the interaction, with most stating that a handler, researcher and/or therapist were present. Often communication and interactions between participants and people is limited by the use of a predetermined script. Others play a substantial role in facilitating the interaction between the animal and the participant as well as generating dialogue between themselves and the participants. Hall and Malpus 2000[161] suggest that human interaction may be responsible for facilitating any change and that the critical component of the intervention may be in fact the interaction with the handler and not the animal. Himes and Fredrickson 1998 (cited in Sellers 2005[53]) agree and acknowledge that any interaction between humans and animals are often wrongly considered to be therapy and though an animal is present for the therapy sessions, it is the therapist who facilitates changes within individuals.

In terms of the format or mode of delivery, interventions can be delivered individually or in a group environment and there could be one animal, multiple animals or a variety of species utilised. Wallace and Nadermann 1987[198] advise that in the majority of cases animals are introduced to a large group of

individuals, typically in the dayroom or lounge of the facility and that by utilising this approach it may be difficult to determine if any of the beneficial effects observed are actually a function of the intervention per se or due to the generally elevated social activity level that exists in the room during the intervention. Conducting a session individually in one's room may be a totally different experience to the group scenario detailed above.

The breed of canine used in the intervention may impact on outcome. Marx et al 2010[26] found that larger breeds compared to smaller breeds were more popular with participants. The size of the animal may be an issue if participants are wheelchair bound, if they have mobility problems or if they are concerned or intimated by larger animals. Some individuals may prefer one breed over another which could impact on their experience. The age of the animal may also play a role - younger dogs/puppies may be more active than older dogs and participants may shy away from the more lively animals or vice versa. Lutwack-Bloom et al 2005[83] recommend assessing dogs at baseline to ensure comparable behaviors, if multiple dogs are to be utilised. Most studies provide a description of the animal used, however it is rare for studies to compare one animal with another and to explain the reasoning behind selection of the animal.

As with administering the intervention there is no accepted standard in relation to the duration of each session or the frequency of sessions to provide to participants. There is an extreme variance in the duration of a session, which would obviously depend on the ability of the individual/individuals to interact and stay focused. For example Marx et al 2010[26] and Kramer et al 2009[199] both utilised people with dementia as their participants of interest with the duration of each session potentially lasting for as little as 3 minutes. On the other hand some sessions have been noted as lasting for 90 minutes[116] while Kongable et al 1989[130] and Walsh et al 1995[186] described sessions lasting 3 hours. If a facility housed a resident animal the duration of interaction could potentially be longer. In terms of session frequency, visits are scheduled weekly, fortnightly or monthly with some facilities organising multiple sessions per week.[200] Commonly though, sessions are weekly and like session duration, frequency would alter if the

animal was a resident animal. Over the course of their study Kongable et al 1989[130] changed from a visiting dog to a resident dog and suggested that because participants had previous interactions with the animal they may have been desensitised to the presence of the dog as a novel experience. As with medication interventions used to treat an illness, prescribing the correct dosage is vital with current AAI literature signifying this remains unknown.

Lastly the very nature of the intervention itself, i.e. as an adjunct therapy, makes the ability to prove causation or even association difficult. Since the intervention of often provided in combination with an array of other interventions it is difficult to determine if the AAI alone is responsible for a change in outcome.

Comparisons

The need for a control/comparison group is essential in ensuring that any change in outcome is attributable to the intervention and doesn't simply occur naturally over time. For those studies that utilised a control group, some did not describe any details of what that actually consisted of rendering it worthless.[61,83,84] A minority of studies used multiple treatment arms i.e. one arm for the intervention (animal and handler), one arm for a control and another arm for a comparison.[51,74,108] This scenario seems ideal as it considers the presence of the handler as a separate condition and assists in establishing if the interaction between the handler and human influences outcomes. It also allows for an alternative intervention to be tested. Some studies utilise a person/people as an alternative intervention;[83, 201] Lutwack-Bloom et al 2005[83] deliberately did not advise their chosen volunteers on the purpose of their study but only provided broad information associated with the procedure they were to follow.

If a study utilises a controlled design, the control and treatment groups should be comparable at entry in terms of their characteristics and subsequently be treated identically other than for the named intervention. This is to ensure confidence in the results i.e. any change in outcome could be attributable

to the named intervention. This will be difficult to achieve due to both the complexities associated with the population and the differences between facilities (if utilising multiple facilities) or even within a single facility. Lutwack-Bloom et al 2005[83] acknowledge the potential for the Hawthorne Effect, whereby participants achieve better results due to the attention they receive in being part of the study or the novelty of the situation as opposed to the intervention itself.

Outcomes

The outcomes measured across current studies are highly variable; both in type and the way they are measured. Outcomes are either general behaviors or behaviors only measured during the interaction.[17] The lack of standardisation of outcomes indicates the inability of statistical pooling and hence the overall unreliability of results. Phelps et al 2008[190] comment that often changes in behavior are limited to only one or a small number of the measured target behaviors potentially limiting the clinical utility of the changes. Whaley 1996[164] suggested that the effects that animals have on social responsiveness may be deeper than what is measured by eye contact or vocalisation, which may explain the varying results. In other words the positive effects from touching an animal or the memories of past companion animals may be short-lived, lasting during and shortly after the interaction. Therefore studies using experimental controls which tend to measure lasting results and studies asking for descriptive case reports of recounts of the session may produce different results.[164] Whaley 1996[164] emphasises that this does not make the effect less important and insignificant to the participant, however ideally an intervention should aim to produce long term results.

Many studies measure outcomes by observational means. Kongable et al 1989[130] point out that data gathered by observation is vulnerable to distortion and experimental bias. In most situations the quality of data obtained is also threatened by the risk of human perceptual errors, such as the investigators' interest and involvement with the study.[83,130,161] The influence of staff reactions to the animal may play a role in misinterpreting results such that it may motivate an increased frequency of interaction. Where possible a structured observational checklist should be developed and interrater reliability established.

Videotaping was recommended as the method of choice[71,130] since it allows continual review so things that were not obvious during the interaction may be examined later.

As well as measuring data by observation, studies tend to include outcomes that rely on self-reporting by participants (e.g. depression, mood, well-being). As mentioned previously this can prove challenging (e.g. residents could become confused) and lead to inaccurate reporting. As well as the participants, some studies rely on the subjective observations by staff, family or friends[164,191] and their expectations on the effects of animals on participants may bias their assessment.[202] Caution should be taken when interpreting these measures and where possible outcomes should be measured in a reliable way using standardised measures with validated scales/tools. Outcomes should be measured in the same way for all groups.

Blinding those who are assessing outcomes so they are unaware of what treatment group each participant has been allocated to is desirable.[188] This will not always be possible since some outcomes will need to be observed directly during the treatment phase. Even if those assessing outcomes are unaware of treatment allocation they may be aware of the study's overall aims potentially leading to exaggerated recordings of observed responses.[161]

Finally the studies in this area have overwhelmingly measured outcomes in the short term, commonly between 4 and 8 weeks. Few studies measured outcomes in the longer term; Lutwack-Bloom et al 2005[83] followed up for 6 months; Barak et al 2001[203] followed up at one year while Crowley-Robinson et al 1996[78] had follow up at 23 months. It is important to establish whether changes in outcomes lead to any long term benefit and as mentioned in Phelps et al 2008,[190] it is also important to determine if changes occur across different situations such as following the conclusion of the intervention when the animal is not present or on a day where the intervention is not being conducted.

Reporting

It should be pointed out that many of the methodological considerations described above might have been addressed but were not reported in the available papers. For example not all studies mentioned that consent had been given to participate.[72,74] Williams and Jenkins 2008[204] note that it is not always clear how ethical approval was sought to protect participants, particularly those with dementia who may have been unable to consent to the study.

It is also not always clear how the research is funded. There may be conflicts of interest with the research if it has been funded by bodies with vested interests such as the animal care industry.[188] A declaration of any conflict of interest should always be provided.

Publication bias is a common occurrence in any type of research. Although many of the experimental studies did not produce statistically significant results, the authors tended to speak positively of the intervention and even go on to recommend it.[115] Although there may not have been any negative effects associated with the intervention it is hard to be sure since they were not mentioned. Research that finds no effects may not be published, and it is possible that research reporting negative findings may also be less likely to appear in published literature.

Qualitative Research

Qualitative studies are important in determining the experiences of people involved in AAIs. Although quite common in most areas of inquiry, there are more quantitative studies that exist in the field of AAIs than qualitative and therefore issues pertaining to quality and conduct can only be based on a small proportion of studies. The current evidence base lacks in-depth information from qualitative research conducted without prior assumptions.[188] Qualitative research has the advantage of being open-ended; themes may be identified that have not previously been considered as important and these may be pivotal in helping to understand the mechanisms at work in the relationship to health.[188]

Design and conduct

Generally qualitative research tends not to follow a standardised set of 'strict' criteria like experimental research. There are a range of different methodologies that can be used to undertake a qualitative study, and within each one a variety of approaches/perspectives can be followed. Nevertheless, qualitative research must demonstrate trustworthiness and rigour, and adhere to strict guidelines in order to achieve these.[205] Qualitative approaches do not distance the researcher from the researched; the analysis is legitimately influenced by researchers when they interpret the data.[13] The core to conducting a good quality study lies in its credibility (confidence in how well data and processes of analysis address the intended focus), transferability (the extent to which the findings can be transferred to other settings or groups) and dependability (seeks means for taking into account both factors of instability and factors of phenomenal or design induced changes).[206]

These aspects can be measured by a) the congruity between the philosophical position adopted in the study and all aspects of its methodology, methods (research question, data collection, analysis) and interpretation, b) the scale to which biases of the researcher are made explicit and c) the relationship between what the participants are reported to have said and the conclusions drawn in the analysis.[13] There are limited studies available that address all of these factors or at least report on all of them making it difficult to determine how credible their results might be.

The researcher may influence the data with their beliefs and opinions; for example they could direct how and where the interview leads and as such it is important to describe the researcher's stance (both culturally and theoretically) and the potential influence this could have on the research.

The main approach to data collection is by interviews, usually structured to some degree and on a one-to-one basis. Interviews varied in length (anywhere between 15 – 50 minutes) and studies explored

different perspectives in the form of residents and staff. It was not always clear if staff were interviewed because residents were too frail to participate (some were in Alzheimer's special care units).[146]

Often the study was undertaken at a single facility and one interview was conducted. Winkler et al 1989[202] and Savishinsky 1985[207] took a different approach and interviewed participants at multiple time points. Collecting data at different points of time would be useful to determine if feelings and experiences changed over time for example before, during, and immediately following the intervention and in the longer term.

As with quantitative studies the sample sizes utilised are small (usually around 6 – 10 people), although unlike quantitative research, this in itself is not a limitation of a study. Limited background information about the participants was provided. It is important to know a person's attitude towards animals, their past experiences with them as well as their cultural and religious values. Although not a participant in the study, Reed 1986[178] describes a situation where the animal had to be kept away from staff from a particular cultural group. As with quantitative research, aspects such as cognition, vision and hearing ability, medication usage and morbidities would impact on the participant's experiences and subsequently on the ability to describe them.

Many studies were mixed methods studies and contained small portions of qualitative data, however since they were predominantly quantitative in nature this meant that limited qualitative analysis could be undertaken or if they were, were not reported.[146]

Publication bias was also likely to have arisen. It is unclear whether papers included all of their findings especially participant quotes/illustrations. For example Kongable et al 1990[125] did not clarify how many findings they actually had. Qualitative papers have the disadvantage of length: often only core themes or selected themes can be presented, meaning that information may be lost to the literature base.

Connecting the Dots

Using the elderly and canines as foci, this paper has explored the current body of research available in the field of AAIs and has found that the majority of studies lack sound scientific methodology. The consequence of this is that the results of studies (both quantitative and qualitative) cannot currently confirm whether AAIs are therapeutically beneficial to human health.

