Dog-handler team visitations for nursing home residents with dementia:

a novel approach

Lonneke Schuurmans

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De Zorgboog
Open Universiteit

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Promotores:
Prof. dr. J.M.G.A. Schols, Universiteit Maastricht
Prof. dr. M.J. Enders-Slegers, Open Universiteit

Copromotor:
Dr. I. Noback, Hanzehogeschool Groningen

Leden beoordelingscommissie:
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Dr. ir. S.R. de Bruin, Hogeschool Windesheim
Dr. R. Leontjevas, Open Universiteit

Contents

CHAPTER 1

General Introduction

Dementia

Dementia is a progressive neurodegenerative disease characterised by a cluster of symptoms, including memory loss, disorientation, difficulty with complex tasks, decreased concentration and diminished social, reasoning and speech skills (WHO, 2022). With progression of the disease people with dementia also suffer from physical problems, like diminished mobility and a decreased ability to control basic physical functions. The number of people suffering from dementia globally is estimated to be 55.2 million and this number is projected to increase to 152 million in 2050 (Alzheimer's Research UK, 2022; WHO, 2021).

Dementia has a significant impact on quality of life both for the person with dementia as the carers. The disease burden (calculated as Disability Adjusted Life Years, DALY's) has doubled in the last decade reflecting the ageing population and increased prevalence of age-associated diseases. Dementia is the 7th cause of death worldwide (WHO, 2021). In the Netherlands, 10.3% of the total health care budget is used for dementia care, either for people living at home (62%) or in nursing homes (38%) (Ministerie van Volksgezondheid, 2020).

Dementia can be caused by more than 50 different diseases (WHO, 2022), the most common and well-known being Alzheimer's disease (65%) and vascular dementia (22%). Lesser known causes, but often with high impact, are frontotemporal dementia and Lewy Body dementia with a prevalence of 4% and 2%, respectively in the Netherlands (Ministerie van Volksgezondheid, 2020). Mixed dementias are also common and often difficult to diagnose. Dementia is associated with loss of brain cells due to the underlying disease and subsequent loss of neurological functions associated with the affected areas of the brain.

The burden of care from dementia is not only determined by the progression of the disease and its subsequent neurocognitive and physical symptoms, but also by the accompanying mood and behavioural disorders, commonly known as neuropsychiatric symptoms. These neuropsychiatric symptoms include symptoms like agitation, depression, apathy and aggression (WHO, 2022). Even though aggression often has the most immediate negative impact on persons with dementia and their caregivers, apathy (or loss of initiative resulting in a general kind of passivity) is often described as the most frustrating. Caregivers often find it incredibly difficult to motivate and activate people with dementia into activity or social interaction.

Caregivers are balancing the burden of care with their own wellbeing and the available formal and informal support. A study in the UK in 2016-2017 revealed that 36% of carers spend more than 100 hours per week caring for a person with dementia and 48.4% of carers have a long-standing illness or disability themselves (Alzheimer's Research UK, 2022). When, due to progression of the disease, severe neuropsychiatric symptoms or loss of the main caregiver, living at home is no longer possible, people with dementia are often admitted to specialised psychogeriatric nursing homes.

Dementia care in nursing homes

The first mention of what is now considered the first nursing home in Dutch history dates back to as early as 1395 and is called Hofje van Bakenes in Haarlem. This Hofje van Bakenes was a courtyard surrounded by small homes and intended specifically for women above the age of 60 (Kurtz, 1960). In the subsequent centuries more and more homes for elderly people appeared - usually described as 'old-peoples homes' or 'old-man's (or wives) homes' - until the opening of the first 'modern' nursing home, in 1965 in a village in Limburg (Hendriks Jansen, 2010). As in other countries, Dutch nursing homes provide 24/7 care for people with complex care needs and employ nursing staff as well as therapists. Unlike other countries, Dutch nursing homes also employ a specialised long-term care physician, called an elderly care physician, responsible for the 24 hr. medical care of the residents.

In the Netherlands the majority of nursing home residents suffer from dementia (80%) and the remaining percentage from chronic somatic or physical diseases and disabilities (e.g. stroke, Parkinson; Ministerie van Volksgezondheid, 2020). People with dementia usually live together on a ward, traditionally in large-scale wards but currently more and more in small-scale home-like settings.

Nursing home wards for people with dementia aim to provide a safe, warm and home-like environment and simultaneously offer specialised 24/7 care. Neuropsychiatric symptoms like agitation and aggression, but also depression and apathy, are common challenges for both residents and care professionals. Agitation often not only has a negative impact on the physical well-being of the person with dementia (for example extreme fatigue), it is also often a symptom of psychological or physical discomfort that requires specific, multi-disciplinary analysis. Agitation can be a nuisance for other residents and when culminating in aggression it can even pose a danger to the residents themselves, other residents and staff. Depression and apathy on the other hand, are often unrecognised, but equally challenging for both persons with dementia and their caregivers. Loss of motivation, loss of initiative, diminished social interaction and diminished general happiness are often very difficult to influence and need targeted interventions.

In the last two decades, a paradigm shift from a more medically-oriented approach (usually involving medication) to a more person-centred and holistic approach, has led to the development of several psychosocial interventions to help manage neuropsychiatric symptoms. These interventions are based on - among others – Kitwood & Bredin's theory that behaviours of people with dementia are determined by several factors, including physical well-being, psychological well-being, environment, life-history and the amount of brain damage (1992). Managing neuropsychiatric symptoms, therefore, needs to address all these factors, and requires more than only medical expertise and needs to be tailored to the specific individual. These tailored interventions are often based on specific sensory and cognitive stimulation (e.g. music therapy and creative therapy), sensory relaxation (e.g. snoezelen, aromatherapy), physical activation (e.g. exercising) or activities that offer combinations of the above (e.g. dancing, elder clowns). One such group of interventions that have the ability to influence several domains are animal assisted interventions.

Animal Assisted Interventions

For thousands of years, animals and humans have coexisted, either harmoniously or as adversaries. It is, however, only since the age of enlightenment (seventeenth century and onwards) that people have become more interested in the unique qualities of the human-animal bond and the benefits of interacting with animals. The first descriptions of positive effects are more anecdotally, for example the observation of well-known philosopher and psychologist John Locke in 1699 that giving children animals to look after, seems to help them develop tender feelings and a sense of responsibility for others (Serpell, 2000). Another well-known advocate for human-animal interaction, especially for sick people, is Florence Nightingale in her Notes on Nursing (Halm, 2008). It is not until the 20th century, however, that research into the human animal bond gains more and more momentum. Petting a dog is discovered to have positive effects on blood pressure (Odendaal, 2000) and hormone levels and pet-ownership is associated with higher post-myocardial infarction survival rates (Friedmann, Katcher, Lynch, & Thomas, 1980). Observations in (child) psychiatry reveal that the presence of a dog during therapy sessions is beneficial for the therapeutic process and that specific interactions with animals can help alleviate symptoms of anxiety and depression (Barker, Dawson, & Barker, 1998; Souter & Miller, 2007). Combined, all these individual findings have led to the development of a new group of specific psychosocial interventions involving animals, called animal-assisted interventions (AAI).

Animal assisted interventions are defined as goal-oriented and structured interventions that intentionally include or incorporate animals in health, education and human services for the purpose of therapeutic gains in humans (Jegatheesan et al., 2018). AAI can be directed by health care professionals (like psychologists or social workers) following a specific treatment plan and if so are referred to as Animal Assisted Therapy (AAT). AAI are also often delivered as part of an activity program, without a specific individualised treatment plan and often in group sessions. These activities are called Animal Assisted Activities (AAA). Animal interventions in education are referred to as Animal Assisted Education (AAE).

The efficacy of AAI is often based on the perceived unique qualities of animals. People often specifically mention the non-judgmental approach of animals, their non-verbal communication and their ability to stimulate a broad array of senses (e.g. smell, touch, vision) when detailing the benefits of interacting with animals (Beetz, Uvnäs-Moberg, Julius & Kotrschal, 2012; Fine, 2010; Friedmann & Son, 2009). In depth research has revealed that beneath all those contributing factors a theoretical framework can be identified that explains the unique quality of the human-animal bond from a more instinctive perspective and is related to the concept of attunement, or mutual coordination, between human and animal. This includes the coordination of behaviour, emotions, movement and respiration (Verheggen, Enders-Slegers, & Eshuis, 2017). When human and animal are in tune with each other (also described as synchrony) the interaction is more likely to yield positive effects, both for human and animal (Beck & Katcher, 2003; Fogel, 1993).

Figure 1 depicts this integrative model for human-animal interaction with the psychological constructs on the left and the involved biomarkers on the right (Enders-Slegers, 2022). Biophilia explains the human tendency to connect to nature and animals and basically describes an engrained love of nature that is imprinted in human DNA and has been helpful in the survival of the human species (Beetz, 2017). Enactivism is a position in cognitive science that argues that cognition (e.g. gaining knowledge and understanding) arises through a dynamic interaction between an organism and its environment (Verheggen et al., 2017). This involves an active exercise of the organism's sensorimotor processes (i.e. seeing, smelling, touching, hearing and feeling) and when two organisms interact, this can be referred to as a sensorimotor embodied interspecies interaction. By referencing each other and coregulating behavioural patterns interspecies embodied interactions develop attunement to and synchrony with each other (in movement, speech, rhythm and speed).

The interaction also evokes cognitions and emotions that result in (changed) behavioural patterns and can be measured through biomarkers. These behavioural patterns subsequently influence the interaction and trigger a new cycle of referencing and coregulation, attunement and synchrony, and cognitions and emotions (etc.).

Ultimately fixed behavioural patterns will arise from this cycle and this is referred to as social learning (e.g. learning by observing and imitating others). These fixed behavioural patterns are the basis of the interspecies relations and within these relations attachment between the organisms (e.g. human and animal) can develop. Both relations and attachment are subsequently necessary to build social support within an (human-animal) interaction. Social support through attachment is often referenced as a valuable outcome of the human-animal bond (Sable, 2013).

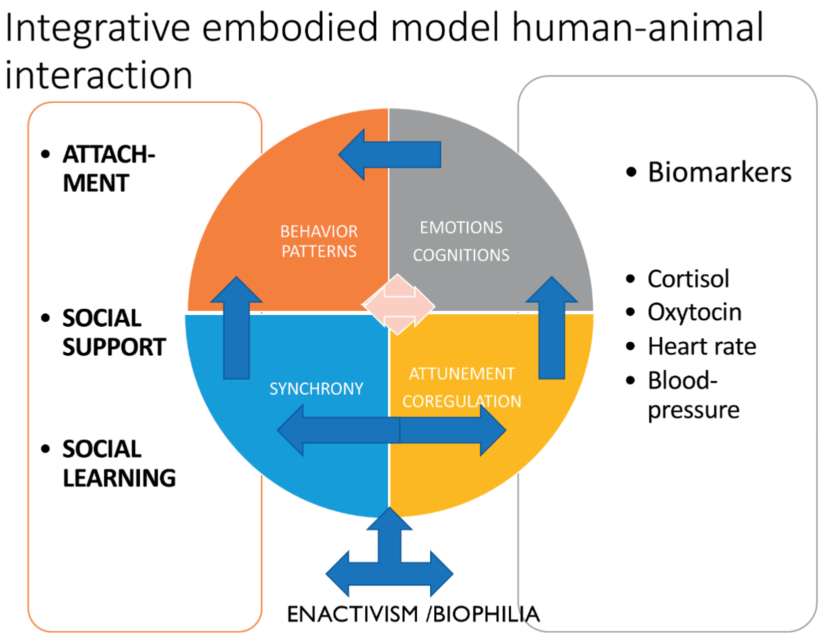

Figure 1. an integrative model for human-animal interaction with the psychological constructs on the left and the involved biomarkers on the right (Enders-Slegers, 2022).

In dementia care, specifically, this theoretical framework is valuable. People with dementia often lack the ability of normal verbal communication and have difficulty interpreting social situations. Interacting with animals does not require higher cognitive functions, but based on the instinctive attunement and embodied interaction, people with dementia are able to interact with animals (and vice versa) on their own terms. Not surprisingly, therefore, AAI have found their way into the nursing home and into dementia research. Several studies have shown (preliminary) beneficial effects on psychosocial and physical outcomes. Wesenberg and colleagues, for example, found that weekly group sessions with a dog increased positive emotions and social interaction in people with dementia (Wesenberg, Mueller, Nestmann, & Holthoff-Detto, 2018). Group sessions with a dog were also shown to increase balance (Olsen, Pedersen, Bergland, Enders-Slegers, & Ihlebæk, 2016a) and engagement (Olsen, Pedersen, Bergland, Enders-Slegers, & Ihlebæk, 2016b). A Swedish pilot study showed preliminary positive results of weekly therapy dog sessions on quality of life of people with dementia (Nordgren & Engström, 2014). Studies also suggest positive effects on agitation behaviours (Richeson, 2003) and depressive symptoms (Majić, Gutzmann, Heinz, Lang, & Rapp, 2013).