To determine whether there is actual benefit (as opposed to current perceived benefit) more consistent research is required that follows sound process and methodology. Due to the many complexities associated with AAIs, the 'perfect study' per se can not be undertaken since some of the issues mentioned throughout this paper can not be avoided (e.g. participant blinding and true randomisation) however, knowing what methodological issues to address can help identify the failings and possible confounders.[22] Reviewing and synthesising the literature has revealed that some currently limiting features can be minimised therefore the following checklists are aimed at those presently involved in or planning to undertake research in the area of AAIs. These are guides for researchers to consider and predominantly focuses on aspects associated with study design and reporting. The guides offered below should be used in conjunction with existing checklists offered to researchers, for example, the British Medical Journal's list of criteria for rigor in qualitative designs (http://resources.bmj.com/bmj/authors/checklists-forms/qualitative-research).

For Quantitative Research please refer to Table 4.

Table 4: Quantitative Research Checklist

• Has a protocol been developed and appropriate approval sought?
• It is possible to conduct a pilot study?
• Is randomisation possible (at some level)?
• Is there an adequate sample size to demonstrate sufficient power?
• Has allocation to treatment groups been concealed from those responsible for assigning participants to intervention and control groups?
• Have participants consented?
• Has sufficient detail about the participants been provided?
• Are participant groups comparable?
• Have potential confounders (e.g. cognition, vision and hearing impairment) been accounted for and described?
• Have measures been taken to account for participants with limited ability to interact with the animal/s and researchers?
• Were there any withdrawals from the study and were they included in any analysis?
• Have aspects surrounding animal selection, duration, frequency, format, mode of delivery and sequence of the intervention been considered?
• Is there a control group that accounts for the presence of the handler?
• Have all treatment and control arms been adequately described?
• Is it possible to include another treatment arm involving an alternative intervention?
• Will all treatment and control arms be treated equally other than for the named intervention?
• Is it possible to use multiple sites/facilities in the study?
• What outcomes will be measured and is it possible to use objective measures as opposed to self-reporting measures?
• Are outcomes measured using reliable and validated scales?
• If outcomes are to be measured via observation is it possible to videotape and follow a structured checklist?
• Will the outcomes be measured the same way across groups?
• Is it possible for those measuring outcomes to be blinded to the treatment group?
• Has sufficient follow-up time been taken into consideration?
• Have all the above aspects been adequately described?
• Have the researchers acknowledged any potential conflicts of interest associated with the research?

For Qualitative Research please refer to Table 5.

Table 5: Qualitative Research Checklist

• Has a protocol been developed and appropriate approval sought?
• Has the sample size been justified?
• What sampling method was used?
• Is the philosophical perspective/stance behind the study acknowledged?
• Is the research methodology in line with the question/objectives of the study, methods for data collection, the representation and analysis of the data and interpretation of results?
• Have the potential influences of the researcher been considered and articulated?
• Has sufficient background to participants been provided e.g. attitudes towards animals or conditions affecting interaction?
• Is it possible to conduct data collection (e.g. interviews) at multiple points of time?
• Have details of the intervention (e.g. animal selection, duration, frequency, format, mode of delivery and sequence of the intervention) been considered?
• Have the participants' voices been adequately represented?
• Are the numbers of findings/statements/themes/metaphors clearly stated?
• Have all the above aspects been adequately described?
• Have the researchers acknowledged any potential conflicts of interest associated with the research?

Conclusion

In conclusion the question raised at the beginning of the paper related to the current state of research in the field of AAIs and aimed to ascertain if the reason for this was because a) it can not be verified through scientific research due to its complexities or b) current standards are poor and need to be advanced. From reviewing the available literature this paper proposes that both explanations are equally plausible and should be given due consideration. This paper has not been developed to discourage people from undertaking such work or to disregard the legitimacy of the literature as it currently exists: it is hoped that researchers consider and address the methodological challenges associated with AAI research in order to advance the current knowledge base.

Conflicts of interest:

- There are no conflicts of interest

Chapter Seven: Conclusion

The aim of this thesis was to examine the current available literature base regarding the role of canine-assisted interventions (CAIs) to determine if they enhance health and wellbeing for older people residing in long term care. In other words are CAIs effective, meaningful, appropriate and feasible to residents in aged care facilities, their friends and families and the staff of such facilities? From the outset planning of this thesis, it was clear that there was a body of evidence available related to this field and instead of conducting more primary research, a deliberate decision was made to review the existing literature.

The methodology employed to undertake this thesis was through the conduct of a series of systematic reviews of the international literature. The assumptions of a systematic review are such that it follows a rigorous documented process that is transparent and reproducible. Unlike traditional literature or critical reviews, strict inclusion criteria and methodological requirements ensure that papers are not included and excluded based on personal preferences to strengthen one's argument or results. This approach reduces the chance of bias and increases the credibility of results.

As outlined in Chapter One, although systematic reviews are commonly thought of as the strongest type of evidence or the 'top level' in evidence tables/hierarchies, there is still debate about the best approach to undertake a systematic review (particularly in the analysis/synthesis of data as well as defining what counts as evidence). Since the topic of interest related to aspects of health and patient care, it was felt that simply determining the effectiveness of the intervention (typically by analysing the results of randomised controlled trials [RCTs]) was insufficient. Health care workers and clinicians also need to know how patients/clients feel about a particular intervention, whether an intervention is practical and whether it is affordable. For this reason the Joanna Briggs Institute (JBI) FAME scale[3] was followed which suggests that evidence of feasibility, appropriateness, meaningfulness and effectiveness is equally important when making decisions about the care of a patient/client. JBI is one of the leaders in evidence synthesis approaches and methods.

The second assumption to the JBI approach relates to what constitutes as evidence. Like the majority of evidence hierarchies, their approach has high quality studies at the upper end of the spectrum, followed by lower quality studies. Where no research studies exist however, they utilise evidence from expert opinion. Ideally high quality studies would exist for every intervention, however this is not reality and in the absence of research studies the 'best available' evidence may come from text and opinion. Some may disagree with this approach in the sense that where no research evidence exists, should a systematic review be conducted, however one may ask how helpful this is when trying to make decisions about the care of patients/clients.

For these reasons the JBI methodology was chosen to answer the following questions:

- What international literature exists in regards to the use of canines as therapeutic interventions in the health and social care of older people?
- How feasible are CAIs in the health and social care of older people?
- How appropriate are CAIs in the health and social care of older people?
- What is the meaningfulness of CAIs in the health and social care of older people?
- What are the effects of CAIs in the health and social care of the older people?

A decision was made to focus on one type of animal, and one population in one setting as it was felt that the ability and level of interactions would vary with different types of animals as well as people of different ages with varying physical, emotional and mental abilities. This could be considered a limitation of this thesis however this decision was deliberate, with preliminary searching also suggesting that the bulk of the literature concentrated on canines and the elderly.

A series of four systematic reviews were undertaken (Chapters Two to Five) to answer each of the above questions. Each of the four systematic reviews undertaken were submitted and subsequently published in the JBI Library of Systematic Reviews (ISSN 1838-2142, available at http://connect.jbiconnectplus.org/). Although four separate reviews, the search for papers was

undertaken in one step and once retrieved and assessed papers were filtered to the relevant question. It was evident from the search that the language and terminology used in this area varied both within and across disciplines and locations, and as such broad search terms were utilised. Over thirty different databases were searched, both for published and unpublished papers. Only one database had a MeSH (Medical Subject Heading) term relevant to animal-assisted therapy (e.g Animal Assisted Therapy).

Only English language databases and websites were searched however some of these abstracted papers from other languages. Without searching all English and Non-English databases and websites, it can not be ruled out that some papers may have been missed. Therefore with the lack of standard terminology of search terms and the limiting to English language papers only, relevant papers may not have been located.

Of the four reviews undertaken, two did not locate any papers that met inclusion criteria.[157,176] This meant that various steps in the systematic review process such as formal critical appraisal, data extraction, data analysis/synthesis and the development of recommendations were not undertaken. However it should be noted that although there were no papers included, both reviews critiqued and analysed the 'surrounding evidence' (i.e. not specific to one animal, setting or population) in their discussion sections respectively. This also explains the grammar choices used in the two reviews (e.g. data were to be extracted as opposed to data were extracted from).[157,176]

The effectiveness review[115] included the highest number of papers (n = 8) and the meaningfulness review[146] included two. Although the criteria of each review was inclusive in terms of the types of papers available (i.e. not limiting exclusively to high quality research studies) there was still a lack of available literature. The main reasons for exclusion related to a combination of animals being used, the setting and age group of participants, inadequate description of control interventions or else studies simply do not exist. Of the papers that were located and subsequently included, none focused on the family and friends of the older person in long term care nor the trainers/volunteers of the animals used. The

majority focused exclusively on the older people themselves and the others included health care staff of the facility.

Along with a paucity of evidence meeting inclusion criteria what also emerged was the poor methodological quality of existing evidence. Issues surrounding design, conduct, analysis and reporting were prominent, impacting on the strength and credibility of results. It was surprising to find literature had consistently been produced and published over a thirty year time frame and the same issues continually arose.

It was intentional not to conduct any primary research as part of this thesis as the initial scope of the literature revealed a large body of literature but it wasn't until undertaking the systematic reviews that the poor quality of this literature base was confirmed. This lead to the development of a fifth piece of research (Chapter Six) to extend the current body of knowledge to improve practice. It aimed to identify and describe the common methodological problems associated with the literature in this area based on the conduct of the four systematic reviews. As well as describing these issues, a series of recommendations were made for people undertaking or planning to undertake research in this area as well as for people reading and interpreting this research. The aim of the paper is to educate future researchers in order to produce rigourous evidence-based findings.

Although the quality of the evidence is a limitation of this thesis, it was still possible to synthesise the evidence base in the area of CAIs following a systematic approach and subsequently generate a set of recommendations, both for practice and further research. To the author's knowledge this is the first body of research undertaken that has attempted to do this in the area of animal-assisted interventions (AAIs) (i.e. four systematic reviews focusing on aspects of feasibility, appropriateness, meaningfulness and effectiveness). Previous reviews focused on aspects of effectiveness only and were broad in population, setting and intervention.[20,21] Although specific to canines and older people in long term care and thus not generalisable, this body of knowledge and the approach it used can be followed for other

populations, settings and outcomes. Ideally results from a series of systematic reviews for each population and setting that analyses diverse types of evidence should be undertaken which can then be used by clinicians and health care administrators to make informed decisions about the health and wellbeing of patients/clients. Systematic reviews can also identify the gaps in the current literature base so further useful research can be conducted. The provision of recommendations to help guide methodological sound research is also beneficial.

This thesis has demonstrated that although the use of CAIs can not currently be recommended nor refuted, if a long term care facility is considering implementing CAIs for older residents they should be aware that canine-assisted activities (CAAs) may produce some short term beneficial effects but they are similar to those seen from organising visits from people or arranging interactions with animal-like inanimate objects. CAAs may also provide a positive experience for some residents.

Finally the evidence base is largely unknown in regards to a) the potential association between the exposure to animal/s and the risk of developing a zoonotic infection or sustaining an animal-related injury/allergy and b) the financial/economic feasibility of implementing a CAI program in a long term care facility.

In conclusion this doctoral dissertation was completed through producing a series of publications. Four systematic reviews were conducted to determine whether CAIs were effective, meaningful, appropriate and feasible for older people in long term care. What emerged from the review of the international evidence (whether that be quantaitive, qualitative or economic) suggests that CAIs may provide some short term benefits on a physical, social and emotional level for residents of long term care facilities however it highlighted a dearth of existing evidence-based material to support these benefits as the majority of literature is riddled with flaws. Without a solid research base AAIs will not receive recognition and acceptance as a potentially credible health care treatment therefore a fifth publication was necessary to consider ways in which rigorous data and evidence might be collected in future research. It

became clear that due to the complexities associated with this type of intervention not all factors can be eliminated and that this intervention may not be suitable for all individuals.

By conducting a series of systematic reviews this dissertation has generated new knowledge based on the analysis of primary research currently available. It has produced a series of practice implications and research implications for those involved in undertaking AAI programs as well as those engaged in academic and organisational-based research. By highlighting the current state of the evidence base in this field and subsequently providing recommendations for future research, new guidance in this field has been created in hope of advancing the current knowledge base. It seems sensible to recommend revisting this literature, perhaps in three to five years[6] time to update these reviews to see if a) there has been an increase in the amount of research undertaken, b) the quality of research has increased and c) if the evidence is strong enough to conclude whether CAIs are actually beneficial to older people in long term care.

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Appendix I: JBI Critical Appraisal Checklist for Experimental Studies

NOTE:
This appendix is included on page 224 of the print copy
of the thesis held in the University of Adelaide Library.

Appendix II: JBI Data Extraction Form for Experimental Studies/Observational Studies

Appendix III: Quick Reference Article Information Sheet

Author

Research Design/Methodology

Outcomes/Instruments

Outcomes for:

Resident Family/Significant other

Health Care Staff Animal Trainer

Population Details/Inclusion Criteria

Intervention Details

Intervention Delivered by:

Health Care Staff Professional Trainer

Volunteer Other _____

Suitable for:

Feasibility Appropriateness

Meaningfulness Effectiveness

Appendix IV: Main Keywords used in Search Strategy

Sample of Search Strategies

		N
Medline Search		
1	elderly.mp. or Aged/	1790872
2	aged.mp. or "Aged, 80 and over"/ or Aged/	3097134
3	frail elderly.mp. or Frail Elderly/	5040
4	nursing home patient.mp.	107
5	older adult.mp.	1872
6	older person.mp.	510
7	older people.mp.	8295
8	residential facilit*.mp. [mp=title, original title, abstract, name of substance word, subject heading word]	4155
9	assisted living.mp. or Assisted Living Facilities/	950
10	long term care.mp. or Long-Term Care/	23552
11	Residential Facilities/ or residential care.mp.	4744
12	6 or 4 or 1 or 3 or 7 or 2 or 5	3110993
13	8 or 11 or 10 or 9 or 12	3124429
14	13 and 12	3110993
15	homes for the aged.mp. or Homes for the Aged/	9008
16	nursing home.mp. or Nursing Homes/	26644
17	residential aged care.mp.	136
18	housing for the elderly.mp. or Housing for the Elderly/	1290
19	elderly care.mp.	461
20	aged care.mp.	580
21	gerontologic care.mp.	3
22	21 or 18 or 19 or 16 or 17 or 20 or 15	32081
23	22 and 14	22581
24	animal assisted therapy.mp.	65
25	animal assisted activit$.mp. [mp=title, original title, abstract, name of substance word,	

	subject heading word]	8
26	animal assisted intervention.mp.	0
27	pet facilitated therapy.mp.	14
28	animal facilitated therapy.mp.	7
29	pet therapy.mp.	69
30	dog.mp. or Dogs/	267129
31	canine.mp.	52599
32	visiting dog.mp.	0
33	resident dog.mp.	2
34	therapy dog.mp.	13
35	animal visitation.mp.	2
36	Bonding, Human-Pet/ or human animal bond.mp.	1117
37	human animal interaction.mp.	12
38	pet human bonding.mp.	0
39	35 or 27 or 25 or 33 or 32 or 28 or 36 or 26 or 38 or 34 or 37 or 24 or 30 or 29 or 31	274977
40	39 and 23	63
41	limit 40 to (english language and english)	57

	N
CINAHL Search	
S1 (""Elderly"") or (MH "Frail Elderly") or (MH "Aged") or (MH "Aged, 80 and Over")	(229213)
S2 ""Aged""	(245334)
S3 ""Aged 80 and over""	(74105)
S4 ""Frail elderly""	(2256)
S5 (""nursing home patient"") or (MH "Nursing Home Patients")	(5855)
S6 ""older adult""	(1443)
S7 ""older person""	(472)
S8 ""older people""	(6976)
S9 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8	(253102)
S10 ("residential facilit*") or (MH "Residential Facilities") or (MH "Residential Care")	(4215)
S11 (""assisted living"") or (MH "Assisted Living")	(1478)
S12 (""long term care"") or (MH "Long Term Care")	(15702)

S13 ""residential care"" (3117)

S14 ""assisted living facilit*"" (318)

S15 S10 or S11 or S12 or S13 or S14 (20806)

S16 (S10 or S11 or S12 or S13 or S14) and (S9 and S15) (10236)

S17 S9 or S16 (253102)

S18 ""homes for the aged"" (49)

S19 (""nursing home"") or (MH "Nursing Homes") (18470)

S20 ""residential aged care"" (181)

S21 (""housing for the elderly"") or (MH "Housing for the Elderly") (1202)

S22 ""elderly care"" (468)

S23 (""aged care"") or (MH "Gerontologic Care") (10120)

S24 S18 or S19 or S20 or S21 or S22 or S23 (28220)

S25 (""animal assisted therapy"") or (MH "Animal Assisted Therapy (Iowa NIC)") or (MH "Pet Therapy") (482)

S26 ""animal assisted activit*"" (7)

S27 ""animal assisted intervention"" (0)

S28 ""pet facilitated therapy"" (9)

S29 ""animal facilitated therapy"" (5)

S30 (""pet therapy"") or (MH "Human-Pet Bonding") (698)

S31 (""dogs"") or (MH "Dogs") (3058)

S32 ""canine"" (986)

S33 ""animal use"" (9)

S34 ""visiting dog"" (0)

S35 ""resident dog"" (1)

S36 ""therapy dog"" (12)

S38 ""human animal bond"" (28)

S37 ""animal visitation"" (4)

S39 ""human animal interaction"" (9)

S40 S25 or S26 or S27 or S28 or S29 or S30 or S31 or S32 or S33 or S34 or S35 or S36 or S37 or S38 or S39 (3931)

S41 S17 and S24 and S40 (71)

	N
Cochrane CENTRAL	
#1 (elderly):ti,ab,kw or (aged):ti,ab,kw or (aged 80 and over):ti,ab,kw or (frail elderly):ti,ab,kw or (nursing home patient):ti,ab,kw in Clinical Trials	239108
#2 (older adult):ti,ab,kw or (older person):ti,ab,kw or (older people):ti,ab,kw	4603
#3 (residential facilit*):ti,ab,kw or (assisted living):ti,ab,kw or (long term care):ti,ab,kw or (residential care):ti,ab,kw or (assisted living facilit*):ti,ab,kw	4242
#4 (homes for the aged):ti,ab,kw or (nursing homes):ti,ab,kw or (residential aged care):ti,ab,kw or (housing for the elderly):ti,ab,kw or (elderly care):ti,ab,kw	5536
#5 (aged care):ti,ab,kw or (gerontologic care):ti,ab,kw	25417
#6 (animal assisted therapy):ti,ab,kw or (animal assisted activit*):ti,ab,kw or (animal assisted intervention):ti,ab,kw or (pet facilitated therapy):ti,ab,kw or (animal facilitated therapy):ti,ab,kw	54
#7 (pet therapy):ti,ab,kw or (dog):ti,ab,kw or (canine):ti,ab,kw or (animal use):ti,ab,kw or (visiting dog):ti,ab,kw	5417
#8 (resident dog):ti,ab,kw or (therapy dog):ti,ab,kw or (animal visitation):ti,ab,kw or (human animal bond):ti,ab,kw or (human animal interaction):ti,ab,kw	432
#9 (pet human bonding):ti,ab,kw	17
#10 (#1 OR #2)	252712
#11 (#10 AND #3)	2792
#12 (#10 OR #11)	252712
#13 (#4 OR #5)	28496
#14 (#6 OR #7 OR #8 OR #9)	5590
#15 (#12 AND #13 AND #14)	117

Appendix V: Search Results by Database/Website

Database	*Date Searched*	*Number of Results*
CINAHL (including PreCinahl)	13/04/2009	71
EMBASE (1980-2009 Wk 15)	13/04/2009	20
CochraneCentral Register of Controlled Trials (CENTRAL)	13/04/2009	117
PsychInfo (1987 to April Wk 1 2009)	13/04/2009	21
Scopus (HS and SS)	13/04/2009	63
Medline (1950 – April Wk 1 2009)	14/04/2009	57
Current Contents (SBS, CM)	14/04/2009	8
ISI Web of Knowledge	14/04/2009	80
Pedro	14/04/2009	4
Ageline	24/04/2009	148
Austhealth	24/04/2009	540
Campbell C2 Spectrum (and PROT)	25/04/2009	0
Campbell Library of Systematic Reviews	25/04/2009	13
Health Technology Assessment (HTA)	25/04/2009	2
NHS Economic Evaluation Database (NHS EDD)	25/04/2009	5
CAB Abstracts	25/04/2009	175
CSA Sociological abstracts	27/04/2009	237
Psychology & Behavioural Sciences Collection	27/04/2009	0
Agricola	2/05/2009	15
Zoological Record	2/05/2009	33
Austrom	2/05/2009	239
Health Source Nursing Academic Edition	2/05/2009	54
Australian Digital Theses Program	3/05/2009	0
Networked Digital Library of Theses and Dissertations (NDLTD)	3/05/2009	3
Proquest Digital Dissertations	3/05/2009	54
Index to Theses	3/05/2009	2
Health Business Fulltext Elite	3/05/2009	15
ECONLIT	3/05/2009	1
OT Seeker	5/05/2009	14
International Encyclopedia of Social and Behavioral Science	13/09/2009	121
Annual Review of Anthropology	13/09/2009	0
Academic Search Premier	13/09/2009	4
Delta Society Website (Aus) (http://www.deltasocietyaustralia.com.au/index.htm)	27/09/2009	139
Delta Society.org (http://www.deltasociety.org)	27/09/2009	0
	TOTAL	2245

Appendix VI: Excluded Studies: Reasons for Exclusion (Effectiveness Revew)

Zapf & Rough 2002[208]
Reason for exclusion: Study did not meet inclusion criteria
Yates 1987[209]
Reason for exclusion: Study did not meet inclusion criteria
Winkler et al 1989 [202]
Reason for exclusion: Study met inclusion criteria but failed critical appraisal
Wilson & Netting 1987[64]
Reason for exclusion: Literature review
Wilson & Barker 2003[63]
Reason for exclusion: Literature review
Williams & Jenkins 2008[204]
Reason for exclusion: Literature review
Whaley 1996 [164]
Reason for exclusion: Study does not meet inclusion criteria
Wenborn 2004[210]
Reason for exclusion: Opinion piece
Waltner-Toews 1993[150]
Reason for exclusion: Prevalence survey, does not meet inclusion criteria
Wallace & Nadermann 1987[198]
Reason for exclusion: Study meets inclusion criteria but higher quality evidence located (Descriptive study)
Velde et al 2005[122]
Reason for exclusion: Literature review
Vance 2004[211]
Reason for exclusion: Opinion piece
Valentine 1978[212]
Reason for exclusion: Study does not meet inclusion criteria
Teeter 1997[149]
Reason for exclusion: Study does not meet inclusion criteria
Tavormina 1999[213]
Reason for exclusion: Discussion paper
Tamura et al 2004[214]
Reason for exclusion: Study does not meet inclusion criteria
Suthers-McCabe 2001[215]
Reason for exclusion: Discussion paper
Struckus 1990[81]
Reason for exclusion: Study met inclusion criteria but failed critical appraisal
Steed & Smith 2002[216]
Reason for exclusion: Literature review
Stauffer 1982[217]
Reason for exclusion: Narrative
Stasi et al 2004[47]
Reason for exclusion: Study does not meet inclusion criteria
Southerland 2007[46]
Reason for exclusion: Study does not meet inclusion criteria
Souter & Miller 2007[21]
Reason for exclusion: Systematic review - inclusion criteria is broader than this review topic => does not meet criteria
Sockalingam et al 2008[218]
Reason for exclusion: Case study does not meet inclusion criteria
Smith 2004[219]
Reason for exclusion: Study not relevant to review topic
Small 1983[41]
Reason for exclusion: Narrative
Silverman et al 2002[220]
Reason for exclusion: Study not relevant to review topic
Sellers 2005[53]
Reason for exclusion: Case Series
Savishinsky 1992[221]
Reason for exclusion: Study does not meet inclusion criteria
Savishinsky 1993[222]
Reason for exclusion: Study does not meet inclusion criteria
Savishinsky 1985[207]