It is still unclear however what the exact dosage - effect equation is and what parameters (like dementia stage and type, but also the diverse AAI characteristics) determine the effects. Also unclear is the effect of the accompanying handler during AAI sessions and the impact of the handler on the embodied relation between human participant (person with dementia) and animal (usually a dog). Another aspect that needs further research is the applicability & suitability of AAI interventions in daily nursing home practice (i.e. what effects can be expected for specific indications and possible challenges in organising AAI interventions in nursing homes). Especially when compared to more easily available interventions like the use of robot animals.

Overview of this dissertation

This dissertation aims to help define and understand the parameters involved in AAI in dementia care and specifically tries to answer 4 research questions:

- What is the baseline of AAI practice in Dutch nursing homes?
- What challenges can be identified when conducting an AAI study in nursing homes?
- Is there a handler effect in the social interaction outcome of dog or robot animal interventions for people with dementia?
- What is the effect of the presence of a dog or robot animal on agitation behaviours of people with dementia during group sessions.

These questions will be addressed in the following chapters:
Chapter 2 describes the results of a survey to establish the baseline of AAI practice in nursing homes in the Netherlands and to identify specific benefits and risks.

Chapter 3 focuses on the specific challenges of conducting an AAI study in a nursing home and the lessons learned along the way.

Chapter 4 is dedicated to the effect of AAI interventions on social interaction and the specific role of the handler in this effect. To measure this effect dog interventions are compared with robot interventions and a handler only control group.

Chapter 5 describes a study into the effect of interaction with a dog on agitation behaviours and again compares the results with interaction with a robot (and a control group).

Chapter 6 is the general discussion that discusses the results within the context of the above-mentioned theoretical framework of integrative embodied interaction.

Chapter 7 is a Dutch summary of the findings in this thesis.

Chapter 8 provides an addendum to connect the theoretical framework of human-animal interaction with well-known theories of dementia care.

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CHAPTER 2

Animal Assisted Interventions in Dutch nursing homes, a survey.

Lonneke Schuurmans
Marie-José Enders-Slegers
Theo Verheggen
Jos Schols

Publicatie
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2

Abstract

Objectives

Animal assisted interventions (AAI) have become more and more popular in nursing homes in the last decade. Various initiatives for using animals in nursing homes have been developed over the years (e.g. animal visiting programs, residential companion animals, petting zoos) and on the whole, the number of nursing homes that refuse animals on their premises has declined. In this survey we aim to determine how many Dutch nursing homes offer animal assisted interventions, what type of interventions are used and with what aim. We also focus on the use of underlying health, hygiene and (animal) safety protocols.

Methods

Using an online Dutch nursing home database, we invited all listed (457) nursing home organisations in the Netherlands (encompassing a total of 804 nursing home locations) to participate in our digital survey, powered by SurveyMonkey. The survey consisted of a total of 45 questions, divided in general questions about the use of animals in interventions, the targeted client population(s) and specific questions about goals, guidelines and protocols. The results were analysed with SPSS Statistics.

Results

In the end 244 surveys, representing 165 organisations, were returned: 125 nursing homes used AAI in one way or another, 40 did not. Nursing homes that did not offer AAI cited allergy and hygiene concerns as the most important reasons. Most nursing homes offering AAI used visiting animals, mostly dogs (108) or rabbits (76). A smaller number of nursing homes had resident animals, either living on the ward or in a meadow outside. Almost all programs involved animal assisted activities with a recreational purpose, none of the participating nursing homes provided animal assisted therapy with therapeutic goals. Psychogeriatric patients were most frequently invited to participate. A total of 88 nursing homes used alternatives when animals were not an option or not available. The most popular alternative was the use of stuffed animals (83) followed by FurReal Friends robotic toys (14). The sophisticated robot seal Paro was used in 7 nursing homes.

A large percentage (80%) of nursing homes that worked with animals did not have AAI specific health protocols or animal welfare and safety protocols underlying the animal activities nor specific selection criteria for the selection of suitable animals.

Conclusion

The majority of the participating Dutch nursing homes offer AAI in recreational programs (animal assisted activities) for psychogeriatric clients (using visiting animals, especially dogs). Most nursing homes do not have specific AAI protocols for animal welfare, hygiene and safety during animal activities, nor do they employ specific selection criteria for participating animals and their handlers.

Keywords
Animal assisted interventions, nursing homes, animal welfare, hygiene, safety, survey

Conflict of interest
The authors declare no conflict of interest.

Funding
De Zorgboog, a nursing home and healthcare institution in the Netherlands, provided the funds to carry out this survey.

Introduction

In the past 50 years animal-assisted interventions have risen from sporadic to mainstream in diverse settings, including hospitals, psychiatric care, schools and prisons (Fine, 2015). The spectrum of animal-assisted interventions (AAI) practised in these settings includes animal-assisted activities (AAA, with recreational goals), animal-assisted therapy (AAT, with therapeutic goals) and animal-assisted education (AAE, with educational goals). Nursing homes are equally well suited for AAI programs, both from a client and an organisational perspective. Improving quality of life, for example, is one of the recurring challenges in elderly care management, especially when combined with complex debilitating illnesses and a restricted financial budget (Droes et al., 2010). The last two decades, therefore, have seen an exponential increase in the incorporation of complementary interventions in nursing homes, especially in dementia care, including animal-assisted interventions (Kverno et al., 2009; Hulme, Wright & Crocker, 2010). Dog visitation programs, in particular, are very popular and various organisations exist worldwide today to assist nursing homes in starting and maintaining such programs (IAHAIO, 2015). Usually these programs are set up for recreational purposes, essentially meaning they provide pleasant human-animal contact opportunities with sometimes additional benefits, like stimulating social contact with other clients or volunteers. A lot of articles have been written about the benefits of the human-animal bond, both in sickness and in health (Friedmann, Son & Saleem, 2015). Friedmann, for example, has shown that petting dogs can positively influence blood pressure and the presence of a friendly dog reduces cardiovascular responses to a stressor like public speaking (Friedman et al., 2013; Friedmann et al., 2007).

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Researchers are more and more focused on surpassing the anecdotal evidence of AAI effects via controlled trials in diverse settings, including nursing homes, and several reviews on this subject have been published in the last decade (Nimer & Lundahl, 2007). In keeping with the rising popularity of AAI, however, concerns about professionalism, hygiene, zoonoses, safety and animal-welfare have been raised. Definitions and guidelines for AAI have, albeit slowly, been developed in the past decade, culminating in the 2014 IAHAIO white paper on this subject (IAHAIO, 2015).

Following the international trend, AAI has become equally popular in the Netherlands. Various initiatives for using animals in Dutch nursing homes have developed over the years (e.g., animal visiting programs, residential companion animals, petting zoos). Several organisations that provide pet-visitation programs for nursing homes exist, as well as training programs for volunteers, who want to participate in AAI programs with their animals (AAIZOO, 2015). The Van Hall Larenstein University of Applied Sciences in Leeuwarden offers an 'animals in healthcare' bachelor as part of an animal-management study program (Van Hall Larenstein, 2015). In 2013 the first European professorate in Anthrozoology was in-stated at the Open University in Heerlen, focusing on various research questions in the AAI field and collaborating in the recently established Institute for Anthrozoology, IVA (Open University, 2015; Anthrozoology Institute, 2015). Both theory and practice are thus well represented in the Netherlands, but it is unclear whether they actually meet each other where it matters most, i.e., at the human-animal interactional level, and consequently lead to best practices based on the available scientific theory.

In this article we describe an AAI oriented survey conducted among Dutch nursing homes, with the purpose to determine how many Dutch nursing homes use animals in one way or another and to categorise the various practices of AAI in those nursing homes (i.e. AAA or AAT, targeted client population, involved staff, etc.). Additionally we aim to analyse what criteria are important for Dutch nursing home staff in deciding for or against the use of animals and if Dutch nursing home staff adheres to specific guidelines during AAI sessions.

Methods

Using the online Dutch nursing home database KiesBeter (2015), a nursing home comparison and review website, we invited all listed (457) nursing home organisations in the Netherlands (encompassing a total of 804 nursing home locations) to participate in a digital survey. We used the main contact email address as provided in the database to send an invitation, with accompanying information detailing the goals of the survey and a digital link to the online questionnaire, powered by SurveyMonkey, a digital surveying tool (SurveyMonkey, 2015). We asked the main addressee to forward the survey to all nursing home locations belonging to the organisation, potentially creating a total of 804 respondents.

The online survey consisted of a total of 45 questions, mostly single or multiple-choice, and focused on the use of animals in general (i.e. animal specifics, type of interventions, selection criteria, alternatives, reasons not to use animals), the targeted client population(s) (e.g. dementia, somatic illness, psychiatric illness, hospice care etc.), participant selection criteria and the intended intervention goals. We were also interested in the use of specific (AAI) guidelines and protocols while managing AAI programs and the value respondents adhere to different aspects of those guidelines.
All results were anonymized and analysed with descriptive statistical tests using SPSS Statistics (IBM, 2015).

Results

A total of 244 surveys were returned, a response rate of 30%. When corrected for incomplete entries (i.e., surveys with more than 50% left blank), the resulting 219 respondents represented 165 nursing homes, 21% of all nursing home locations in the Netherlands. Respondents were mostly working as part of the recreational staff with nursing and management staff in second and third place (figure 1).

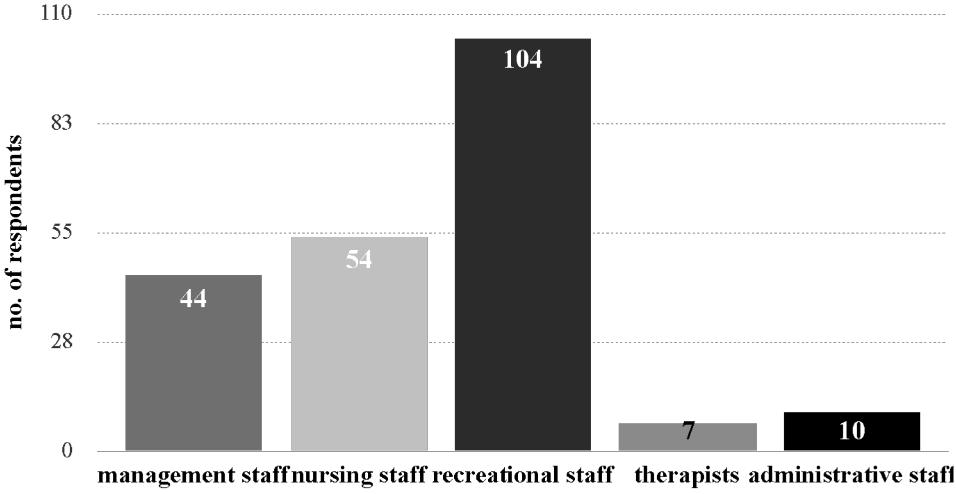

Figure 1. Number of respondents per function profile (n = 219 respondents).

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A number of nursing homes (28) asked multiple employees to participate, creating 54 duplicate entries for those nursing homes in total. In case of discordant responses in those duplicate entries, we used the entry of the respondent most likely to know the actual situation (e.g. preferring entries by recreational staff of nursing home wards over, for example, managers). When corrected for those duplicate entries, the results show that 125 nursing homes (76%) did use AAI in one way or the other and 40 did not. According to the respondents dogs were used most frequently, followed by rabbits and birds (figure 2). Less mentioned animals (below 10 mentions) are clustered in the 'other' category and include rats, pigs, horses, donkeys, cows and even a llama and an iguana.

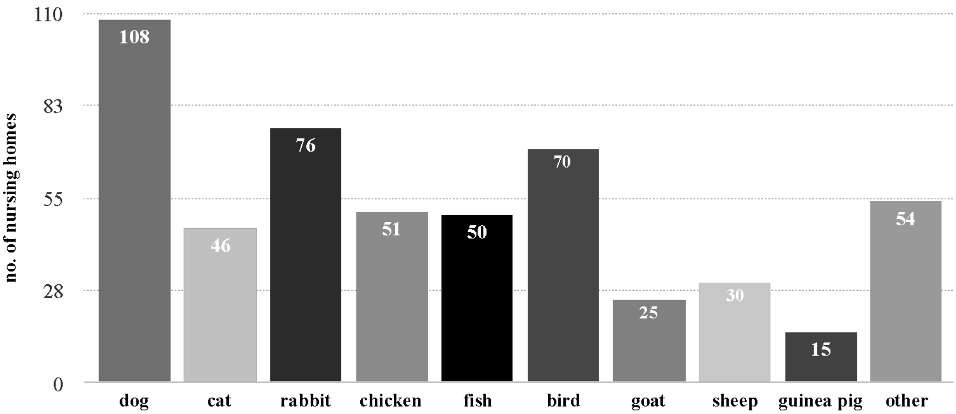

Figure 2. Frequency per type of animal used in responding Dutch nursing homes (multiple choice, n=125). Other (less than 10 mentions): llama, iguana, cow, horse, rat, donkey, duck, goose, piglet, pot bellied pig.

According to the respondents AAI sessions typically involved 1 - 4 animals (85 mentions). When asked about the animal's origin or ownership, 13 nursing homes mentioned using only resident animals (either in the house or on a meadow outside), 50 used only visiting animals and 37 nursing homes used both. The remaining 25 nursing homes did not specify the origin or ownership of the animals.