Reason for exclusion: Study does not meet inclusion criteria
Santiago 1993[223]
Reason for exclusion: Narrative piece not relevant to topic
Sanders 1993[224]
Reason for exclusion: Study does not meet inclusion criteria
Sable 1995[225]
Reason for exclusion: Study does not meet inclusion criteria
Ryder 1985[226]
Reason for exclusion: Literature review
Russen-Rondinone & DesRobert 1996[227]
Reason for exclusion: Discussion paper
Ruckdeschel & Van Haitsma 2001[91]
Reason for exclusion: Study does not meet inclusion criteria
Rosenkoetter & Bowes 1991[228]
Reason for exclusion: Narrative
Rosenfield 2001[229]
Reason for exclusion: Narrative – not related to topic
Rogers et al 1993[230]
Reason for exclusion: Study does not meet inclusion criteria
Roenke & Mulligan 1998[231]
Reason for exclusion: Study does not meet inclusion criteria
Robelotto 1994[118]
Reason for exclusion: Study meets inclusion criteria but higher quality study located (has no control group)
Robb 1982[52]
Reason for exclusion: Conference abstract only, could not locate additional information
Risely-Curtiss et al 2006[232]
Reason for exclusion: Study does not meet inclusion criteria
Richeson 2007[233]
Reason for exclusion: Discussion paper
Richeson & McCullough 2003 [54]
Reason for exclusion: Discussion paper
Richeson 2003[108]
Reason for exclusion: Study does not meet inclusion criteria
Reynolds 2006[234]
Reason for exclusion: Literature review
Reiman 2000[235]
Reason for exclusion: Discussion paper
Reel & Kleiber 2008[236]
Reason for exclusion: Literature review
Reed 1986[178]
Reason for exclusion: Study meets inclusion criteria but higher quality study located (No control group)
Rapelje 1983[237]
Reason for exclusion: Narrative
Prosser et al 2008[116]
Reason for exclusion: Study does not meet inclusion criteria
Prelewicz 1993[238]
Reason for exclusion: Study does not meet inclusion criteria
Prato-Previde et al 2003[239]
Reason for exclusion: Study not related to review topic
Podheiser 2000[59]
Reason for exclusion: Study does not meet inclusion criteria
Pirotta 2000[240]
Reason for exclusion: Narrative
Pillars 2001[241]
Reason for exclusion: Discussion paper
Phelps et al 2008[190]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (multiple baseline across participants)
Perkins et al 2008[191]
Reason for exclusion: Literature review
Park 1999[242]
Reason for exclusion: Narrative
Panzer-Koplow 2000[84]
Reason for exclusion: Study meets inclusion criteria and critical appraisal but does not describe control group

Pachana et al 2005[243]
Reason for exclusion: Study does not meet inclusion criteria
Owen 2001[159]
Reason for exclusion: Narrative
Ory & Goldberg 1983[244]
Reason for exclusion: Study does not meet inclusion criteria
Orts et al 1983[245]
Reason for exclusion: Study does not meet inclusion criteria
Ormerod 2005[246]
Reason for exclusion: Literature review
Ormerod 2005[247]
Reason for exclusion: Literature review
Nussman & Burt 1982[248]
Reason for exclusion: Narrative
Nimer & Lundahl 2007[20]
Reason for exclusion: Systematic review - inclusion criteria broader than this review => does not meet inclusion criteria
Netting et al 1987[249]
Reason for exclusion: Literature review
Netting et al 1984[250]
Reason for exclusion: Literature review
Neer et al 1987[192]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (cross over study)
Motooka et al 2006[251]
Reason for exclusion: Study does not meet inclusion criteria
Montague 1995[185]
Reason for exclusion: Narrative
Mogul 2005[67]
Reason for exclusion: Could not locate
Mitchell et al 1983[252]
Reason for exclusion: Topic not relevant to review
Milligan 1986[253]
Reason for exclusion: Narrative
Medlyn 2007[254]
Reason for exclusion: Narrative
McNicholas & Collis 2000[255]
Reason for exclusion: Study does not meet inclusion criteria
McCartin 2004[119]
Reason for exclusion: Study met inclusion criteria but failed critical appraisal
McCabe et al 2002[44]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (Within subjects Repeated Measures)
Mayhew 1988[256]
Reason for exclusion: Narrative
Marx et al 2010[26]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (Within subjects Repeated Measures)
Martindale 2008[257]
Reason for exclusion: Study does not provide sufficient detail on intervention
Martin 1998 [258]
Reason for exclusion: Study does not meet inclusion criteria (not randomised)
Marr et al 2000[259]
Reason for exclusion: Study does not meet inclusion criteria
Mallon 1994[260]
Reason for exclusion: Study does not meet inclusion criteria
Maher 2001[261]
Reason for exclusion: Narrative
Lutwack-Bloom et al 2005[83]
Reason for exclusion: Study meets inclusion criteria and critical appraisal but does not describe control group
Lust et al 2007[60]
Reason for exclusion: Study does not meet inclusion criteria
Loden 2000[262]
Reason for exclusion: Narrative
Llewellyn et al 2004[263]
Reason for exclusion: Discussion paper

Lilienfeld & Arkowitz 2008[181]
Reason for exclusion: Narrative
Libin & Cohen-Mansfield 2004[45]
Reason for exclusion: Study does not meet inclusion criteria
Lewis 1986[264]
Reason for exclusion: Narrative
Lefebvre et al 2008[155]
Reason for exclusion: Guideline
Le Roux & Kemp 2009[82]
Reason for exclusion: Study meets inclusion criteria and critical appraisal but does not describe control group
Lawson 1999[80]
Reason for exclusion: Study meets inclusion criteria but not critical appraisal
Kramer et al 2009[199]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (Within subjects Repeated Measures)
Kovacs et al 2004[265]
Reason for exclusion: Study does not meet inclusion criteria
Kovach & Magliocco 1998[266]
Reason for exclusion: study does not meet inclusion criteria
Kongable et al 1990[125]
Reason for exclusion: Study meets inclusion criteria and critical appraisal (meaningfulness review)
Kongable et al 1989[130]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (Within subjects Repeated Measures)
Kogan 2000[267]
Reason for exclusion: Discussion paper
Kawamura et al 2007[268]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (no control group)
Kawamura et al 2009[93]
Reason for exclusion: Study meets inclusion criteria and critical appraisal (meaningfulness review)
Katsinas 2000[177]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (Case Study)
Katcher 1982[269]
Reason for exclusion: Literature review
Kanamori et al 2001[270]
Reason for exclusion: Study does not meet inclusion criteria
Kaiser et al 2002[201]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (descriptive study)
Johnson 2002[271]
Reason for exclusion: Narrative
Johnson et al 2002[142]
Reason for exclusion: Narrative
Jessee 1982 [272]
Reason for exclusion: Narrative
Jackson 2006[273]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (no control group)
Hsu 2006[274]
Reason for exclusion: Narrative
Hoban 2002[275]
Reason for exclusion: Narrative
Hirst & Metcalf 1984[276]
Reason for exclusion: Narrative
Hines 2003[277]
Reason for exclusion: Literature review
Herbert & Greene 2001[278]
Reason for exclusion: Study does not meet inclusion criteria
Hendy 1987[279]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (Within subjects Repeated Measures)
Headey 1999[174]
Reason for exclusion: Study not relevant to topic
Haubenhofer & Kirchengast 2006[280]
Reason for exclusion: Study does not meet inclusion criteria
Hatch 2007[85]

Reason for exclusion: Study does not meet inclusion criteria
Harris & Gelline 1990[43]
Reason for exclusion: Discussion paper
Hara 2007[32]
Reason for exclusion: Study not relevant to review topic
Hamilton 1985[281]
Reason for exclusion: Study does not meet inclusion criteria
Hall & Malpus 2000[161]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (no control group)
Hagman 1997[49]
Reason for exclusion: Study does not meet inclusion criteria
Guay 2001[147]
Reason for exclusion: Literature review
Granger & Carter 1991[282]
Reason for exclusion: Study does not meet inclusion criteria
Gold 2001[283]
Reason for exclusion: Narrative
Geisler 2004[40]
Reason for exclusion: Literature review
Gammonely 1991[35]
Reason for exclusion: Literature review
Freeman 2004[39]
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Foster et al 2005[284]
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Foster 2005[285]
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Forbes et al 2005[286]
Reason for exclusion: Discussion paper
Forbes 1998[287]
Reason for exclusion: Literature review
Forbes et al 2008[288]
Reason for exclusion: Systematic review does not relate to review topic
Foltz-Gray 1998[289]
Reason for exclusion: Narrative – not related to review topic
Fischman 2005[290]
Reason for exclusion: Narrative
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Draper et al 1990[293]
Reason for exclusion: Study does not meet inclusion criteria
Dopson 2005[294]
Reason for exclusion: Narrative
Dono 2005[295]
Reason for exclusion: Literature review
Donker & Heidenreich 1999[296]
Reason for exclusion: Literature review
Donaldson 2002[297]
Reason for exclusion: Narrative
Dolezel 2008[298]
Reason for exclusion: Literature review - not related to topic
Darrah 1996[27]
Reason for exclusion: Study does not meet inclusion criteria
Cutt et al 2008[299]
Reason for exclusion: Study does not meet inclusion criteria
Culliton 1987[194]

Reason for exclusion: Narrative
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Reason for exclusion: Study meet inclusion criteria but not critical appraisal
Crowley-Robinson & Blackshaw 1998[300]
Reason for exclusion: Study does not meet inclusion criteria
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Reason for exclusion: Study does not meet inclusion criteria
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Reason for exclusion: Study does not meet inclusion criteria
Cole et al 2007[303]
Reason for exclusion: Study does not meet inclusion criteria
Colby & Sherman 2002[304]
Reason for exclusion: Study does not meet inclusion criteria
Clement 2008[305]
Reason for exclusion: Literature review
Churchill et al 1999[306]
Reason for exclusion: Study meets inclusion criteria but higher quality studies located (Within subjects Repeated Measures)
Christensen et al 2008[307]
Reason for exclusion: Review does not relate to this topic
Chatterjee 1999[308]
Reason for exclusion: Narrative
Carpenter 1997[309]
Reason for exclusion: Narrative
Cangelosi & Embrey 2006[310]
Reason for exclusion: Narrative
Calvert 1989[55]
Reason for exclusion: Study does not meet inclusion criteria
Burgess 1997[77]
Reason for exclusion: Study meet inclusion criteria but not critical appraisal
Bumstead 1988[61]
Reason for exclusion: Study meets inclusion criteria and critical appraisal but does not describe control group
Buettner 2004[311]
Reason for exclusion: Narrative
Buettner 2008[312]
Reason for exclusion: Narrative
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Bruck 1996[314]
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Reason for exclusion: Literature review
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Reason for exclusion: Narrative - not related to topic
No author 2008[328]
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No author 2006[329]
Reason for exclusion: Narrative
No author 2006[330]
Reason for exclusion: Narrative
No author 2006[331]
Reason for exclusion: Narrative
No author 2005[332]
Reason for exclusion: Opinion piece
No author 2002[333]
Reason for exclusion: Narrative
No author 1996[334]
Reason for exclusion: Narrative
No author 1982[335]
Reason for exclusion: Narrative

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Beck and Katcher 1984[187]	Literature review
Blake 1980[68]	Could not locate
Brickel 1984[339]	Study does not meet inclusion criteria
Brodie & Biley 1999[34]	Literature review
Carmack & Fila 1989[340]	Narrative
Connor & Miller 2000[62]	Literature review
Daniel & Bourke 1985[69]	Could not locate
Dossey 1997[341]	Narrative
Francis et al 1985[48]	Study does not meet inclusion criteria
Fritz et 1995[42]	Study does not meet inclusion criteria
Harris 1993[197]	Study does not meet inclusion criteria
Haughie 1992[342]	Study does not meet inclusion criteria
Hubbard et al 2003[343]	Study does not meet inclusion criteria
Hundley 1991[179]	Study does not meet inclusion criteria
Iannuzzi & Rowman 1991[145]	Study does not meet inclusion criteria
Johnson 2002[271]	Literature review
Jorgenson 1997[151]	Literature review

Kalfon 1991[344]	Study does not meet inclusion criteria
Khan & Farrag 2000[148]	Literature review
Lapp 1991[345]	Study does not meet inclusion criteria
Laun 2003[36]	Literature review
McQuillen 1985[346]	Study does not meet inclusion criteria
McVarish 1994[347]	Study does not meet inclusion criteria
Michaels 1982[348]	Narrative
Morrison 2007[158]	Literature review
Motomura et al 2004[200]	Study meets inclusion criteria but higher quality studies located (Descriptive study)
Munoz Lasa & Franchignoni 2008[349]	Narrative/letter to editor
Parslow et al 2005[113]	Study does not meet inclusion criteria
Perelle & Granville 1993[58]	Study does not meet inclusion criteria
Powell Lawton et al 1986[350]	Study does not meet inclusion criteria
Robb et al 1980[351]	Study does not meet inclusion criteria
Salmon & Slamon 1982[70]	Could not locate
Saylor 1998[37]	Study does not meet inclusion criteria
Schantz 1990[352]	Study does not meet inclusion criteria
Sobo et al 2006[353]	Study does not meet inclusion criteria
Sorrell 2006[354]	Narrative
Stanley Hermanns & Miller 2002[355]	Literature review
Taylor et al 1993[131]	Study meets inclusion criteria but higher quality studies located (Within subjects Repeated Measures)
Walsh et al 1995[186]	Study does not meet inclusion criteria
Zamir 2006[356]	Study does not meet inclusion criteria
Zissleman et al 1996[160]	Study does not meet inclusion criteria

Appendix VII: Characteristics of Included Studies (Effectiveness Review)

Study	Sample size	Setting	Inclusion Criteria	Age Range	Intervention (Type & duration)	Outcome Measure/Scale	Control /Comparisons
Andrysco 1982	46	Nursing Home, USA	Not stated	Not stated	CAA – weekly visit (20 minutes) from investigator to converse with participant with dog present for 10 weeks. Dog able to wander freely.	Eye contact of participant[1] Participants smile[1] Participants tactile contact[1] Participants verbal response time to questions[1] Quantity of participants verbalisation[1] Number of questions asked by participant[1] (Visits recorded and measured by playback) Activity Involvement – by observation Weekly interaction with nursing staff – by observation Residents' conversation about animals - by observation Residents' interactions with other residents – by observation Residents' dependency on staff– by observation Residents' interactions with non-nursing personnel – by observation Residents'	Daily visit (20 minutes) from investigator to converse with participant for 10 weeks.

						opinion of animals - by observation	
Banks & Banks 2002	45	3 Nursing Homes, USA	No cognitive impairment, no known history of psychiatric disorders/ diseases, no known allergies to cats/dogs, minimum 6th grade English, At least a score of 24 on the Mini-Mental State Exam, completion of the Demographic and Pet History Questionnaire and a score of at least 30 on the UCLA Loneliness Scale	Not stated	CAA Once 30 minute session with a dog and attendant per week for 6 weeks. Participant able to freely interact with the dog, limited interaction with the attendant	Loneliness - UCLA Loneliness Scale Pet History – Demographic and Pet History Questionnaire	CAA Three 30 minute sessions with a dog and attendant per week for 6 weeks. Participant able to freely interact with the dog, limited interaction with the attendant No CAA
Banks & Banks 2005	37	3 Nursing Homes, USA	A score less than 30 on the UCLA loneliness scale, no known history of psychiatric disorders/ Alzheimer's disease, no allergies to dogs or cats, a	75 – 90 years	Individual CAA – 30 minute session per week for 6 weeks where participant could interact with the dog as they pleased. Investigator present.	Loneliness – UCLA Loneliness Scale	Group CAA - 30 minute session per week for 6 weeks where participants could interact with the dog as they pleased

			score lower than 24 on the modified mini-mental status exam				
Banks, Willoughby & Banks 2008	38	3 Nursing Homes, USA	Scored more than 24 on the modified mini-mental status exam, no allergies to dogs or cats, scored more than 30 on the UCLA loneliness scale, no known history of psychiatric disease or Alzheimer's disease	Not stated	CAA - 30 minute session for 8 weeks of dog next to participant in bed/chair. Not stated if handler/observer present	Loneliness – modified Lexington Attachment to Pets Scale	Robotic Dog - 30 minute session for 8 weeks of dog next to participant in bed/chair. Not stated if handler/observer present Control
Bohlingher 1985	36	Nursing Home, USA	Oriented to person, non-psychotic, able to read and understand English, not allergic to dogs, fond of dogs, minimal score of 35% on the Zung Depression scale	60 – 91 years	CAA – 15 minute session, once per week (for 4 weeks) of unstructured interaction of dog and participant (observers present)	Depression – Zung Self-Rating Depression scale	CAA – 15 minute session, three times a week (for 4 weeks) of unstructured interaction of dog and participant (observers present)
Richeson & McCullough 2003	37	3 Nursing Homes, USA	No recorded cognitive impairment, no known fear of dogs, no known	51 – 101 years	CAA - 10 – 15 minute session with dog and handler for four weeks where participant could interact how they pleased (observer present)	Subjective Well-being – Positive and Negative Affect Scales, Satisfaction with Life Scale	Control (general recreational therapy) Visit (10-15 minute) for four weeks from a pair of student visitors

			allergy to dogs, an interest in being visited by a dog				
Wall 1994	80	11 Nursing Homes, USA	Cognitive function level able to understand content of 2 outcome measures Absence of fear/dislike of canines	61 - 96 years	CAA - Three sessions (6- 10 minutes) of a dog and visitor involving opportunity for tactile stimulation	Mood – portion of the NIMH Mood Scales-Elderly Speech Activity – Sessions recorded and measured by researcher[2] Attitude toward dog –Canine Attitude Scale	Three sessions of Novel stimulus with visitor Visitor condition No-treatment control condition
Zulauf 1987	40 (20 in int 20 in control)	Nursing Home, USA	Minimal level of social responsiveness	60 – 99 years	CAA – one 30 minute current events session for 6 weeks which involved participants discussing current events with a dog present and able to interact how they pleased, Two treatment groups were used, each using a different dog. Therapist present.	Depression– Geriatric Depression Scale Morale/Life Satisfaction – Philadelphia Geriatric Center Morale Scale Self Esteem/Self concept – The Self-Esteem Scales Patient Behaviour – Nurse Observation Scale for Inpatient Evaluation Activity Participation – Patient's activity record Blood Pressure	One 30 minute current events session for 6 weeks which involved participants discussing current events. Therapist present.

[1]. This measure did not distinguish results between intervention and control group participants.
[2]. Did not measure this outcome for the no-treatment control condition

Appendix VIII: JBI Critical Appraisal Checklist for Qualitative Studies

NOTE:
This appendix is included on page 247 of the print copy
of the thesis held in the University of Adelaide Library.

Appendix IX: JBI QARI Data Extraction Form for Interpretive & Critical Research

Appendix X: Reasons for Exclusion (Meaningfulness Review)

Zapf & Rough 2002[208]
Reason for exclusion: Study did not meet inclusion criteria
Yates 1987[209]
Reason for exclusion: Study did not meet inclusion criteria
Winkler et al 1989 [202]
Reason for exclusion: Study did not met inclusion criteria
Wilson & Netting 1987[64]
Reason for exclusion: Literature review
Wilson & Barker 2003[63]
Reason for exclusion: Literature review
Williams & Jenkins 2008[204]
Reason for exclusion: Literature review
Whaley 1996[164]
Reason for exclusion: Study does not meet inclusion criteria
Wenborn 2004[210]
Reason for exclusion: Opinion piece
Waltner-Toews 1993[150]
Reason for exclusion: Prevalence survey, does not meet inclusion criteria
Wallace & Nadermann 1987[198]
Reason for exclusion: Study does not meet inclusion criteria
Velde et al 2005[122]
Reason for exclusion: Literature review
Vance 2004[211]
Reason for exclusion: Opinion piece
Valentine 1978[212]
Reason for exclusion: Study does not meet inclusion criteria
Teeter 1997[149]
Reason for exclusion: Study does not meet inclusion criteria
Tavormina 1999[213]
Reason for exclusion: Discussion paper
Tamura et al 2004[214]
Reason for exclusion: Study does not meet inclusion criteria
Suthers-McCabe 2001[215]
Reason for exclusion: Discussion paper
Struckus 1990[81]
Reason for exclusion: Study does not meet inclusion criteria
Steed & Smith 2002[216]
Reason for exclusion: Literature review
Stauffer 1982[217]
Reason for exclusion: Narrative
Stasi et al 2004[47]
Reason for exclusion: Study does not meet inclusion criteria
Southerland 2007[46]
Reason for exclusion: Study does not meet inclusion criteria
Souter & Miller 2007[21]
Reason for exclusion: Systematic review - does not meet criteria
Sockalingam et al 2008[218]
Reason for exclusion: Case study does not meet inclusion criteria
Smith 2004[219]
Reason for exclusion: Study not relevant to review topic
Small 1983[41]
Reason for exclusion: Narrative
Silverman et al 2002[220]
Reason for exclusion: Study not relevant to review topic
Sellers 2005[53]
Reason for exclusion: Case Series
Savishinsky 1992[221]
Reason for exclusion: Study does not meet inclusion criteria
Savishinsky 1993[222]
Reason for exclusion: Study does not meet inclusion criteria
Savishinsky 1985[207]