The 40 nursing homes that did not use animals cited several reasons that could be divided into 6 distinct categories:

- hygiene concerns [15 mentions]
- allergy concerns [10 mentions]
- animal welfare cannot be guaranteed [11 mentions]
- fear of legal liability [2 mentions]

- perceived fear of animals among clients [3 mentions]
- no qualified personnel available [6 mentions]

Of the nursing homes not using animals, 13 did not use alternatives for animals either. Of all 165 nursing homes that are represented in the survey, 88 nursing homes at times used alternatives like toys or robots instead of animals, while 36 nursing homes did not. Unfortunately, for 42 nursing homes this question was not answered. Alternatives used most frequently were stuffed (plush) animals (figure 3). The well-known artificial interactive therapeutic robot seal Paro was mentioned for 7 nursing homes. Among alternatives mentioned in the category 'other' were dolls, animal images or videos and even taxidermy (the mounting or stuffing of dead animals).

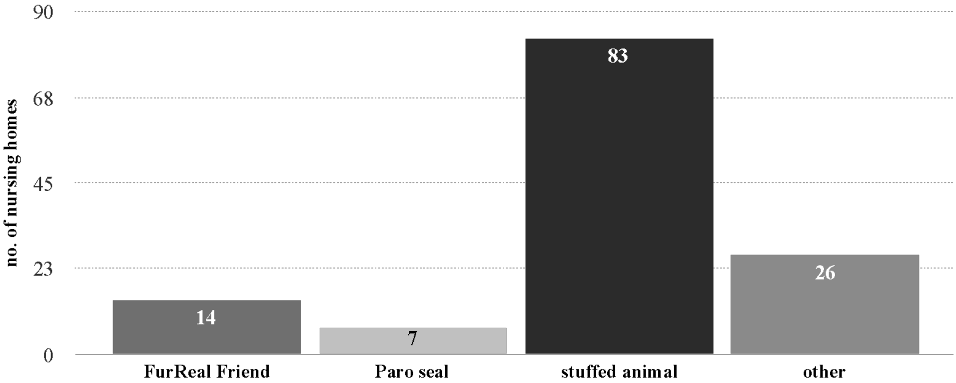

Figure 3. Frequency per type of alternative for an animal used in responding Dutch nursing homes (multiple choice, n=165). Other (less than 7 mentions): animal hand-dolls, baby dolls, animal images and videos, taxidermy, sensory stimulation via 'snoezelen'.

Looking at the specific details of AAI sessions in Dutch nursing homes, visiting animal programs (i.e., volunteers/handlers visit the nursing home with their animals) were most common (83 mentions), very closely followed by activities focused on clients participating in the caring for resident animals (82), with several nursing homes offering both. A total of 107 respondents cited stroking & cuddling the animals as the most important activity during the programs, followed by playing (60 mentions), walking (56), feeding (55) and grooming (50). Most nursing homes organised AAI as group activities (93), with most groups consisting of 4 or more clients. Individual sessions, however, were also mentioned by 43 nursing homes.

According to the respondents AAI was offered for the entire range of nursing home client profiles (i.e., psychogeriatric/dementia, somatic/physical illness, psychiatric, etc.), but psychogeriatric clients were most frequently invited to participate (mentioned by 120 of respondents) with somatic clients in second place (71 mentions, figure 4). None of the nursing homes offered specific animal assisted therapy programs. Clients not participating (or exposed) were most often excluded because of allergies, fear of animals or no (expressed) interest. AAI frequencies of once a week (26 mentions) and once a month (27 mentions) seemed to be equally popular, as well as the undefined response of 'when needed' (25 mentions). In most nursing homes sessions lasted between 30 - 60 minutes (33 mentions) and took place in a separate designated space (not on the clients' ward, either outside or inside).

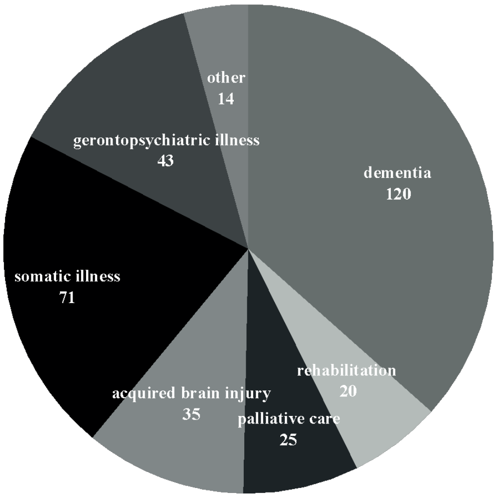

Figure 4. Number of responding Dutch nursing homes using animal assisted activities per medical category of participants (n=125, multiple choice). Other: early onset dementia, Korsakov, retirement home clients, day-care.

We also listed the personnel involved in the animal programs and as shown in figure 5 recreational staff, volunteers and animal handlers were most frequently involved. Handlers were seen by most respondents as responsible for the animal (81 mentions) and recreational or nursing staff was seen as responsible for the client (92 mentions). A total of 29 respondents indicated that the animal handlers or volunteers were also responsible for the participating clients. When no handler was available (e.g., for resident animals) 44 respondents answered that the recreational staff was responsible for animal welfare. Thirteen respondents noted that the division of responsibility between participating staff and other personnel was unclear.

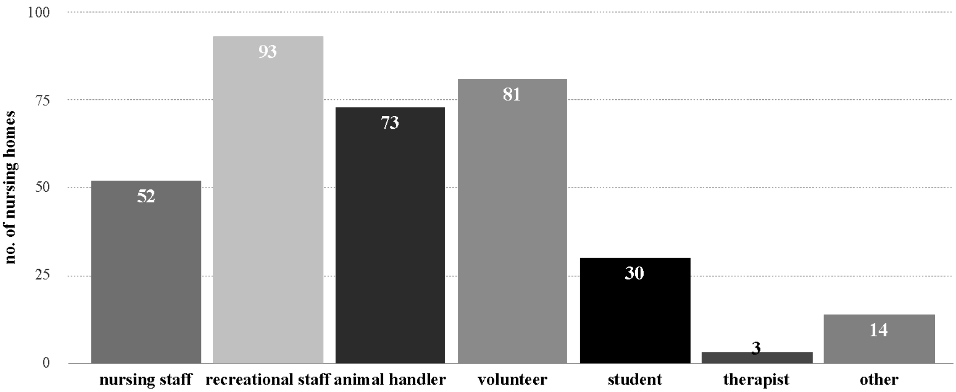

Figure 5. Personnel involved in animal-assisted interventions in responding Dutch nursing homes (n=125, multiple choice). Other (less than 3 mentions): client, family, nursing home hostess, child daycare personnel (when combined activity with a child daycare), farm employee, management staff, dog training center personnel.

2

The final part of the survey focused on AAI guidelines and protocols regarding selection criteria, hygiene, welfare of clients and welfare of animals. A total of 73 respondents skipped this entire part of the survey for unknown reasons. The remaining 146 respondents mentioned the following selection criteria for the animals involved (listed according to mentioned most to least frequently):

- the animal has to be healthy (not specified) [42 mentions]
- the animal has to be free of zoonoses [21 mentions]
- the animal has to be vaccinated [15 mentions]
- the animal has to be clean (not specified) [14 mentions]
- the animal has to be free of worms and fleas [10 mentions]
- the animal has to be periodically checked by a veterinarian [7 mentions]

Thirteen respondents answered they do not know what selection criteria are employed and 15 respondents mentioned the health status of the animal is the sole responsibility of the animal handler.

Respondents were also asked to list the specific measures taken during sessions to ensure animal welfare. Only 99 respondents answered this question: 20 of them said they did not know what measures were used, the remaining 79 respondents mentioned two measures that were seen to be of equal importance. The first one indicated to be important is the presence of the animal handler during sessions. The second safety measure cited as most relevant was that the animal had to be provided with food, water and a place to retreat during the sessions.

2

Respondents listed several hypothetical reasons for sessions to be aborted. The reasons mentioned most involved client welfare and safety and animal welfare and safety. A large number of respondents (86) stated individual clients were prematurely excluded from sessions when they exhibited symptoms of an allergy, showed signs of fear, unhappiness, fatigue or agitation or when they asked to leave or showed signs of wanting to leave. A smaller number of respondents (25) mentioned they prematurely stop sessions when there is no discernible response in the group or individual client, based on observations and not supported by specific assessment tools.

A total of 109 respondents indicated that some sessions were also aborted when the animals showed signs of stress or fatigue or acted in an unacceptable way (i.e., growling, biting, etc.). Another reason for ending sessions was situations in which the safety of the animals could not be guaranteed due to specific circumstances (e.g., sudden agitation or aggression in psychogeriatric clients).

All respondents of the nursing homes that used animals (n=125) were subsequently asked about the availability of specific protocols related to AAI or hygiene and safety in general. As can be seen in the pie chart (figure 6), according to the respondents 42 nursing homes have general hygiene protocols (A) that are also used during AAI sessions, 32 have no protocols related to AAI (J), 23 have an incident registration system (I) and 23 have animal safety protocols (F). Least mentioned protocols involve specific hygiene (zoonosis, B) and animal management during sessions (C).

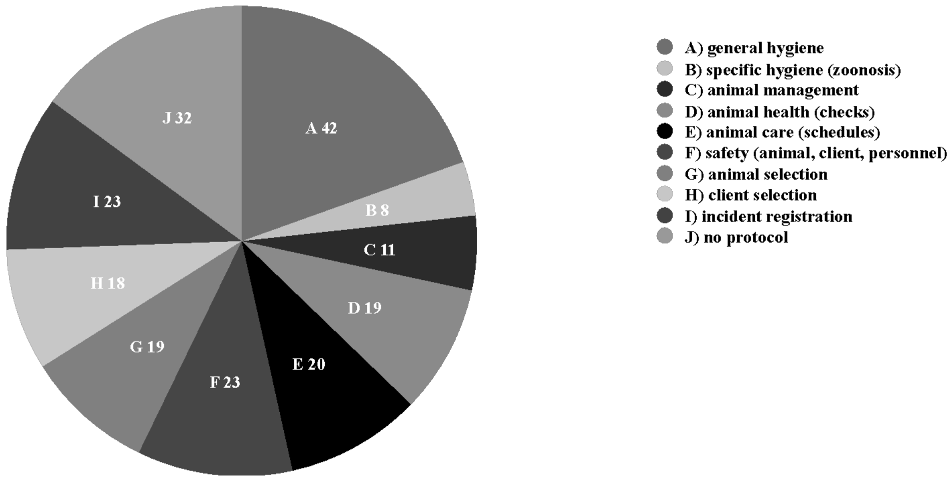

Figure 6. Availability of protocols related to animal assisted interventions, displayed by the number of responding Dutch nursing homes that mention availability of such protocol (n = 125).

Finally, we asked respondents to rate the following 7 statements regarding AAI safety according to perceived importance (table 1). A total of 84 respondents finished this task. All statements were perceived to be of equal importance with the exception of statement 4 and, to a lesser degree, statement 3.

Table 1. Mean rating (range 1–10, least to most important) of safety statements as perceived by respondents (n=84).

Statement	μ (SD)
1. Clients' hands are washed after touching the animals.	8,14 (1,64)
2. Designated rooms are off-limits for the animals, for example kitchen and sanitary units.	8,29 (1,85)
3. The room used for the activity is cleaned after every session.	7,26 (2,29)
4. The animal handler has successfully finished an AAI training.	5,18 (2,85)*
5. The person responsible for the animal takes animal behaviour (e.g., stress signals) into account and acts accordingly.	8,65 (1,87)
6. The person responsible for the animal takes care to minimise risks of transmitting zoonotic diseases and other safety hazards.	8,70 (1,69)
7. All animals are vaccinated and treated for parasites.	8,63 (1,88)

* = significant difference.

Discussion

The implementation of animal assisted interventions, especially animal assisted activities, in nursing homes has gained more and more momentum in the past decades (Johnson & Bibbo, 2015). The results of this survey underline this observation: 76% of participating Dutch nursing homes use animals in one way or another. There is very little comparable research available. Janssen and Bakker have looked at animals in Dutch psychiatric care settings in 2007 (Janssen & Bakker, 2007) and found that 22 out of 46 Dutch psychiatric institutions allow visiting animals on the premises (47%) and 24 out of 44 have resident animals on the wards (54%). Interestingly, of those institutions that allow visiting or resident animals the majority (55%) specifically provide only long-term geriatric psychiatric care, while in contrast in 2007 none of the child psychiatry settings allow visiting or resident animals. The authors offer no explanation for this difference. Compared to the numbers of Janssen and Bakker a lesser percentage of nursing homes (25%) in our study have resident animals (either inside or outside in a meadow), while a similar percentage (50%) allow visiting animals.

Internationally, Darrah has investigated the occurrence of animal assisted interventions in nursing facilities in California and South Dakota in 1996 and found that 24 out of 33 nursing homes (73%) used animal assisted interventions (termed animal facilitated therapy - AFT - in the article) in California and 8 out of 22 (36%) in South Dakota

(1996). It should be noted that the participating Californian nursing facilities were preselected on the criterion that they offered AFT as an activity, while the South Dakota sample was selected from all nursing homes in the region (with or without pets). It is quite unclear why the authors chose this approach, but it does explain the discrepancy in numbers between the regions. Only the South Dakota results can therefore be used in comparison to our results, with the major limitation that the Darrah survey took place nearly 20 years ago and consequently is dated. A Pubmed search did not yield any other studies that specifically surveyed the use of animal assisted interventions in (a sample of) nursing homes within a country or even between countries. Our study therefore seems quite unique in this respect.