Reason for exclusion: Study does not meet inclusion criteria
Santiago 1993[223]
Reason for exclusion: Narrative piece not relevant to topic
Sanders 1993[224]
Reason for exclusion: Study does not meet inclusion criteria
Sable 1995[225]
Reason for exclusion: Study does not meet inclusion criteria
Ryder 1985[226]
Reason for exclusion: Literature review
Russen-Rondinone & DesRobert 1996[227]
Reason for exclusion: Discussion paper
Ruckdeschel & Van Haitsma 2001[91]
Reason for exclusion: Study does not meet inclusion criteria
Rosenkoetter & Bowes 1991[228]
Reason for exclusion: Narrative
Rosenfield 2001[229]
Reason for exclusion: Narrative – not related to topic
Rogers et al 1993[230]
Reason for exclusion: Study does not meet inclusion criteria
Roenke & Mulligan 1998[231]
Reason for exclusion: Study does not meet inclusion criteria
Robelotto 1994[118]
Reason for exclusion: Study does not meet inclusion criteria
Robb 1982[52]
Reason for exclusion: Conference abstract only, could not locate additional information
Risely-Curtiss et al 2006[232]
Reason for exclusion: Study does not meet inclusion criteria
Richeson 2007[233]
Reason for exclusion: Discussion paper
Richeson & McCullough 2003[54]
Reason for exclusion: Discussion paper
Richeson 2003[357]
Reason for exclusion: Study does not meet inclusion criteria
Reynolds 2006[234]
Reason for exclusion: Literature review
Reiman 2000[235]
Reason for exclusion: Discussion paper
Reel & Kleiber 2008[236]
Reason for exclusion: Literature review
Reed 1986[178]
Reason for exclusion: Study does not meet inclusion criteria
Rapelje 1983[237]
Reason for exclusion: Narrative
Prosser et al 2008[116]
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Prelewicz 1993[238]
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Prato-Previde et al 2003[239]
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Podheiser 2000[59]
Reason for exclusion: Study does not meet inclusion criteria
Pirotta 2000[240]
Reason for exclusion: Narrative
Pillars 2001[241]
Reason for exclusion: Discussion paper
Phelps et al 2008[190]
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Perkins et al 2008[191]
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Park 1999[242]
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Panzer-Koplow 2000[84]
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Pachana et al 2005[243]

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Ory & Goldberg 1983[244]
Reason for exclusion: Study does not meet inclusion criteria
Orts et al 1983[245]
Reason for exclusion: Study does not meet inclusion criteria
Ormerod 2005[247]
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Ormerod 2005[246]
Reason for exclusion: Literature review
Nussman & Burt 1982[248]
Reason for exclusion: Narrative
Nimer & Lundahl 2007[20]
Reason for exclusion: Systematic review - does not meet inclusion criteria
Netting et al 1987[249]
Reason for exclusion: Literature review
Netting et al 1984[250]
Reason for exclusion: Literature review
Neer et al 1987[192]
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Motooka et al 2006[251]
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Montague 1995[185]
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Mogul 2005[67]
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Mitchell et al 1983[252]
Reason for exclusion: Topic not relevant to review
Milligan 1986[253]
Reason for exclusion: Narrative
Medlyn 2007[254]
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McNicholas & Collis 2000[255]
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McCartin 2004[119]
Reason for exclusion: Study does not meet inclusion criteria
McCabe et al 2002[44]
Reason for exclusion: Study does not meet inclusion criteria
Mayhew 1988[256]
Reason for exclusion: Narrative
Marx et al 2010[26]
Reason for exclusion: Study does not meet inclusion criteria
Martindale 2008[257]
Reason for exclusion: Study does not provide sufficient detail on intervention
Martin 1998 [258]
Reason for exclusion: Study does not meet inclusion criteria
Marr et al 2000[259]
Reason for exclusion: Study does not meet inclusion criteria
Mallon 1994[260]
Reason for exclusion: Study does not meet inclusion criteria
Maher 2001[261]
Reason for exclusion: Narrative
Lutwack-Bloom et al 2005[83]
Reason for exclusion: Study does not meet inclusion criteria
Lust et al 2007[60]
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Loden 2000[262]
Reason for exclusion: Narrative
Llewellyn et al 2004[263]
Reason for exclusion: Discussion paper
Lilienfeld & Arkowitz 2008[181]
Reason for exclusion: Narrative
Libin & Cohen-Mansfield 2004[45]

Reason for exclusion: Study does not meet inclusion criteria
Lewis 1986[264]
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Lefebvre et al 2008[155]
Reason for exclusion: Guideline
Le Roux & Kemp 2009[82]
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Lawson 1999[80]
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Kramer et al 2009[199]
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Kovacs et al 2004[265]
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Kanamori et al 2001[270]
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Connor & Miller 2000[62]	Literature review
Daniel & Bourke 1985[69]	Could not locate
Dossey 1997[341]	Narrative
Francis et al 1985[48]	Study does not meet inclusion criteria
Fritz et 1995[42]	Study does not meet inclusion criteria
Harris 1993[197]	Study does not meet inclusion criteria
Haughie 1992[342]	Study does not meet inclusion criteria
Hubbard et al 2003[343]	Study does not meet inclusion criteria
Hundley 199[179]	Study does not meet inclusion criteria
Iannuzzi & Rowman 1991[145]	Study does not meet inclusion criteria
Johnson 2002[271]	Literature review
Jorgenson 1997[151]	Literature review
Kalfon 1991[344]	Study does not meet inclusion criteria
Khan & Farrag 2000[148]	Literature review
Lapp 1991[345]	Study does not meet inclusion criteria
Laun 2003[36]	Literature review
McQuillen 1985[346]	Study does not meet inclusion criteria
McVarish 1994[347]	Study does not meet inclusion criteria
Michaels 1982[348]	Narrative
Morrison 2007[158]	Literature review
Motomura et al 2004[200]	Study does not meet inclusion criteria
Munoz Lasa & Franchignoni 2008[349]	Narrative/letter to editor
Parslow et al 2005[113]	Study does not meet inclusion criteria
Perelle & Granville 1993[58]	Study does not meet inclusion criteria
Powell Lawton et al 1986[350]	Study does not meet inclusion criteria
Robb et al 1980[351]	Study does not meet inclusion criteria
Salmon & Salmon 1982[70]	Could not locate
Saylor 1998[37]	Study does not meet inclusion criteria
Schantz 1990[352]	Study does not meet inclusion criteria
Sobo et al 2006[353]	Study does not meet inclusion criteria
Sorrell 2006[354]	Narrative
Stanley Hermanns & Miller 2002[355]	Literature review
Taylor et al 1993[131]	Study does not meet inclusion criteria
Walsh et al 1995[186]	Study does not meet inclusion criteria
Zamir 2006[356]	Study does not meet inclusion criteria
Zissleman et al 1996[160]	Study does not meet inclusion criteria

Appendix XI: Table of Included Studies (Meaningfulness Review)

Study	Method	Methodology	Data Analysis	Setting & Context	Geographical context	Cultural Context	Participants	Phenomena of Interest
Kawamura et al 2009[93]	Interviews (semi-structured &open ended)	Phenomenology	5 Steps: Reading, Extracting Statements, Meaning, Themes, Descriptors	Private nursing home	Japan – Northern City	Japanese	8 women with mild – very mild dementia	Residents perceptions of animal-assisted activities which they have been involved in for more than 2 years
Kongable et al 1990[125]	Interviews (structured & open ended)	Qualitative – not explicitly stated	Content analysis	Special care Alzheimer's Unit in Veterans Home	USA - Midwestern	American	6 Health care workers Director of Nursing, Coordinator of program, 2 Registered Nurses & 2 Nursing Assistants	Staff feelings & attitudes about the use of a dog as a therapeutic agent for residents with Alzheimer's Disease

Appendix XII: Reasons for Exclusion (Appropriateness Review)

Brodie SJ, Biley FC, Shewring M. An exploration of the potential risks associated with using pet therapy in healthcare settings. *Journal of Clinical Nursing* 2002;11:444-456. **Reason for exclusion:** Not specific to long term care, older people or canines

DiSalvo D, Haiduven D, Johnson N, Reyes V, Hench C, Shaw R, et al. Who let the dogs out? Infection control did: Utility of dogs in health care settings and infection control aspects. *American Journal of Infection Control* 2006;34(5):301-7. **Reason for exclusion:** Focuses on hospital settings

Guay DRP. Pet-assisted therapy in the nursing home setting: potential for zoonosis. *American Journal of Infection Control* 2001;29(3):178-186. **Reason for exclusion**: Not focused on canines

Johnson RA, Odendaal JSJ, Meadows RL. Animal-assisted interventions research: issues and answers. *Western Journal of Nursing Research* 2002;24(4):422-40. **Reason for exclusion:** Not specific to long term care, older people or canines

Jorgenson J. Therapeutic use of companion animals in health care. *Journal of Nursing Scholarship* 1997;29(3):249-54. **Reason for exclusion:** Not specific to long term care, older people or canines

Khan MA, Farrag N. Animal-assisted activity and infection control implications in a healthcare setting. *Journal of Hospital Infection* 2000;46:4-11. **Reason for exclusion:** Not specific to long term care, older people or canines

Lefebvre SL, Golab GC, Christensen E, Castrodale L, Aureden K, Bialachowski A, et al. Guidelines for animal-assisted interventions in health care facilities. *American Journal of Infection Control* 2008;36(2):78-85. **Reason for exclusion:** Not specific to older people or canines

Morrison ML. Health benefits of anima-assisted interventions. *Complementary Health Practice Review* 2007;12:51-62. **Reason for exclusion:** Not specific to long term care, older people or canines

Owen OG. Paws for thought... pet therapy. *Nursing Times* 2001;97(9):28-29. **Reason for exclusion:** Focuses on hospital settings

Sehulster LM, Chinn RYW, Arduino MJ, Carpenter J, Donlan R, Ashford D, et al. Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Chicago IL; American Society for Healthcare Engineering/American Hospital Association, 2004. **Reason for exclusion:** Not specific to long term care, older people or canines

Teeter LM. Pet therapy program: proposal for the US Department of Health and Human Services 1996 Secretary's Award. *Journal of the American Veterinary Medical Association* 1997;210(10):1435-1438. **Reason for exclusion:** Not focused on long term care or older people

Waltner-Toews D. Zoonotic disease concerns in animal-assisted therapy and animal visitation programs. *Canadian veterinary journal = La revue veÌteÌrinaire canadienne* 1993;34(9):549-551. **Reason for exclusion**: Not specific to long term care

Appendix XIII: JBI Critical Appraisal Checklist for Narrative, Expert Opinion & Text

NOTE:
This appendix is included on page 261 of the print copy
of the thesis held in the University of Adelaide Library.

Appendix XIV: JBI Critical Appraisal Checklist for Economic Evaluations

NOTE:
This appendix is included on page 262 of the print copy
of the thesis held in the University of Adelaide Library.

Appendix XV: JBI Data Extraction for Narrative, Expert Opinion & Text

Appendix XVI: JBI Data Extraction Form for Economic Evaluations

NOTE:
This appendix is included on pages 265-266 of the print copy of the thesis held in the University of Adelaide Library.

Appendix XVII: Reasons for Exclusion (Feasibility Review)

Barnett & Quigley 1984[180]

Reason for exclusion: Not specific to canines and insufficient data

Edwards and Beck 2002[56]

Reason for exclusion: Not specific to canines

Hundley 1991[179]

Reason for exclusion: Not specific to long term care, older people or canines

Katsinas 2000[177]

Reason for exclusion: No cost data provided

Lilienfield et al 2008[181]

Reason for exclusion: Not specific to long term care, older people or canines

Lust et al 2007[60]

Reason for exclusion: Not specific to long term care or older people

McCabe et al 2002[44]

Reason for exclusion: No cost data provided

Morrison 2007[158]

Reason for exclusion: Not specific to long term care, older people or canines

Reed 1986[178]

Reason for exclusion: Not specific to canines

Saylor 1998[37]

Reason for exclusion: Not specific to long term care

Appendix XVIII: Email Template Sent to Experts/Organisations

Dear [ ]

My name is Cindy Stern and I am currently undertaking a PhD at the University of Adelaide, Australia. My PhD topic is on the role of animals in the health and social care of the elderly who reside in long-term care.

Part of the project involves conducting a systematic review on the feasibility of using animal-assisted interventions/pet therapy (more specially canines) in long-term care. So far I have not managed to locate any papers that discuss the costs associated with these interventions and was hoping you could assist me.

I'm hoping you could direct me to any research on this area that you may be aware of (either by yourself and your organisation) or could suggest some places I should look.

Any suggestions would be greatly appreciated.

Kind Regards

Cindy Stern BHSc (Hons)

The University of Adelaide

Appendix XIX: Supplementary Paper

Chur-Hansen, A., Stern, C. and Winefield, H. (2010), COMMENTARY: Gaps in the evidence about companion animals and human health: some suggestions for progress. International Journal of Evidence-Based Healthcare, 8: 140–146. doi: 10.1111/j.1744-1609.2010.00176.x

COMMENTARY: Gaps in the evidence about companion animals and human health: some suggestions for progress

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Keywords:

- companion animal;
- health;
- psychological well-being;
- research method

Abstract

A number of researchers have explored the relationship between companion animal ownership and human physical and psychological health. Results have been inconclusive, with positive, neutral and negative effects variously reported in the literature. Furthermore, the possible mechanisms of any

influence are frustratingly unclear. A number of conceptual and methodological weaknesses have hampered progress in our understanding of how companion animals may impact upon human health. The two evidence gaps discussed in this paper, with suggestions for needed next steps, are: (i) a preponderance of anecdotal reports and cross-sectional research designs; and (ii) failure to control for a host of other known influences on human health including health habits, level of attachment to the companion animal and human social supports. Finally, an example of these gaps is provided in relation to the literature on the effects of animals on elderly nursing home residents.

Introduction

In the last 30 years there has been a growing literature base about the health benefits to humans, of companion animal ownership. Although a number of studies have considered the physical and psychological health benefits of interaction with a companion animal, the overall results are inconclusive. Nevertheless, there is a popular belief that companion animals are 'good for us'.

This paper briefly reviews some of the claims made by researchers regarding the benefits of companion animals for human physical and mental health. We then comment on the major identifiable gaps in the research evidence, to explain why our understanding is not complete despite many studies having been undertaken. Associated with each gap we offer suggestions for remedies or needed next steps in research. Finally, we discuss a specific area – the use of animal-assisted interventions (AAIs) for the elderly in residential care. We highlight the methodological weaknesses in research that make claims that animals benefit the elderly a dubious conclusion, and one that is lacking in a solid evidence base. This paper is not an exhaustive literature review but rather, a synthesis of knowledge and ideas aimed to stimulate a better quality evidence base for future research. In this paper we focus on the adult literature (and not children). We refer to companion animals as any non-human animal that shares its life with a human caregiver. This is distinct from AAIs, which relates to any therapeutic process that intentionally includes or involves animals as part of the process. AAIs can be grouped as either animal-assisted activities (AAAs) or animal-assisted therapies (AATs). AAAs refer to 'the utilisation of animals

that meet specific criteria to provide participants with opportunities for motivational, educational, recreational, and/or therapeutic benefits to enhance quality of life'[1] while AATs are 'goal-directed interventions directed and/or delivered by a health/human service professional with specialised expertise, and within the scope of practice of his/her profession'.[2]

Examples of the claims of recent reviews

Animals have been attributed with positive effects on humans in a number of areas. Cutt *et al*., in a review of dog ownership, health and physical activity, argue that there is considerable evidence to suggest that living with a dog encourages walking, facilitates health benefits and increases social supports.[3] Consistent with this, Wells states in her review that dogs have prophylactic and therapeutic value for human psychological and physical health.[4] Barker and Wolen acknowledge that many studies are descriptive, but nevertheless conclude that research supports the health benefits of interacting with companion animals.[5] In a review on the benefits of assistance dogs, such as those who help people who have mobility problems or who cannot hear,[6] the authors conclude that the literature is so small and the methodologies so flawed, any statements about the real benefits or otherwise of service animals cannot be made.

Filan and Llewellyn-Jones reviewed the literature on AAT for people with dementia and stated that while the duration of beneficial effects has not yet been explored, the presence of dogs, an aquarium and robotic pets may be considered helpful for the behavioural and psychological symptoms of dementia.[7] A meta-analysis conducted by Nimer and Lundahl concluded that AAT is associated with moderate effect sizes in improving outcomes in Autism-spectrum symptoms, medical difficulties, behavioural problems and emotional well-being.[8]

Inconclusive results about the companion animal-human health connection

The conclusions that can be drawn from the present literature on the health effects of owning a companion animal are mixed, and the causal mechanisms are unclear.[9–11] Some studies conclude that

companion animals are beneficial to health. Other authors have reported that any claims that companion animal ownership is beneficial should be viewed with caution,[12] citing the weak methodologies used to investigate the hypothesis and the preponderance of anecdotal and biased research. For example, self-selection of companion animal owners is likely to introduce all kinds of biases that obscure the proper interpretation of results, as would allowing patients in a drug trial to choose whether they tried the new drug or stayed on the old one, or allowing medical practitioners to choose which patients should enter the active treatment group testing a new drug. To date there are no rigorous, randomised double-blind controlled clinical trials to investigate the question of whether companion animals are beneficial for psychological or physical health, as would be expected for any other therapeutic intervention.

Recently the literature on companion animal ownership in the elderly presents data that argue the association between companion animal ownership and health is, in fact, negative. Parslow and Jorm found that companion animal owners did not have reduced systolic blood pressure (as has been reported in previous research), but had higher diastolic blood pressure, higher body mass index and were more likely to smoke cigarettes as compared with those without companion animals.[13] In a case review of patients over 75 years of age, Kurrie *et al*. concluded that companion animals might pose a hazard for the elderly, by increasing the likelihood of falls (interestingly, in their case review one cat fatality was also recorded, when its falling elderly owner crushed it to death).[14] Nair and Flynn noted companion animal-related injuries, and some of these (usually through dog attacks) can be serious or even fatal.[15] Thompson showed that about half the respondents in a large random survey expressed fear of dog attacks and for half of those, this fear restricted their behaviour.[16] Thus other people's companion animals might pose a health hazard.

Parslow *et al*. concluded from a large cross-sectional survey that companion animal owners reported more depressive symptoms, that married female companion animal owners had poorer physical health, and that caring for a companion animal was associated with symptoms of depression, poorer physical health, higher rates of pain relief medication and higher levels of psychoticism as assessed by the

Eysenck Personality Questionnaire (usually taken as an indicator of impulsivity, autonomy and aggression).[17]

Thus, with the important question 'Are companion animals beneficial for health?' as yet unanswered conclusively, there is scope, and a need, for further research in the area that addresses the weaknesses.

Most of the literature has been concerned with the relationship between companion animal ownership and chronic conditions such as cardiovascular disease, and risk factors such as exercise and blood pressure levels. Depression and social isolation are risk factors for heart disease and also reduce the quality of life of those struggling with chronic illnesses of every type.[18] There is high comorbidity of physical and emotional distress. The Australian Longitudinal Study of Aging found strong interconnections between physical, psychological and social functioning, in their large sample of 1403 community-living adults aged over 70 years.[19] Two mechanisms by which companion animal ownership may reduce the burden of illness, which need to be examined in a rigorous method, are increased exercise and decreased depression. Both may mediate benefits of companion animal ownership in people with inadequate previous levels of physical activity, social support, and sense of personal value and worth.

First gap in the evidence: weak research designs

The companion animal-health literature has been fairly criticised for its preponderance of descriptive and cross-sectional research designs. These, even with a longitudinal element, do not allow conclusions to be confidently drawn about whether or for whom companion animal ownership might be recommended as a health-promoting measure. Studies are needed that are based upon the quantitative methodologies used to assess other healthcare strategies, namely randomised double-blind controlled intervention trials. The populations employed would vary, but could include those people living in the community, in psychiatric facilities and in residential aged care. Such research would be an important contribution to the literature. The focus of research would be an investigation of psychological health,

along with physical and physiological parameters. Because of the increased incidence of chronic illness in older people, research could focus on those aged over 65 years. However, randomised double-blind controlled intervention trials for individuals with any illness are plausible and would be valuable additions to knowledge.

Before funding is likely to be made available for ambitious projects such as these, more preparatory studies are needed. For example, if conducting research into elderly peoples' companion animals and health, we could expect that about half of households of 65+ year olds will already include a companion animal,[17] but we need first to discover how many of those might agree to accept one if offered recompense (in the form of companion animal food, money or vet bill vouchers for example) in return for completion of research measures. As suggested by Furber,[20] we need to identify elderly people's experiences and interests regarding companion animal ownership, the problems associated with owning a companion animal, and reasons why a companion animal may not be wanted, or had to be relinquished.

While a large randomised trial with placebo controls and double-blind assessments of outcome is difficult to conduct,[21] much useful information could be gained from an intervention study where companion animals are given to elderly people who do not have one, with adequate longitudinal follow ups. One of the only intervention studies was conducted by Serpell.[22] He compared the health and mental health of new companion animal owners with non-owners, over 10 months. Unfortunately his report lacked any information about the ages of participants or the method of recruitment of non-owners. Worse, there was no randomisation, so the mild benefits he found especially for dog ownership may be based on self-selection into groups. Allen et al did conduct a randomised trial of companion animal ownership effects on hypertension, by telling half their sample of living-alone stockbrokers with pathologically high blood pressure to adopt a dog or cat as a companion animal.[23] All also started medication, which succeeded in lowering their blood pressure; however, those who received a companion animal responded to mental stressors such as arithmetic tasks with only half as much reactivity in terms of blood pressure elevations. The authors attributed the benefit of companion animal

ownership to the mechanism of non-judgmental social support provided by the companion animals. Replication with participants of more diverse living arrangements and socio-economic status is desirable.

For an intervention study, randomly selected consenting older people could be invited to choose a companion animal cat or dog from a shelter, and their health would be re-assessed after 6 and 12 months. Waiting-list controls could be used. To increase ecological validity only some of the financial costs of companion animal ownership should be defrayed by the researchers, who would also need to plan for contingencies such as owner or companion animal ill-health, or owner–companion animal rejection or temperamental mismatch. It would not of course be possible to 'blind' the participants as to whether they are receiving the active treatment (companion animal) or a credible placebo (whatever the researchers might plan that to be). However, outcome assessment by workers blind to the treatment is very desirable, for example to reduce the risks of inadvertent bias in reported health and well-being, according to the pre-existing expectations of either the research participants or the data collector.

Positive relationships between companion animal ownership and both physical and psychological health may prove to be mediated by baseline levels of physical activity, social supports and feelings of self-worth. If dog owners engage in more exercise than people with other companion animals, might people whose activity level is low show health benefits from acquiring a dog? If owning a dog increases exercise in the able elderly, it could be promoted through public health campaigns and face-to-face consultations with healthcare professionals.[24]

Alternatively, the main benefit of companion animal ownership might be found to be facilitation of increased social supports, in people whose supports were previously inadequate. For example, they might begin to attend companion animal clubs or classes, or to interact socially with other companion animal owners. The non-judgmental nature of companion animal support might be particularly valuable for people who lack social confidence, or whose recent social experiences have been unsatisfying. The

unconditional, non-evaluative nature of a companion animal's emotional support may make their company less stressful than that of a human peer, as was suggested by Allen et al.[25]

Longitudinal qualitative research would also be valuable to help us understand how companion animal ownership might change in its impact upon an individual over time. The research evidence base lacks in-depth information from qualitative research conducted without prior assumptions. Qualitative research has the advantage of being open-ended; themes may be identified that have not previously been considered as important, and these may be pivotal in helping to understand the mechanisms at work in the relationship of companion animal ownership to health.