Dogs are used most in AAI programs in Dutch nursing homes, mostly in visiting animal programs. The use of dogs in (rehabilitative) medicine and psychology is well documented in both popular media and scientific publications (Nimer & Lundahl, 2007) and dogs in general are popular pets. A periodic report on domestic animals in the Netherlands by the ministry of economic affairs and agriculture estimates a total of 1,5 million dogs in the Netherlands in 2011 (HAS, 2011). Cats are even more popular pets in Dutch households (2.9 million), though this popularity is not reflected in the appearance of cats in Dutch nursing homes. Cats are used less frequently than dogs and also less frequently than other animals, like rabbits, birds and fish. In general cats are seen as more solitary and less trainable than dogs and thus less suited for (specific) AAI programs (Turner & Bateson, 2013; Bradshaw, Casey & Brown, 2012). Successful resident and visiting cat programs do exist, however (Enders-Slegers, 2008). The range of animals is quite broad, with even the occasional mention of exotic animals. It seems that animal (and handler) availability and personal preferences ultimately are the most important factors in the choice of animal used in AAI programs in Dutch nursing homes.

When animals are not available or the use of animals is not possible, about 50% of nursing homes use alternatives. Interestingly, the highly advanced robot seal Paro is used only in 7 nursing homes, even though research on the positive effects of Paro in dementia care is available (Shibata & Wada, 2011). The high price tag of Paro seems to be an important factor in not using the robot. Nursing homes instead look for cheaper alternatives, like FurReal Friends (less sophisticated toy animal robots that are available in most toy stores) or regular stuffed animals.

All Dutch nursing homes that responded to the survey, use animals in animal assisted activity programs (AAA), either in group sessions or individual. Visiting animal programs are more common than resident animals, most likely because of the additional responsibilities involved in caring for a resident animal. Therapy programs with the assistance of animals, as defined by animal activities with specific therapeutic goals and under the guidance of a therapist, do not exist in the Dutch nursing homes participating in our survey. Some respondents think they offer therapy programs, but when asked in detail, there are no therapists involved, nor is there a therapy plan with specific goals. Even the few therapists that answered the questionnaire only mention animal assisted activities and no therapeutic programs.

The target population of AAI programs is diverse, but the participation of clients with dementia is mentioned most. This coincides with an increase in scientific studies into the effect of AAI in dementia care (Bernabei et al., 2013) and the increasing awareness in the medical field that complementary interventions are needed to cope with the challenges this deteriorating illness brings. Neuropsychiatric symptoms, like (verbal and non-verbal) agitation, aggression, depression and apathy, are very difficult to manage and more and more research is focused on using complementary interventions (e.g., music therapy, snoezelen (sensory stimulation), medical clowns and physical activities) to alleviate these symptoms (Droes, Schols & Scheltens, 2015). AAI programs fit neatly into this category.

Respondents are unanimous in the exclusion criteria for clients: the existence of allergies, fear of animals and no interest in animals, are the three - very obvious - reasons not to include clients. No response to the activities is also mentioned as a reason to exclude clients, yet specific assessment tools for measuring response are not used.

A small percentage of Dutch nursing homes (24%) does not allow animals on the premises for specific reasons, mostly out of hygiene and allergy concerns, but the lack of qualified personnel or concerns for animal welfare are also mentioned. Most of these concerns could theoretically be addressed by education and training. Several studies have shown that hygiene concerns are unfounded when the proper precautionary measures are used (Brodie, Biley & Shewring, 2002) and various guidelines and organisations exist to aid a nursing home in the implementation of AAI programs and the training of volunteers (IAHAIO, 2015). Unfortunately, respondents of nursing homes that do use animals, seem to be equally unaware of these existing training programs and guidelines. Specific protocols for AAI programs detailing important information on the selection of animals, the selection of volunteers/handlers, the required personnel (e.g., recreational staff and/or nursing staff) and the necessary precautionary hygiene and safety measures are mostly absent, as are specific courses for volunteers on the desired target population (e.g., courses how to approach people with dementia). The animal selection criteria mentioned by respondents are broad and unspecified (e.g., 'the animal has to be healthy') and the high number of respondents (140) who either skipped the question about animal welfare measures or answered they don't know whether specific safety measures are used, is quite alarming in itself. The lack of these protocols as found

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in our survey is comparable to the findings of other studies. Waltner-Toews, who focused on zoonotic disease concerns of animal-assisted therapy and visitation programs, concluded only 10% of respondents (animal care agencies and humane societies) had printed guidelines about the prevention of zoonotic disease transmission and fewer than half of respondents consulted a health professional about prevention of zoonotic disease (1993). Lefebvre and colleagues noticed a significant lag in relevant infection and prevention policies concerning animal visitation programs and subsequently developed practical guidelines for animal assisted interventions in healthcare facilities (Lefebvre et al., 2008). Finally, both Lannuzzi and Santori have looked at the ethical issues in animal assisted therapy programs and both concluded that even though most animal assisted intervention programs appear to have a relatively benign impact on the animals, general ethical guidelines and recommendations are needed for these programs to prevent inappropriate animal use and exploitation (Lannuzzi & Rowan, 1991; Santori, 2011).

The reasons for the lack of knowledge about relevant guidelines and protocols as found in our survey are probably two-fold. First of all, the relative ease of organising AAI programs, especially visiting animal programs, combined with the enthusiasm of clients, personnel and volunteers for these kinds of interventions, seems to create a 'let's do this' type of attitude, without attention to underlying risks. All you need is a volunteer with a dog who is able to visit on a regular basis and a visiting program is born. In essence there is nothing wrong with such a practical approach and it should be noted that the current programs are perceived by the respondents to be successful and are very much enjoyed by clients. Incidents involving animals during AAI programs seem quite rare, even in the current largely unregulated state (Lannuzzi & Rowan, 1991). Yet with the growth of the AAI field, the need for a basic set or regulations cannot be ignored.

The second reason for lack of knowledge of proper guidelines and protocols, is in essence a lack of universal guidelines and protocols in the AAI field itself. A proliferation of AAI organisations exist both worldwide and in the Netherlands, with or without proper qualifications and with different approaches to AAI. If a nursing home opts to use an AAI organisation or qualified AAI volunteers, it is quite difficult to choose one based on clearly defined criteria, because those criteria do not exist at the moment. Only very recently the International Association of Human-Animal Interaction Organizations (IAHAIO) has released a white paper addressing these issues (IAHAIO, 2015), while Zenithson and colleagues have provided comprehensive guidelines to ensure the welfare of therapy animals (2015). National AAI organisations are tasked with developing universal guidelines and protocols that will hopefully, ultimately lead to some kind of register of specifically qualified AAT therapists and to the necessary blueprints of AAI programs. In the United Kingdom, for example, the Society for Companion Animal Studies (SCAS) has recently developed a very practicable AAI Code of Practice (SCAS, 2015).

Our survey shows that AAT programs are currently notably absent in the nursing homes that participated in this survey. A therapy dog foundation that specifically offers animal assisted therapy for people with dementia does exist in the Netherlands (Stichting Therapiehond Nederland, 2015), but none of the nursing homes that participated in this survey mention the involvement of this foundation or the specific use of therapy dogs in dementia care. Our survey does not provide any insights in why therapy dogs are not used. Possibly nursing homes are unaware of the existence of trained therapy dogs as suitable interventions for people with dementia or possibly financial motives are involved. Our survey does show that respondents often confuse animal assisted activities with animal assisted therapy and seem unaware that for an intervention to qualify as a therapy, specific therapeutic goals and a therapy plan are needed and the presence of a therapist is required.

Animal assisted therapy programs require different, more strict, qualifications and guidelines than animal assisted activities. A physician will be less likely to refer a client to AAT and health insurance companies will be less likely to pay for such therapy, without some form of regulation in the field. A specific AAT register therefore will undoubtedly aid the implementation of AAT programs in nursing homes. To establish such a register more research on the therapeutic efficacy is needed. Palley concludes the same in his article about mainstreaming animal assisted therapy (2010). *'To fully integrate AAT into conventional medical practice as an accepted therapeutic modality, more convincing intervention studies are necessary to confirm its clinical merits.'*

This study has several limitations. The response rate of 30% is low and when corrected for duplicate entries even lower (21%). The results of this survey, therefore, cannot necessarily be extrapolated to all Dutch nursing homes. However, the nursing homes that have responded, do represent all provinces of the Netherlands, thus balancing this limitation somewhat.

The respondents represent diverse functions within the nursing home (i.e., management staff, nursing staff, recreational staff, administrative staff and therapists). It is quite plausible that management staff has a different depth of knowledge of AAI programs in their organisation than recreational staff. A manager will possibly know more about guidelines and protocols, while recreational staff will probably know more about the practical side of things. This could potentially lead to different answers. Indeed the duplicate answers (more than one survey returned for 1 nursing home) show that two people in the same organisation can give different answers depending on their function. A manager might answer that no alternatives are used, while a nurse answers they use FurReal Friends on the ward or conversely, a nurse answers that no protocols are available, while the manager mentions the general hygiene protocol that is used within the organisation. This illustrates that managers do not always know what is happening on the wards and vice versa and that could also have influenced the results.

The overall conclusion that can be drawn is that the majority of Dutch nursing homes participating in this survey, use animals in diverse animal assisted activity (and not animal assisted therapy) programs, but mostly without specific underlying AAI protocols or specific outcome assessment tools. An important challenge will be to balance the need for regulations with the risk of overregulation, which will in the end only decrease the implementation of AAI programs. From the answers to the survey it is very clear that all volunteers and all personnel involved in these programs do so with much enthusiasm and with the very best of intentions and ultimately any attempt to improve quality of life of nursing home clients should only be encouraged. Furthermore, respondents do not mention any negative experiences when describing their AAI programs and when asked, all respondents would advise others to start AAI programs as well. If nursing home personnel and volunteers can be facilitated with easy to use, practical guidelines and protocols and physicians and therapists can be provided with specific referral guidelines, this would be an enormous step forward in professionalising the AAI field in nursing homes for the benefit of both the residents and the animals involved.

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Addendum: Self-selection bias

To address possible self-selection bias in our sample we interviewed at random 30 additional nursing homes that were not part of the original sample and determined how frequent AAI is present in this sample of non-responding nursing homes. Of the 30 nursing homes questioned, 4 did not have any animals on their premises (either visiting or resident) while 26 did (87%). Of those 26 nursing homes with animals, 17 homes (65%) organised AAA activities on a regular basis, all involving visiting-animal programs. None of the nursing homes had AAT programs.

Participants of these AAA programs usually suffered from a psychogeriatric illness (14 out of 17 homes). In this sample, 12 nursing homes allowed clients to take their own pet (including a dog or a cat) with them upon admission, even on psychogeriatric wards. The conditions for clients to have their own pets were that family members commit themselves to take care of the animal when the client can no longer do so and that the animal in question does not create disturbances on the ward.

A small number of nursing homes (6 out of 26) reported to have resident pets on the wards (mostly cats, rabbits or birds) and 5 nursing homes indicated to have resident animals in a meadow on the premises for the clients to visit. These resident animals were, however, not part of an AAA program. None of the nursing homes used specific AAI guidelines. Only one respondent mentioned taking animal welfare into account when organising AAA activities and terminating activities when animal-welfare could not be guaranteed.

Based on these results we conclude that the original sample of our survey is a representative sample of Dutch nursing homes.

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CHAPTER 3

An Animal Assisted Intervention Study in the Nursing Home: Lessons Learned.

Lonneke Schuurmans
Inge Noback
Jos Schols
Marie-José Enders-Slegers

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Abstract

AAI studies in the nursing home pose a specific set of challenges. In this article the practical and ethical issues encountered during a Dutch psychogeriatric nursing home AAI study are addressed with the aim to share our experiences for future researchers as well as AAI practitioners in general.

In our study we compared three groups of clients with dementia who participated in group sessions of either visiting dog teams, visiting FurReal Friend robot animals or visiting students (control group) and monitored the effect on social interaction and neuropsychiatric symptoms through video analysis and questionnaires. We encountered the following four categories of challenges during our study.

Participant related challenges include the legal implications of working with vulnerable patients, the practical implications of a progressive neurodegenerative disease with accompanying memory loss and behavioural problems and the ethical implications of the use of robot animals for people with diminished cognitive functions.

A very important challenge involves the selection of the participating dogs and ensuring animal welfare during the study. We partnered with a local university of applied sciences to help us successfully address these issues.

The nursing home setting poses several practical challenges due to its inherent organisational structure, the high workload of nursing home staff and an often suboptimal environment for a controlled randomised trial, especially when comparing non-pharmacological interventions. Balancing the desire for scientifically sound procedures with the practical limitations of a nursing home setting is often difficult and requires specific considerations.

Methodological challenges are related to the core dilemma of how to measure and value small effects that might clinically be very relevant, but are often not scientifically significant. Video-analysis seems to be a useful method to help solve this dilemma, but is not without issues of its own, especially when considering the sensitive nature of video data and important privacy laws.

We feel that sharing our challenges and lessons learned, positive or negative, will ultimately help the field of animal assisted interventions in the nursing home.

Keywords
Animal assisted interventions, nursing home, dementia, research, animal welfare, ethics.

Introduction

Animal Assisted Interventions (AAI) have gained momentum in the last two decades as a means to increase the quality of life of nursing home residents, especially for people suffering from dementia. A growing number of studies document (small) positive effects on outcomes like social interaction, neuropsychiatric symptoms and depression (Kongable, Buckwalter, & Stolley, 1989; McCabe, Baun, Speich, & Agrawal, 2002; Nordgren & Engström, 2012; Richeson, 2003; Sellers, 2006). In recent years, more and more research has been conducted to support the—sometimes anecdotal—evidence through a scientific approach based on theoretical constructs (Baun & McCabe, 2003; Friedmann & Son, 2009; Marx et al., 2010; Verheggen, Enders-Slegers, & Eshuis, 2017; Wilson, 1994). Systematic reviews combine the best studies to further enhance our understanding of the effects of AAI in older people and dementia care in particular (Bernabei et al., 2013; Filan & Llewellyn-Jones, 2006; Hu, Zhang, Leng, Li, & Chen, 2018; Peluso et al., 2018; Perkins, Bartlett, Travers, & Rand, 2008; Yakimicki, Edwards, Richards, & Beck, 2019). From anecdotal case reports to systematic reviews, all efforts help propel the momentum forward by eliciting new questions and thus inviting us to conduct new intervention studies. Basically, this describes the scientific process at its best.

Unfortunately, the scientific process is not always easily applicable in the daily field of AAI and particular AAI in the nursing home, working with people with dementia and animals in a highly regulated environment. Practical problems, safety and animal welfare concerns, staff workload and the inclusion of people with impaired autonomy all pose multiple challenges that need to be addressed. Ideally before starting the study, but sometimes as you go along. Furthermore, many of these challenges are not limited to AAI research, but equally relevant for all AAI practitioners in nursing homes.

This article aims to describe the main practical and ethical challenges in running a specific AAI intervention study in a nursing home and in doing so to share lessons learned for future researchers and practitioners in this field. The details of the study that provides the basis of this article are described in box 1.

Challenges and lessons

We divided the encountered challenges based on the PICO(TS)-strategy of evidence based practice (i.e. define the population, intervention, comparison, outcome, time horizon and setting for each study, as described by Riva, Malik, Burnie, Endicott, & Busse, 2012) resulting in the four main categories discussed in this paragraph.

Participants [population]

Including people with dementia as study participants is both very rewarding and challenging. AAI sessions for people with dementia usually provide immediate positive feedback to the research and nursing staff involved with the sessions, especially when the residents respond to the activities (Crowley-Robinson & Blackshaw, 1998; Gundersen & Johannessen, 2018). Running an AAI study protocol in the nursing home is, for lack of a better word, ‘fun’ and contrasts with the usual image of science as a ‘boring’ discipline, a view that is predominant among the nursing home staff.

The inherent nature of dementia, on the other hand, also poses staff and researchers with several challenges. First of all, people with dementia are considered a vulnerable subject group and often lack the decisional capacity to give autonomous informed consent to participate in research, as is required by law (Kim, 2011). To include participants without decisional capacity in a research study, an informed consent by proxy is needed, usually by a family member or sometimes a representative appointed by law. Informed consent also requires that all proxies know exactly what they are consenting to and why. Dutch law provides the researcher with helpful, but also extensive, guidelines that need to be followed when involving vulnerable subjects in (medical) research (Rijksoverheid, 2014). This includes prior approval by the medical ethics committee. Getting approval involves a lot of paperwork. Getting informed consent by proxy also involves a lot of paperwork. An often heard complaint by proxies was why they needed to read so many papers just to have their mum or dad join a dog activity. Finding the right balance of not overcomplicating things and at the same time complying with the letter of the law proved quite a challenge and looking back we feel the (legal) complexity of it all has deterred some families from enrolling their loved ones in the study, thus limiting the number of participants. We most definitely do not propose to relax the guidelines—people with dementia are vulnerable and need to be protected—but we want to share our experience as a warning not to underestimate this aspect of enrolling participants. The comprehensive list of suggestions to help improve enrollment of people with dementia, as compiled by Cohen-Mansfield et al. (1988), is very helpful in this regard.

Another important aspect of informed consent is described by Kim (2011) as authenticity. This term is used to explain that a lack of decisional capacity does *not* mean a total inability to communicate a preference or exercise some level of decision-making. Even though people with dementia cannot give informed consent to enrol in the study as a whole, they can express a desire to join an activity or, equally so, an unwillingness to participate per session. Informed consent by proxy does not overrule the wishes of a person with dementia at any given moment. A client that clearly refuses (verbally or nonverbally) to participate cannot be forced, even though staff or researchers (or AAI practitioners) know he or she will enjoy it later. Stimulating or even seducing people to join the activity via positive interaction is completely acceptable, but forcing them is not. During our study some clients refused to participate in a session, even with positive stimulation, meaning attendance varied on a session per session basis.

This highlights another challenge of working with people with dementia that might seem very obvious, but in fact can be very draining at times: people with dementia forget. For most people with severe dementia even repeated sessions are usually experienced as new and initial invitations to join in are often met with confusion or even refusal that requires a lot of the motivational skills of the research assistant or staff. Similarly, group sessions are challenging because a certain amount of patience is required of the participants when taking turns in petting the dog or robot and for some participants the presentation order (i.e. whether they were first or last in the group) significantly influenced their engagement. By varying the presentation order over the different sessions, we tried to correct for this possible confounder. We deliberately did not vary in the scheduling of the sessions: all took place in the afternoon at the same time slot (14.30–15.30 hours). We picked this time slot, because in our experience people with dementia are usually very fatigued in the morning due to the exertion of various care activities. Afternoons, especially after the post-lunch nap period, are often well suited for activities. Our findings are not unique. In a similar study, Kongable et al. (1989) highlight the difficulty of structured, alternate, group interventions due to the short attention span of people with dementia. Furthermore, research by the team of Cohen-Mansfield (2009; 2010a) has identified important variables that influence the engagement of people with dementia. These variables include dementia severity, presentation order, time of day and setting. All these variables are involved when conducting AAI research, or indeed any AAI session in the nursing home, and need specific attention. By experiencing these challenges first hand, this study has greatly increased our respect for nursing home staff and recreational therapists: coaxing people with dementia to join and engage in your activity requires a very specific skill set! Finally, the view of nursing staff, psychologists and physicians who work with people with dementia on a daily basis is usually quite different from the public view. Specific aspects of dementia, especially the cognitive decline into a child-like or even vegetative state and the sometimes very severe neuropsychiatric symptoms, are considered emotionally confrontational or even inhuman (animal-like) in general society and politics (Innes, 2002). Examples of such symptoms include severe agitation or even aggression, repeated utterances of (animal-like) noises, loss of decorum (e.g. urinating in public) and sexual disinhibition. Educating dog handlers and research assistants (in our study psychology master students) in the various dementia symptoms and how to approach people with dementia, is essential to help them successfully manage the sessions and overcome possible preconceptions or hesitations (Robinson & Cubit, 2007). Even so, differences in personality of handlers and students can influence the general atmosphere of a session and needs to be taken into account when analysing results. These factors are not only important as possible confounders in AAI research, but also need special consideration for general AAI sessions in the nursing home. Any AAI practitioner working in dementia care needs to be educated (or coached) in approaching people with dementia.

Animals (and robots) [intervention]

3

When working with animals in a research study one thing should be paramount: ensuring animal welfare (Glenk, 2017). Picking random dogs to participate in a dog visitation program is obviously not the right way to go. Instead researchers should enrol veterinarian checked, certified AAI dogs or offer appropriate and robust AAI training to dog teams (dogs and handlers) who are interested in participating, including an 'exam' to determine final suitability as an AAI dog team for the specific participants (e.g. people with dementia) that are involved in the research study (Mongillo et al., 2015). Organising a dog team training and selection program, whether for AAI research or any regular AAI program in the nursing home, should not be taken lightly. It requires careful planning, funds and specific animal experts. Another important and obvious lesson is to have backup dogs and handlers. Dogs (and handlers for that matter) can be indisposed for various reasons, including the obvious one of female dogs being in heat. Having backup teams ready to substitute is necessary even though it might mean extra costs.

We have experienced during our study that it is vital that the research team includes independent, qualified animal behaviourists who know the species being used, and who are focused on the animal and nothing else. This concurs with the general consensus expressed in the IAHAIO guidelines on animal welfare in AAI (Jegatheesan et al., 2018). Physicians, psychologists and nurses or recreational therapists are usually not trained to read stress signals in dogs and we wouldn't even think of pretending otherwise. Certified handlers should be able to read stress signals in their dogs and act accordingly, but might feel under a pressure to perform that could influence their judgement. Having independent animal behaviour researchers of the local Agricultural University for Applied Sciences monitoring our sessions each week (through video-analysis) and providing us with feedback on a session per session basis proved very helpful. For example, at one point one specific dog showed some signs of stress due to unintended pressure exerted by the handler out of a desire to perform well for the sake of the study. Due to the input of the behaviourist, we were able to act swiftly and successfully to improve the situation with the feedback provided by the behaviourists to the handler and the practical solution to not use a leash for this specific dog. Behaviourists may be researchers or practitioners, but they must be qualified and only use positive reinforcement methods (McBride & Montgomery, 2018)

To control for the effects of the handler, we deliberately chose to assign handlers to the robot-animals. Dog handlers, who were not involved in the dog condition, because their dog was not suitable, were 'reused' as robot handlers. Other handlers in the robot condition were research assistants (psychology master students). All robot handlers were instructed to work according to a protocol similar to the dog teams. Robot-animals might seem like an uncomplicated alternative compared to living animals, but they can provide their own set of challenges. Bemelmans et al. (2013) have looked at important considerations for the development of robot interventions for intramural (institutional) psychogeriatric care. They stress the importance of a broader concept, including technical aspects, goals, target groups, environment and staff perceptions.

An important technical consideration is to always make sure the desired robot is still in production at the time they are needed for the study. Unexpected production or delivery issues are not uncommon and can delay a project if not anticipated in a timely manner. Again, this illustrates that the trivial matters are the most unexpected and the most challenging at times. Another seemingly trivial technical lesson is to always make sure the robot is functioning without problems before each session and to have backup batteries available during each session.

Ethical considerations are also important when working with robot-animals, both in a research setting as well as more generally when using robots in the nursing home: depending on dementia severity some people will believe the robot is a real animal and act accordingly. Providing a moment of happiness is very valuable in dementia care, even though it is provided through a robot, but nevertheless it can be hard, especially for family members, to be faced with the reality of the cognitive decline that leads to this confusion and could be construed as the team employing deception and encouraging infantilization (Diefeldt, 2014; Sharkey & Sharkey, 2012; Vanlaere, 2014). We deliberately chose not to mislead participants and always introduced the robot-animal as a robot. Likewise however, we did not correct people who despite this introduction firmly believed the robots were real. Instead, we validated their feelings at that moment, as described by Feil in her validation theory (2002). Family members and staff did not participate in sessions, but were sometimes able to observe sessions through a window. Staff members were all very enthusiastic about the robot and the response of the clients. Family members were more ambivalent: most enjoyed the positive interaction displayed, but the emotional confrontation of a loved one 'playing with a toy' was hard at times. One proxy decided to withdraw permission for participation of a client for that specific reason.

Upon completion of the study, all participating nursing home wards received a robot as a thank you gift. As can be imagined, this gift was highly appreciated by the nursing home staff.

Nursing Home [setting & time horizon]

Theoretically, the highly structured and regulated nature of a nursing home should provide an optimal setting for scientific research. In practice, however, the nursing home is a challenging research environment due to a combination of staff related and organisation related factors, including compliance (Maas, Kelley, Park, & Specht, 2002). A factor that was also relevant in our study. Nurses are not trained researchers and often require additional instruction and motivation to understand the importance of adhering to the intervention and data collection protocol. An ongoing interaction by members of the research team with the nursing staff is therefore highly recommended by Maas and her team. Furthermore, it is important for researchers to realise that the research protocol adds another burden to the already high workload of nurses, making it difficult to absorb. For some wards that participated in our study, it was challenging to provide the requested questionnaires in time, leading to missing values in the eventual data analysis. A pattern emerged in which the number of returned questionnaires was inversely proportional to two organisational factors: high nursing absentee rate due to illness (creating a high workload on that ward) and turnover of staff due to structural measures (and thus compromising protocol adherence). Unfortunately, because of the somewhat unwieldy nature of a nursing home, it is not always possible to foresee these changing circumstances and have enough time to adjust. We tried to overcome these issues by assigning a research assistant (usually a psychology master student) to each ward to help coordinate all the practicalities, answer questions and provide positive feedback and support for the nursing staff.