To overcome the problem of researchers finding only what they expect, open-ended and deep interviews of companion animal owners and companion animal non-owners are desirable. Qualitative research into the health benefits of companion animals certainly does exist. However, there is a tendency for these studies to be descriptive, rather than generating new hypotheses or theories that can be further explored in subsequent research. The trustworthiness and defensibility required in qualitative methodologies is lacking in some of the current literature:[26] thus there is considerable scope for worthwhile contributions to our knowledge through high-quality qualitative research. The specific methodology chosen is not as important as the rigour of the method. Thus, new research could include ethnographic studies (drawn from the discipline of anthropology), around companion animals and health. This would involve carrying out fieldwork based on participant observation. For example, a researcher might choose to spend a year following a specific group of people and their companion animals: fertile material would be found in nursing homes with a shared companion animal, or in the homes and lives of people who rely upon a guide dog, to give only two examples. Another avenue of qualitative research could involve collecting life histories and narratives from people who reflect on the possible relationships between companion animals and their psychological and physical health. Such data may serve as valuable avenues of enquiry and sources of plausible hypotheses that can be systematically explored in subsequent quantitative research such as surveys. A combination of

semistructured interviews with standardised questionnaires measuring physical and mental health may also be pursued; this type of mixed methodology is particularly appropriate for applied health research.[26]

Groups with vested interests have funded some of the companion animal-health research, such as the companion animal food or companion animal care industry. Such potential conflicts of interest risk being perceived as problematic, in an era of growing awareness of the influence on drug companies on medical research.[27] Solutions may be to ask researchers for declarations of any conflict of interest (as is now usually the case when submitting to peer-reviewed journals), to insist on transparency of study design and findings, and where possible, conducting research independently of bodies who may favour one outcome over another.

Second gap in the evidence: failure to control for other influences

Pachana *et al*. found confounding of companion animal ownership with sociodemographic factors such as income, household size, area of residence and usual activity levels in a longitudinal survey of elderly women.[28] As they point out it is difficult to disentangle the direction of causality, in the association between better health and companion animal ownership. Research studies are needed that take into account variables that have been previously less well considered, including the type of social interactions available to the companion animal owner, their leisure time, their financial resources,[29] and the important but often ignored variable of attachment, the emotional bond between the owner and the animal.[30]

Some parts of the research evidence base suffer from a lack of standardised measures. Reported health habits such as exercise and smoking can in the right context be reasonably reliable if based on self-report, but more objective measures are potentially available, such as pedometers (for steps walked), salivary cotinine (for smoking), and structured observations of mobility and fitness. Health and psychological well-being measures have been standardised within the health psychology and public health domains and are now readily available and of known reliability and validity; these include both self-report and physiological forms such as blood pressure, salivary cortisol and body mass index. As

noted by McNicholas *et al*.,[11] quality of life is an important dimension of health in addition to the more traditional biomedical and risk factor assessments.

To gauge the owner's emotional relationship with the companion animal, researchers have tried looking at whether the owner has sole, shared or no responsibility for companion animal care. However, that information may not adequately capture the psychologically important aspects of their relationship, for example the undemanding/unconditional nature of the animal's 'affection', or the sense of security and self-worth associated with the reciprocal emotional bond known to psychologists as attachment.[31] A possible downside of intense owner–companion animal attachment is the owner's isolation from human contacts because of companion animal care responsibilities. Thus, there is a need to examine owners' human social supports, and more fully explore owners who are fiercely attached to their companion animal to the exclusion of human relationships, including the reasons behind such strong attachments. Stallones *et al*. found that for participants aged 45–64 years in a large national survey, individuals with high attachment to a companion animal had fewer human social supports.[32] Some people with, for example, chronic psychological illness might find human relationships too challenging and for them a companion animal might be a perfect companion; however, such people might be particularly vulnerable to pathological grief when the companion animal dies.[33]

Another need is the refinement of psychometric scales to measure companion animal attachment. A number of authors have acknowledged that a flaw in their research has been the lack of attachment measures, a consideration of which may help to explain the contradictory results that characterise the current literature. Although two existing scales have high internal reliability,[32,34] their theoretical and pragmatic origins are unclear and from a psychological viewpoint, some crucial additional items may prove to increase validity. Attachment to companion animals (especially for relatively socially isolated individuals or those with few sources of a sense of value or purpose) may predict well-being but not necessarily in a linear fashion: the relationship between companion animal attachment and health might, for example, follow an inverted U curve, with very low and very high companion animal attachment both associated with poorer health than moderate attachment.[35]

Another psychological benefit of companion animal ownership, especially for sick, elderly or disabled people, may be the sense of self-worth and purpose generated by caring responsibilities. A widely used model of psychological well-being includes the variables Self-acceptance, Positive relations with others, Autonomy, Environmental Mastery, Purpose in life and Personal growth.[36] While all are correlated with life satisfaction and inversely with depression, they show different patterns of association and of change at different age periods. Personal growth and sense of purpose in life are particularly likely to decrease with ageing. We hypothesise that having a companion animal to care for and to provide companionship and stimulation may ward off these adverse changes. The potential role of companion animals to stimulate activity in their owners and reduce depression, by increasing their social contacts and sense of being needed, and to provide attachment figures, give rigorous research in this area a strong rationale.

Positive relationships between companion animal ownership and both physical and psychological health may prove to be mediated by baseline levels of physical activity, social supports and feelings of self-worth. Human social supports can be relatively easily measured using several brief standardised scales. Those with impoverished human social supports and few reasons to feel valued by others could be predicted to show greater mental health benefits from companion animal ownership than those who have adequate social supports, if their attachment to the companion animal is at least moderate.

AAIs for the elderly in residential aged care: one example

Recently some as yet unpublished work has been undertaken by the second author to synthesise the best available evidence on the role of AAIs for the elderly in residential aged care; this has focused exclusively on the use of dogs. As mentioned throughout this paper, the elderly are one such population that has the potential to benefit from human–animal interactions because of declines in physical, social and cognitive ability commonly associated with aging. Reported benefits of AAIs for the elderly include enhanced sensory stimulation, facilitated social interaction, stress reduction, companionship, increased resident–therapist interaction, muscle strength, range of motion and pain management and reduced blood pressure and heart rate.[37] Most residents of long-term care facilities do not choose to live in such

facilities but are there because they can no longer look after themselves because of their often complex morbidities. Opportunities to interact with animals may enhance the physical, emotional and social health of some individuals because of the interaction between human and animal not needing to be dependent on a high level of cognitive function.[38]

A systematic review was undertaken to evaluate if such benefits exist for residents of aged care facilities. Only randomised controlled trials were eligible for inclusion into the review and after an exhaustive search of the literature eight studies met the inclusion criteria. Findings were based on methodologically flawed papers with preliminary evidence suggesting that in the majority of outcomes measured, AAAs were beneficial to residents in the short term following implementation; however, they were not superior to control or alternative interventions such as visits from humans or interactions with inanimate objects.

Like the literature available on animal ownership, the methodological quality of studies in this area presents similar challenges in producing solid conclusions. The issue of weak design frequently arose during the search for papers. The majority of literature was anecdotal or descriptive in nature. Half of the studies included in the review were doctoral theses. Although this systematic review limited inclusion to randomised controlled trials, only three of the eight studies adequately described the method of randomisation. An assumption was made for those papers that did not describe the randomisation process that it had adequately been conducted; however, this may not have been the case and lead to selection bias. It was also not clear for the majority of studies whether allocation to treatment groups was concealed from the allocator as most did not clearly identify who the allocator was and the method that was used. Other studies had to be excluded from the review as despite the inclusion of a control group, there was no explanation as to how the control group was constituted.

Some papers did not define who was measuring outcomes and whether they were blinded to treatment allocation. It was obvious in some instances that blinding was not possible, when outcomes such as smile, and eye contact were measured during the intervention period.

The sample sizes were small, ranging from 36 to 80 participants. The length of the interventions (i.e. the interaction with the animal) varied from anywhere between 6 and 30 minutes per session. The durations on the shorter side of the scale in particular seem extremely small to be able to establish any level of attachment and subsequent benefit, suggesting the literature is unclear on the optimum interaction time required.

The follow-up time for measuring outcomes was quite short, varying from 9 days to 14 weeks. It is impossible to determine whether the benefits reported would remain in the longer term. It would seem imperative to conduct research that measured outcomes on a longer scale, at least at 6 and 12 months to determine if the effects were not based on the 'novelty' factor of such an intervention.

The issues surrounding the failure to control for other influences was also prevalent among this literature. Utilising a complex population such as the elderly in long-term care with multiple comorbidities would warrant comprehensive collection of baseline characteristics in order to be able to accurately compare intervention and control groups. Some papers reported basic characteristics such as age and sex. Others were more comprehensive and measured factors such as level of care, past companion animal ownership and time in residence. Many factors that may impact on interactions were not captured in studies such as medication usage, hearing, vision and mobility impairments, and attitudes to animals. Studies that measured across more than one facility did not describe the care and services provided to residents. Differences such as other types of therapies offered or the staffing levels and mix for example could impact on resident outcomes.

One of the prominent limitations found in this area related to the presence and level of interaction of the animal handler or the researcher (which in some cases were one and the same). Studies were unclear in describing whether a person/people (besides the participant) were involved in the intervention. In some cases it was clear that the researcher/handler was present during the interaction, in others it was not clear who was involved. Some of the interventions involved the researcher/handler interacting with the participant freely,[39] while others used predeveloped scripts in an attempt to limit the interaction

between the researcher/handler and the participants.[40] This suggests that the presence/interaction level of the researcher/handler was not adequately controlled for implying that the outcomes produced may have in fact been related to the interaction of the researcher/handler and not the animal. A few studies did however utilise multiple treatment arms to control for this interaction.[41,42] A treatment condition (researcher/handler and the dog), a control condition and another treatment arm were some examples used.

Lastly in regards to the dogs used in the interventions, most papers did not describe the characteristics of the animal (e.g. breed, age). Some dogs were allowed to wander freely during the intervention while others were leashed during the entire intervention period. Some papers failed to provide this level of detail. It was not always clear what level of interaction the participants had with the animal. It was noted that staff members owned some of the dogs used for the interventions, with one paper[43] providing details that the dog would become distracted during the intervention and wanted to interact with its owner. Controlling for such factors would seem critical to obtaining methodologically sounds results.

In conclusion, the literature base of one particular area of human–animal interaction (i.e. AAIs in residential aged care) has been reviewed. A sample of methodological challenges has been presented. It is probable that these challenges exist across many areas of human–animal research.

Conclusion

This paper shows that sound, empirically based evidence of whether and how human psychological and physical health benefits arise from human–companion animal interactions is needed. There is a strong tendency in the literature to assume that human–companion animal interactions are beneficial, and while this may well be the case in many instances, hard evidence is lacking. Claims in favour of the efficacy of human–animal interactions to improve and promote health are poorly supported by well-controlled research studies, and many claims are founded on anecdotal evidence, descriptive research and qualitative and quantitative data collected in research with weak designs. One consequence of flawed research is that the mechanisms by which humans might benefit are not clearly understood. For

example, the characteristics of both the humans and the animals concerned that may predict positive consequences for the humans cannot be stated definitively. We do not know, for instance, whether people of certain age groups, health status, personality or social circumstances are more likely to benefit than others or conversely, whether some people may perhaps suffer adverse consequences from interactions with animals. Further, it is not clear whether ownership and shared living arrangements with the animal are important, or if other kinds of contact with companion animals are sufficient for the human to benefit, such as in the case of brief interventions during animal-assisted interventions and therapies. Explorations of the effects of animal-assisted interventions and therapies are particularly weakened by the confounding of the effects of interaction with the handler or therapist against interactions with the animal. High-quality, rigorous research that addresses the questions of how, why and under what conditions humans benefit or do not benefit from interactions with animals would illuminate our understanding of how to increase well-being in many different healthcare contexts. Clearly there are many methodological challenges to overcome, and these are considerable – otherwise the literature would be characterised by research of a higher quality. However, efforts to improve the evidence base in this area are to be commended and encouraged: an increase in knowledge is highly desirable, so that human–companion animal relationships, interventions and therapies can be promoted where appropriate, and evaluated, for the benefit of the health of the wider community.

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