On a session level the nursing home setting provides additional challenges. The basis of sound scientific research, and subsequently evidence based medicine, is adhering to strict protocols to limit possible confounding factors that could influence the results (Rosenberg & Donald, 1995). Unfortunately, even the best protocols can go awry due to unforeseen circumstances. External disturbances, for example, can easily distract people with dementia. An unexpected music activity nearby can therefore be quite disturbing for the entire session. Knowledge of the activity-schedule in the nursing home is essential to minimise these disturbances. *Do not disturb* or *do not enter* signs (and even a 'door guard' if necessary) can also help prevent external disturbances. Other external factors that are quite prominent in the winter months are the flu and related viral illnesses. During our trial, the nursing home was hit by a flu epidemic, infecting not only participants but also research assistants! In retrospect, the winter months are not the ideal time of year for a nursing home experiment.

Another, less obvious, nursing home challenge involves the previously described required informed consent for the participation of people with dementia in research. A required informed consent for participants automatically excludes those residents that don't have an informed consent. Unfortunately, the residents themselves are usually not aware they don't have consent and might want to join in and play with the dogs or robots. In some locations of the nursing home, we struggled with keeping 'unwanted' visitors out of the room that was designated for the interventions and sometimes had to make ad-hoc decisions to include a person for that particular session out of an ethical standpoint because forced exclusion seemed inhumane and harmful for that particular person. Fortunately, this was a rare occurrence, but nevertheless something we did not anticipate. Choosing the location of the interventions wisely is the most important lesson we learned in this regard.

Finally, a totally unexpected issue was brought forward by the participants themselves. Some participants who were 'unlucky' enough to be randomised in the control group (chatting with students without dogs or robots) expressed unwillingness to continue, because—to quote one of them—*'this is the most boring activity ever, I prefer to go and play bingo'*. Once this sentiment started to prevail in the group, more and more residents were unwilling to attend the control group sessions. This feeling was especially prevalent in the large nursing home location that provided lots of activities for residents in the weekly activity schedule (including bingo). A control group in which the handler engages the residents in conversations about animals in general and their own pets in particular, with the help of animal cards or photos and possibly a bingo-like setting might have been more suitable and more engaging for those residents. The 'boring' sentiment was not universal, however. In the small-scale homelike locations the response was completely the opposite: residents are captured on video thanking the research assistants for the visits of the students and requesting other visits. This discrepancy is intriguing: residents in large scale nursing homes seem to be accustomed to more specific activities and to them chatting with students seems to be an inferior choice. Residents in small-scale nursing homes usually live in a homelike environment and participate in household tasks without access to a variety of other (large-scale) activities. Chatting to students was apparently a sufficiently rewarding and novel experience for them, even without additional props. Other studies have looked extensively into the differences between large and small scale settings and found similar differences in activities (Boekhorst, 2010; Verbeek, 2011).

Methodology [comparison & outcome]

Methodological challenges are related to the inherent nature of AAI research in nursing homes: a true randomised controlled trial (RCT) is difficult in the nursing home due to randomization issues (for example attrition of participants due to death or illness) and research protocol contamination (for example due to staff movement). As Maas et al. (2002) describe 'a quasi-experimental rather than true experimental design is a compromise that may be necessary when nursing interventions are tested in nursing homes'. Participants and staff are usually not blind to the intervention. Completely controlling the environment and all confounding factors is often not possible (as illustrated in the previous section), enrolling clients can be disappointing and statistical power issues can be the result. All these factors can detract from the true experimental RCT-quality, hence the 'quasi-experimental' designation. It is important to be aware of these limitations, but not be distracted by them, because a quasi-experiment is often the only option when researching AAI in the nursing home.

Video-analysis seems to be a useful method to enhance a quasi-experimental setting. Using a camera to capture an AAI session provides the researcher with valuable data that can be analysed *ad infinitum* either qualitatively or quantitatively. The use of video data is not without issues of its own, especially when considering the sensitive nature of video data and important privacy laws.

Dutch law states specific requirements concerning the storage of medical data, including research data (Rijksoverheid, 2014). As part of the approval by the medical ethics committee, the researcher needs to provide information about where the data will be stored and when it will be destroyed. Video data is considered especially sensitive and has to be destroyed upon completion of the study.

As with all digital data, digital research data is also prone to unwanted deletion. The importance of having several backups cannot be underestimated, especially with video data. Due to privacy and safety concerns, video data cannot be stored in well-known cloud storage providers like Dropbox or OneDrive, but require an encrypted network share provided by the research institute or external hard drives in a secure environment. Setting up a safe backup and storage routine needs to be addressed before starting the experiment. The UK Data Archive has put together a comprehensive guide concerning data management, sharing and storage that is also helpful for researchers outside the UK (Van der Eynden, Corti, Woollard, Bishop, & Horton, 2011).

Discussion and conclusion

Animal assisted research studies, or indeed any AAI program, in nursing homes are not without pitfalls, especially when working with psychogeriatric clients. As described, the legal implications of including vulnerable patients in a research study should not be underestimated and require extensive preparation. These implications are not new. As early as thirty years ago Cohen-Mansfield (1988) wrote about the (ethical) issues of obtaining informed consent for research in nursing homes and similarly concluded that high consent rate requires intensive personalised follow-up and effort. The practical implications of specific dementia issues like neuropsychiatric symptoms and memory loss are even more challenging and include behavioural problems during sessions and motivational problems with an impact on session attendance. Maas (2002) and Kongable (1989) have reported similar methodological issues concerning (dementia) research in nursing homes, while the teams of Cohen-Mansfield (2009; 2010a; 2010b) and Marx (2010) have demonstrated the low stimulus-engagement level of people with dementia and the complex variables involved.

Animal welfare has gained steady traction as an equally important consideration when setting up an AAI study. As a consequence of this IAHAIO released an AAI whitepaper in 2014 with guidelines for the welfare of the animals involved (Jegatheesan et al., 2018). Animal welfare is in danger of being in the researchers blind spot due to lack of expertise in animal behaviour. A study by Ng and colleagues confirms this issue: AAI publications rarely report the descriptions of how the animal was used nor the possible adverse outcomes on the animals nor the training, certification and veterinary and behavioural care of the animals involved (Ng, Morse, Albright, Viera, & Souza, 2018). Similarly, in previous research, we have found that Dutch nursing homes rarely have protocols concerning animal welfare during AAI sessions (Schuurmans, Enders-Slegers, Verheggen, & Schols, 2016). Glenk (2017) has summarised the current body of evidence of animal welfare in AAI and in doing so illustrates all the important variables involved. Researchers are usually not sufficiently equipped to correctly handle all these variables. Collaborating with animal behavioural experts is, therefore, necessary to ensure animal welfare during an AAI study as well as an optimal fit between dog team and participant. As stressed previously, all these considerations are equally important for non-research AAI programs.

Using robot-animals eliminates welfare issues, but brings up ethical considerations, especially when people with dementia can no longer identify the robot as a robot. Various authors have published on the delicate issues of elderly people with cognitive disabilities 'playing' with robots, stuffed animals or toys and the perceived infantilization of such activities (Diefeldt, 2014; Sharkey & Sharkey, 2012; Vanlaere, 2014). A common denominator in these articles seems to be that perceived infantilization is strongly associated with an inherent fear of dementia in general society. This can be addressed by stressing the importance of a substitute attachment figure in later stages of dementia and the importance of person-oriented use of robots (or dolls) based on previous preferences and life history. A baby doll, for example, will probably have more meaning for a woman who has had children than a woman without children.

This person-oriented use of robots with a clear explanation of the benefits (e.g. no allergies, no fear of dogs, no compromised animal welfare due to neuropsychiatric symptoms, required 24/7 availability) usually helps ease possible apprehension of family members. Especially, when the intervention has specific, monitored goals (e.g. providing an attachment figure, stimulating interaction, providing relaxation) that are formulated in collaboration with the family or primary carers. Furthermore, a demonstration of the robot in which family members participate often results in more understanding and additional input for its use (Robinson, MacDonald, Kerse, & Broadbent, 2013). Vanleare also stresses the importance of being honest: always present a robot animal as such (a battery powered robot) and validate any subsequent feelings the robot provokes. Verheggen and colleagues (2017) have proposed an integrative approach towards understanding the therapeutic relationships between humans and animals, combining elements of important anthrozoological theories, including the attachment theory, social support and the biophilia hypothesis. The view of robot animals as substitute attachment figures, implies robots can contribute to this approach as well.

From an evidence based medicine perspective, the nursing home environment is a challenging environment, rife with possible confounding factors that require specific attention. A lot of decisions might seem trivial or obvious—choosing the designated session area, picking a time-slot in the nursing home activity program, excluding non-participants—but can turn out to be very instrumental in the success or failure of an intervention-session or an AAI program in general. Furthermore, specific methodological requirements for high evidence results (i.e. blinding, large numbers, controlled environment) are usually not possible in AAI research (Maas et al., 2002).

By describing the challenges that we had to face during our experiments, we hope to help other researchers and practitioners when setting up their own AAI study or program in this field. We most definitely don't want to discourage anyone who has an interest in this type of research, because AAI studies in nursing homes also provide lots of opportunities to progress the field of AAI. Even though working with people with dementia requires a lot of patience and at times improvisational talent, it is also one of the most rewarding experiences a researcher can have. A dog that elicits a smile from a person with severe dementia, who is known to be unresponsive most of the time, is worth all the stress of doing research in this environment. Even when that specific smile was not captured on camera and will never be recorded in your SPSS database, the moment itself is invaluable. After all, clinical relevance is not always statistically significant.

Box 1

Early 2015, we conducted a 12 week trial in nursing home locations of De Zorgboog, a large care organisation in the south of the Netherlands, with the aim to evaluate the effects of visiting dogs and visiting robots on social interaction and neuropsychiatric symptoms of people with dementia living in 24/7 care. During an 8 week intervention period, 66 clients (out of 183 eligible residents) participated in weekly sessions with either a dog (and handler), a robot (and handler) or a handler/student only (control group). Clients were assigned to one of the three groups through randomization. The study was registered at ISRCTN (reference number: ISRCTN93568533) and approved by the regional committee for medical research ethics (METC Zuyderland).

Only clients that lived 24/7 in the nursing home with a registered dementia diagnosis in their medical history could participate. Exclusion criteria included known dog-allergies and a history of fear of dogs as well as extreme neuropsychiatric symptoms (e.g. aggression) that could potentially harm other participants or the dogs.

Participating dogs and their handlers were all certified AAI-teams and specifically selected on suitability for working in an unpredictable environment through a 2-day course and final examination, simulating client sessions. The robots used were FurReal Friend robot-animals by Hasbro, specifically the model 'Daisy', an interactive kitten.

All sessions were videotaped for further analysis through video-coding software with the focus on social interaction in the group and the presence or absence of neuropsychiatric symptoms during sessions. We also monitored dementia progress, quality of life, depression and neuropsychiatric symptoms during the trial and 4 week follow-up through specific questionnaires and we logged intercurrent illness and medication usage via the medical history.

3

Conflict of Interest

The authors declare no conflicts of interest. De Zorgboog, a nursing home and health care institution in the Netherlands, provided the funds to carry out the study referenced in this article.

Ethics

The referenced study was registered at ISRCTN (reference number: ISRCTN93568533) and approved by the regional committee for medical research ethics (METC Zuyderland, reference number: NL50623.096.14).

Animal Welfare

All participating dogs were veterinarian checked and certified by Pets4Care (www.pets4care.nl) according to the IAHAIO Guidelines. All dog teams (dogs and handlers) were specifically trained and selected for AAI in dementia care. Animal welfare was monitored in collaboration with researchers of the local Agricultural University for Applied Sciences in 's-Hertogenbosch.

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CHAPTER 4

Social Interaction during Dog and Robot Group Sessions for Nursing Home Residents with Dementia: the Handler Effect.

Lonneke Schuurmans
Inge Noback
Jos Schols
Marie-José Enders-Slegers

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Abstract

As part of an 8-week intervention study in Dutch nursing homes, we used video-analysis to observe the interaction of psychogeriatric participants with either the handler, the stimulus (dog or robot) or other clients during weekly dog, robot (RAI, robot assisted interventions) and control (human facilitator only) group sessions. Additionally, we measured the initiative of the handler to engage participants. Several baseline characteristics, including dementia severity, neuropsychiatric symptoms and medication usage, were recorded as possible confounders.

Participant-handler interaction is increased in all three groups compared to a baseline of no interaction, while inter-client interaction is not. In the dog group participant-handler interaction scores are similar to participant-dog interaction scores, while in the robot group participant-handler interaction scores are significantly lower than participant-robot interaction scores. Handler initiative does not differ between the three groups.

Our results suggest that a handler effect of AAI on social interaction in dementia care does exist and we hypothesise this effect is linked to the required fully embodied, mutual attunement between dog and handler and between dog-handler team and participants. This embodied interaction distinguishes AAI from RAI and when the required attunement is met, AAI can significantly increase the social interaction of people with dementia.

Keywords
Animal-assisted interventions, dementia, handler effect, robot therapy, social interaction

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Introduction

Research suggests that Animal Assisted Interventions (AAI) increase social interaction for people with dementia. It is still unclear, however, to what extent the AAI effect is influenced by the human handler accompanying the animal. In this article, we analyse this handler effect based on the concept of mutual embodied attunement as proposed in the theory of enactive anthrozoology.

In the last decade, Animal Assisted Interventions (AAI) have become increasingly popular in nursing homes as part of the regular activity program, especially in dementia care. A recent survey among Dutch nursing homes shows that a majority of the responding homes offer animal assisted activities, mostly in group sessions and mostly with visiting dogs and predominantly targeted at residents with dementia (Schuurmans, Noback, Schols, & Enders-Slegers, 2019). Animal assisted interventions are defined as "*a goal oriented and structured intervention that intentionally includes or incorporates animals in health, education and human services (e.g., social work) for the purpose of therapeutic gains in humans. It involves people with knowledge of the people and animals involved*" (Jegatheesan et al., 2018, p. 5).

Due to the inherent progressive loss of communicative abilities in dementia, nursing home residents often struggle with a diminished ability to interact with others and baseline social interaction - i.e. social interaction without external prompting - on nursing home wards is often very low or even absent (Harper Ice, 2002). Social interaction is considered as one of the basic human needs and diminished social interaction leads to compromised quality of life (Weiss, 1974). In their theory of personhood and well-being in dementia care, Kitwood and Bredin (1992) argue that these changes in social interaction are not static and can change when the interaction is adapted to the needs of the person with dementia. AAI in dementia care are often aimed at increasing social interaction of the residents by offering other avenues for (non-verbal) interaction through contact with animals. Several (preliminary) studies suggest that AAI do indeed increase social interaction of people with dementia (Bernstein, Friedmann, & Malaspina, 2000; Fick, 1992; Kongable, Buckwalter, & Stolley, 1989; Olsen, Pedersen, Bergland, Enders-Slegers, & Ihlebæk, 2016; Richeson, 2003; Sellers, 2006; Thodberg et al., 2016; Wesenberg, Mueller, Nestmann, & Holthoff-Detto, 2018). In these studies, social interactions are not limited to human-human contact and are defined as clients engaging in behavior, like talking to, smiling or looking at, or touching either other clients, staff, the animal or its handler. Researchers have used the term 'engagement' to describe the level in which people with dementia are involved with their surroundings and in the last decades a lot of research has focused on understanding all the complex variables involved (Brod, Stewart, Sands, & Walton, 1999; Campo & Chaudhury, 2012;

Cohen-Mansfield, Dakheel-Ali, & Marx, 2009; Cohen-Mansfield, Hai, & Comishen, 2017; Kitwood & Bredin, 1992; Schroll, Jonsson, Berg, & Sherwood, 1997). Among the variables that are identified to influence engagement are person-person interactions. AAI are especially complex in this regard, because the animals are usually accompanied by a handler who is not a separate non-responsive entity, but as a person also influences the interaction (and possible effects). The handler is primarily responsible for the animal and ensuring human and animal welfare, but often also acts as an intermediary to facilitate participant-animal contact. Any effect of AAI can, therefore, not be viewed without taking this human effect into account. Marino eloquently describes this conundrum as "*the degree to which the purported positive effects of AAI are attributable to contact with the human facilitating the animal interaction*" (Marino, 2012, p. s141). Or, more precisely, is the handler an integral part of the intervention instead of only facilitating it? The unknown extent to which the handler influences the results of the intervention can be translated to the basic question: is there a handler effect on social interaction in AAI in dementia care?

Observing social interaction of people with dementia during AAI activities seems to be the logical first step in examining the possible handler effect. This requires an analysis of the degree to which the effect on social interaction is due to the interaction with the handler (either through conversation or touch) and should also take into account the effort of the handler in trying to engage participants in interaction. Ideally, this involves a comparison of AAI with and without the handler present, but these types of studies are not feasible practically and ethically unadvisable. The reverse comparison of activities with and without a dog present has been studied. Wesenberg and colleagues (2018), for example, examined the additional effect of the animal in AAI by comparing group activities with a visiting dog and handler with similar group activities with a human facilitator only. Their results show the dog has an additional effect on social interaction that is largely attributable to physical contact with the dog. In both groups, however, participants talked longest to the handler/group facilitator.

Other researchers have added robot assisted interventions (RAI) to the comparison. Robots are often used as substitute animals in interventions for people with dementia that are similar to AAI and three studies suggest positive effects of RAI on social interaction (Jøranson, Pedersen, Rokstad, & Ihlebæk, 2015; Libin & Cohen-Mansfield, 2015; Robinson, MacDonald, Kerse, & Broadbent, 2013b). Furthermore, two studies specifically compared individual visitations of a human with a dog and a human with a robot and found a similar effect for dog and robot on social interaction of people with dementia (Kramer, Friedmann, & Bernstein, 2009; Thodberg et al., 2016).

We believe observing interaction during AAI and RAI is especially valuable in examining the handler effect when viewed from the perspective of the recently proposed unified theoretical framework of enactive anthrozoology (Verheggen, Enders-Slegers, & Eshuis, 2017). The basis of enactive anthrozoology is the concept of mutual, fully embodied attunement of behaviour between living systems, either human or animal. Verheggen et al. describe embodied attunement as a fluent interaction that is mutually coordinated and acknowledges the autonomy of all the subjects involved. Examples of interactions that require embodied attunement are walking a dog, riding a horse, petting a cat or talking to a person. If the subjects involved in these interactions are not oriented towards one another, the interaction fails or as the authors describe it: *"people will stumble over their dogs, fall from their horses, or pet and talk in the air as a result of non-fluent, awkward interactions."* These awkward interactions are a well-known phenomenon in dementia care: people with dementia are often not able to properly attune to others.

Successful dog assisted interventions in dementia care require attunement on several levels: between dog and handler, between dog and participants and between handler and participants. Verheggen et al. (2017) hypothesise that measuring the different levels of attunement during AAI sessions will help understand AAI efficacy. Similarly, we propose measuring social interaction during AAI sessions in dementia care can be used to evaluate the possible role of the handler during AAI. Even more so when compared to RAI, because mutual fully embodied attunement is by definition not applicable to robots. Robots are not living systems, but respond to the environment with pre programmed behaviours based on sensory input. People with dementia respond to these behaviours, but this cannot be classified as attunement and autonomous robots will not invite an embodied relation (Coeckelbergh, 2011). During RAI only one type of attunement is present: between the human facilitating the sessions (the robot 'handler') and the participants. The effectiveness of RAI therefore does not depend on additional successful attunement between robot and participants or robot and handler but seems to be solely related to the attractiveness of the robot as a stimulus for people with dementia.

Based on the above, we hypothesise it will be possible to examine whether a handler effect exists in AAI by observing the interaction with the handler during AAI and RAI sessions. We expect the additional levels of attunement during AAI will result in more handler-participant interactions and this will reflect the effect of the handler on the intervention. To test this hypothesis we measured social interaction behaviours in weekly group sessions for people with dementia during three different interventions: a dog and handler (AAI), a robot and human facilitator or robot 'handler' (RAI) and a human facilitator only (control). The control group is specifically added to represent the 'human only' interaction without an additional stimulus. For the sake of brevity and clarity we will refer to the human facilitator as a 'handler' in all groups from now on.

Methods

Design

This study was part of a larger Dutch prospective cluster randomised 12-week trial into the effects of AAI in dementia care. The overall study consisted of an 8-week intervention period of weekly group sessions with either a dog (and handler), a robot (and handler) or a handler only (control group) and included a 4-week follow-up. Clients were recruited among 6 nursing homes of De Zorgboog, a large care organisation in the Netherlands. Only clients that lived 24/7 in the nursing home with a registered dementia diagnosis could participate. Inclusion also required a written informed consent by the legal representative of the client. Clients were excluded when they had known allergies for dogs or a known fear of dogs. Clients with extreme aggression that could potentially harm other participants or the dogs were also excluded. Regular dog visitation activities – similar between all locations - ceased during the intervention period in all participating nursing homes.

Participants were allocated to the different groups via randomization. All sessions were recorded on video to enable behavioural coding. The study was registered at ISRCTN (reference number: ISRCTN93568533) and approved by the regional committee for medical research ethics (METC Zuyderland).

Participants

Of the 183 eligible patients (i.e. patients without allergies or extreme aggression) 69 were enrolled in the study by their legal representative (38%). We aimed to create groups with a maximum of 10 clients per group, because large groups are known to be impractical in these types of interventions (Kongable et al., 1989). One location provided 28 participants, meaning we could randomise those clients over three groups (one dog, one robot, one control) using computer generated numbers, resulting in a dog group of 9 participants, a robot group of 9 participants and a control group of 10 participants. The 5 other nursing homes provided 41 participants, with no nursing home enrolling more than 10 participants and one nursing home providing only four participants. We therefore chose to treat each of these nursing homes as a unit and randomise the intervention per unit, resulting in two dog groups of 4 and 9 participants each, one control group of 10 participants and two robot groups of 9 clients each. All sessions took place in similar multi-functional activity rooms within the respective nursing home locations.

Clients were asked to participate on a session by session basis. Participants that displayed verbal or non-verbal resistance upon invitation were not forced to attend the session and were again invited the subsequent week. Clients sometimes were indisposed to attend for a specific reason (usually temporary sickness or personal appointments). This meant that the actual group size during sessions could vary from week to week.

Unfortunately, after one session, we lost all but one client of the control group in the larger nursing home location, because those clients all chose not to attend the sessions any longer. They preferred to attend the regular - not animal or robot related - activities (like music, creative activities and sports) that were provided for the residents of that nursing home and when asked answered they thought talking to and drinking a beverage with handlers without additional activities was too boring. Following our policy not to force clients to attend, we accepted their decision, meaning we were no longer able to collect video data for these clients after the first session and thus a substantial loss to follow-up in the control group.

In contrast, the clients in the other control group in the smaller nursing home location, expressed enthusiasm about their weekly gathering with the handlers. We have written about the challenges of including people with dementia in AAI research extensively elsewhere and refer to this article for additional information about these issues (Schuurmans, Noback, Schols, & Enders-Slegers, 2019).

Intervention

During the 8-week intervention period the three dog-groups had weekly sessions with one or two certified AAI dogs and a qualified handler per dog. Smaller groups (less than 5 participants) had one dog, larger groups two. Dog-handler teams did not switch between groups. The three robot-groups had weekly sessions with one or two robots and one handler per robot. The control-group had weekly sessions with one or two handlers only. All groups followed the same standardised protocol and started each session with an introduction-period of approximately 5-10 minutes, in which the dog, robot and/or handler was introduced to the participants, followed by an intervention period in which each participant was allowed an allocated time - in rotation - to interact with the dog or robot individually. Allocated personal time of a participant with a dog or robot was based on handler’s discretion, up to a maximum of 5 minutes. The total duration of the intervention period averaged about 30 minutes (depending on the number of participants). Individual activities included petting (dog and robot), grooming (dog and robot), giving treats (dog), puzzles (dog) or exploring functionality (robot) and talking with the handler or other clients (dog and robot). The activities in the control group consisted of small-talk or non-verbal contact with the handlers (up to five minutes per client in rotation) while enjoying a beverage that was provided by the handler during the introduction period, to simulate the circular introduction of the dog or robot. All sessions ended with a period of leave-taking of approximately 5-10 minutes.

In both the robot and the control group participants were seated in a semicircle at a table to facilitate access to the robot or beverage respectively, while in the dog group participants were seated in a semicircle without a table to facilitate access to the dog.

Dogs, robots and handlers

All participating dogs were checked by a veterinarian and all dog-handler teams were certified for AAI in dementia care. A total of five dogs participated in the study: a Labradoodle, a Kooiker, a Stabyhoun, a Bouvier des Flanders and an Icelandic herding dog. The dogs were primarily kept on a leash unless the type of interaction required otherwise (playing fetch). The well-being of each dog during sessions (through video-analysis) and after sessions (via behavioural questionnaires) was monitored by students and staff of the HAS University of Applied Sciences in 's-Hertogenbosch, who were not involved with the primary study.

The robots used in the study were a specific type of FurReal Friends robot, called Daisy Plays-With-Me Kitty, produced by Hasbro (2019). Daisy had tactile sensors in her front right paw and back as well as movement sensors in her eyes. She responded by moving, jumping, standing, purring or meowing melodically. A cat toy and brush were included in the set. We specifically choose Daisy because of the various options to play with the robot, even though the argument can be made that a kitten cannot be compared to a dog. Previous research with Paro, however, seems to indicate that the recognizability of the animal is not an important factor in a companion robot for people with dementia (Robinson, MacDonald, Kerse, & Broadbent, 2013a; Shen, Xiong, Chou, & Hall, 2018; Shibata & Wada, 2011).

All handlers completed training to be a volunteer for people with dementia. Control and robot group 'handlers' were either dog-team handlers who did not make the final selection as a dog-team, but still wanted to participate, or psychology master students.

Baseline characteristics

Information about the participants was collected at baseline and included: age, gender, type of dementia, dementia severity (as measured by the *Clinical Dementia Rating scale*, CDR), neuropsychiatric symptoms (as measured by the *Neuropsychiatric Inventory Questionnaire*, NPI-Q) and medication usage. CDR is a classification scale to quantify the severity of the dementia based on exhibited symptoms and cognitive performance and results in a composite score ranging from 0 (no dementia) - 3 (severe dementia), with a high inter-rater reliability both for physicians and non-physicians (Morris, 1993). The CDR scores of all patients were determined by researcher L.S. NPI-Q is a shortened version of the NPI, a validated informant-based (interview) rating scale for assessing neuropsychiatric symptoms in dementia (Cummings, 1997). The NPI-Q measures

12 neuropsychiatric symptoms on both a severity (3-point) and a distress (6-point) scale. Sum scores for each scale can be calculated, with higher scores indicating more neuropsychiatric symptoms or a higher impact respectively. The NPI-Q is validated and compared to the original NPI interview by Kaufer et al. (2000). NPI-Q scores were rated by the primary nurse of the participant.

During the intervention period any changes in prescribed medication (specifically psychotropic drugs) were recorded by researcher L.S. and converted into standardised medication scores using the appropriate doses equivalency tables (Andreasen, Pressler, Nopoulos, Miller, & Ho, 2010; Ashton, 2007).

Video observations

All sessions were recorded on video with at least one, but usually two or three cameras (SONY HDR-CX330) per session depending on the size of the group and the available space in the room. The cameras were operated by research assistants who were instructed not to interact with the participants or interfere with the intervention protocol in any way. The cameras were placed in the room before the participants arrived. The six clients whose legal representative had not given permission for video recording were placed outside camera view and were excluded from the video-analysis for this study.

Data analysis

Behavioural coding has been recognized as a valuable tool to analyse AAI interventions in addition to questionnaires (Thodberg, Berget, & Lidfors, 2014). Similarly to other studies (Olsen, Pedersen, Bergland, Enders-Slegers, & Ihlebæk, 2016; Wesenberg et al., 2018) all first session, middle session (fourth week) and final session (eighth week) videos - 22 videos in total - were analysed by two trained observers using Solomon Coder (Péter, 2017), coding software for Windows that can be used to quantify behaviour. Participant's behaviours related to social interaction were defined in a so-called coding sheet (or ethogram, table 1). Behaviours were measured in either the length of time an element lasted (duration) or the number of times an element occurred (frequency). The items listed in table 1 were chosen based on the items used by other researchers in this field (Bernstein et al., 2000; Fick, 1992; Jøranson et al., 2016; Kongable et al., 1989; Kramer et al., 2009; Olsen et al., 2016; Richeson, 2003; Thodberg et al., 2016). Inter-rater agreement between the two observers was determined by first concurrently coding 7 random clients and calculating Cohen's Kappa coefficient via the statistical software IBM SPSS Statistics Version 25 for Mac (IBM, 2017). The mean overall Kappa was 0,8 for all behavioural elements combined and the per element Kappa varied between 0,7 – 0,9 (see table 1).

All participants in the first session videos were coded (47). We initially enrolled 69 participants. Unfortunately, we lost three clients before the data collection started: one participant died, one person was withdrawn after initial consent and one person fell severely ill before the start and was unable to attend the sessions. A total of 10 participants were indisposed during the first session due to either other engagements or illness, 3 participants refused to attend the first session and 6 participants were placed outside of camera view, because their legal representative did not consent to video analysis and therefore these participants could not be coded.

During the entire study period 7 clients died (2 in dog group, 5 in control group) and 17 clients were temporarily unable to attend due to intermittent illness (8 in dog group, 7 in robot group, 2 in control group). For the middle and last sessions (respectively week 4 and 8) we coded only the participants (34) that attended 4 or more successive sessions during the entire study period. We hypothesised a below 50% recurring attendance will greatly hamper continuity and any follow-up effects (i.e. an increasing familiarity with the intervention) due to repeated exposure cannot be expected in people with dementia that attend sporadically. Even worse, repeated exposure effects will be diluted when including people with effectively no repeated exposure due to a low attendance rate, hence the choice to limit our analyses to those clients with a minimum attendance of 4 or more sessions, even though this decreased the number of clients in the analysis. Each client was analysed separately, meaning that a video of 4 participants was coded 4 times, each time focusing on a different participant.

Raw coding sheet data was imported into IBM SPSS Statistics for further analysis. We used a bootstrapped one way ANOVA analysis to compare the baseline variables age and neuropsychiatric symptoms between the three intervention groups and a Fisher exact analysis (due to small sample size) to test for possible differences in dementia severity, dementia type and sex. A mixed ANOVA analysis was used to compare medication scores at baseline and over time and a bootstrapped one way ANOVA to test for the possible fixed effect of which handler was assigned to the group.

Coding variables (either duration or frequency) were standardised as a percentage of the time the stimulus (i.e. dog or robot) was within arm's reach of the person and thus available for interaction (as defined by the 'stimulus' code in the ethogram in table 1). We coded the initiative frequency of each handler as a measure of the effort to engage participants and used the standardised initiative frequency in a bootstrapped one-way ANOVA to test for a possible difference in initiative between the intervention groups.

To measure all interaction with the handler, we combined all separate coding variables that indicate interaction with the handler (i.e. touching the handler, conversation with the handler, engagement with the handler) into one standardised sum variable. Similar sum variables were calculated for interaction with the dog, robot or the other clients present during the intervention. Sum variables can theoretically surpass 100% because participants can, for example, simultaneously talk and touch.

Table 1. Coding Variables as Defined in the Coding Sheet with Kappa Score for Inter-Rater Agreement.

Coding element	Description	F/D	Kappa
Analysis	*variables coded to aid the statistical analysis*		
Stimulus	location of stimulus relative to subject (i.e. is stimulus within arm's reach of the subject) | *used to standardise coding variables as a percentage of available time for interaction*	D	n/a
Initiative	number of times subject, handler or other client takes the initiative during the intervention | *used to correct for the effort by the handler to engage participants*	F	n/a
Social Interaction	*variables coded to measure various aspects of social interaction*		
Conversation	subject talks to dog, robot, handler or other client	D	0,7
Touch	subject has direct physical contact with dog, robot, handler or other client	D	0,9
Activity	subject is involved in either a predominantly physical (touching/ playing with) or predominantly verbal (talking with/about) activity with dog or robot	D	0,8
Social Engagement	subject is involved in either a solitary (stimulus) activity or a (stimulus) activity that also involves a handler or other client	D	0,8

Note. F/D= frequency/duration, n/a= not applicable. All items within a category (e.g. conversation) are mutually exclusive (e.g. a client talks to either dog or handler not both). The different interaction variables, however, are not mutually exclusive and can occur at the same time (e.g. a client can simultaneously touch and talk to a dog). Standardised sum variables (e.g. all interaction with the handler) can therefore exceed 100%.

Due to the number of initial participants and the subsequent loss to follow-up in later sessions we were unable to accurately compare between the groups beyond a preliminary independent sample t-test, but instead used a bootstrapped one-sample t-test to compare the interaction variables for each intervention group with a hypothetical test-score of 0 (reflecting a score of no interaction) and plotted the results as bar-charts with confidence intervals. As discussed in the introduction, very low levels of social interaction are common in dementia care, hence our comparison with a test-score of zero.

Results

Baseline Characteristics

Baseline characteristics are listed in table 2. Age differed between the three groups due to the inclusion of a small location for people with young-onset dementia, that was randomized in the dog group as a unit (see methods) and resulted in a mean age (*M*

= 76.00, *SD* = 10.87) that was significantly lower than in the control (*M* = 82.57, *SD* = 10.04) and robot (*M* = 83.69, *SD* = 6.84) groups, $F(2,63) = 4.433$, $p = .016$, $\omega^2 = 0.09$. There was no significant association between sex and type of intervention (p = .501) or dementia diagnosis and type of intervention (p = .247) Most clients were diagnosed with Alzheimer's disease followed by vascular dementia. The majority of participants suffered from moderate-severe (CDR 2) or severe dementia (CDR 3) with no significant association between CDR and type of intervention (p=.840). The presence of neuropsychiatric symptoms did not differ between the three groups with a mean NPI score in the dog group of 7.36 (*SD* = 6.54), in the robot group of 3.95 (*SD* = 4.32) and in the control group of 5.25 (*SD* = 5.05), $F(2,59) = 2.13$, $p = .128$, $\omega^2 = 0.035$. A mixed ANOVA analysis of standardized medication scores revealed no difference in medication usage between the three groups at baseline (dog M = 1.94, *SD* = 3.46, robot M = 1.44, *SD* = 2.63 and control M= 1.70, *SD* = 3.19, $F(2,47) = 0.114$, $p = .893$) or over time ($F(2.48,58.23) = 0.442$, $p = .687$).

Handler Initiative

Handler interaction cannot be analysed without taking into account the effort of the handler to initiate interaction. A handler who is more active in engaging clients, will probably yield a higher interaction score. To correct for this possible confounding factor we analysed the number of times the handlers take the initiative for an interaction during the first session. A bootstrapped ANOVA comparison of the standardised means (dog *M* = 0.934, *SD* = 0.83; robot *M* = 0.91, *SD* = 0.58; control *M* = 1.44, *SD* = 0.30) is not significantly different between the three groups, $F(2,44) = 1.85$, $p = .169$, $\omega^2 = 0.035$. Furthermore, when analysing the initiative variable for the first session per handler (n=8) we did not find any differences either, $F(7.39) = 1.50$, $p = .198$, $\omega^2 = 0.069$, suggesting all handlers displayed a similar effort to engage the clients, irrespective of the intervention. Due to the significant loss to follow-up in subsequent sessions we were unable to reliably repeat these analyses for the follow-up sessions.

Social interaction variables

We first detailed the standardised means of the different social interaction variables coded during the first session of the dog, robot and control group (table 3). When compared to a test score of no interaction, *touching the stimulus* (i.e. dog or robot) is significantly higher than zero in both dog ($p = .013$) and robot ($p = .006$) groups, while *touching handler* and *touching other clients* are not. Similarly, the variable *conversations with the handler* is significantly higher than zero in all groups (dog $p = .001$, robot $p = .017$, control $p = .033$), while *conversations with other clients* is not. The activity type variables (i.e. whether the activity is either predominantly verbal or physical) are significantly increased in the dog and robot groups, but with a different pattern: verbal activity is higher in the dog group ($p = .005$), while physical activity is higher in the robot group ($p = .001$). When all social interaction variables related to handler interaction are combined to one standardised sum interaction variable (as described in methods) an independent sample t-test shows a significantly handler interaction score in the dog group (*M* dog = 49.12) compared to the robot group (*M* robot = 23.99, $p = .001$).

Table 2. Baseline Characteristics Per Intervention.

Characteristic	Dog (n=22)	Robot (n=24)	Control (n=20)	Total (n=66)
Gender				
female	14	16	16	46
male	8	8	4	20
Age (mean)	76.00	83.69	82.57	81
Diagnosis				
Alzheimer's Disease	11	11	7	29
Vascular Dementia	3	9	8	20
Frontotemporal Dementia	3	0	0	3
Korsakov's Disease	1	0	0	1
Parkinson's Dementia	2	1	1	4
Dementia NOS*	2	3	4	9
CDR**				
0.5	0	1	0	1
1	2	5	2	9
2	12	13	14	39
3	8	5	4	17
NPI (mean)	7.36	3.95	5.25	5.52

Note. *NOS = Not Otherwise Specified, **CDR = Clinical Dementia Rating scale,***NPI = NeuroPsychiatric Inventory.

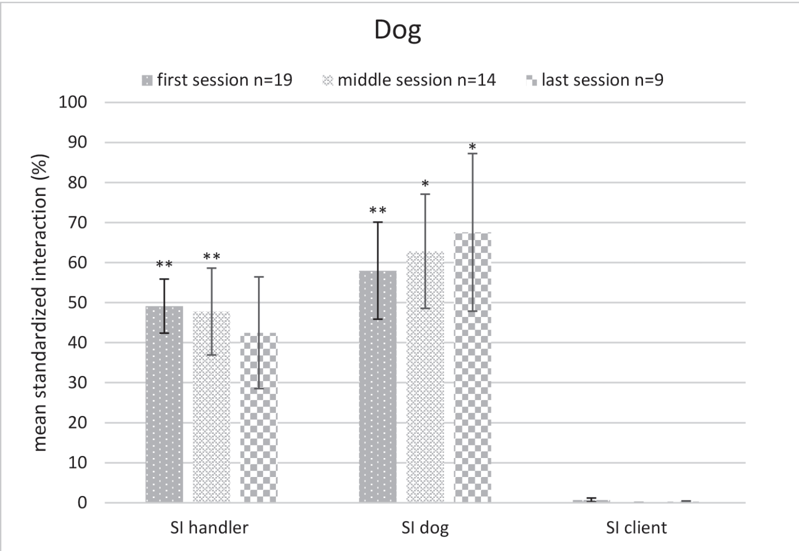
Table 3. Standardized Mean Duration of Social Interaction Variables in Dog and Robot Groups During the First Session.

Element	Dog (n=19)	Robot (n=16)	Control (n=12)
social interaction variable			
touching the stimulus	21.78 (24.54)*	29.13 (27.55)**	n.a.
touching the handler	0.36 (1.17)	0.00 (0.00)	7.85 (16.06)
touching other client	0.05 (0.23)	0.00 (0.00)	0.63 (1.80)
conversation with stimulus	5.65 (10.66)	11.88 (21.97)	n.a.
conversation with handler	23.88 (16.41)**	10.14 (10.48)*	22.73 (24.16)*
conversation with other client	0.64 (1.92)	1.41 (1.48)*	3.23 (6.95)
type of stimulus activity			
physical activity	13,97 (18.59)*	21,32 (13.10)**	n.a.
verbal activity	16.58 (15.68)**	14,85 (20.00)*	n.a.

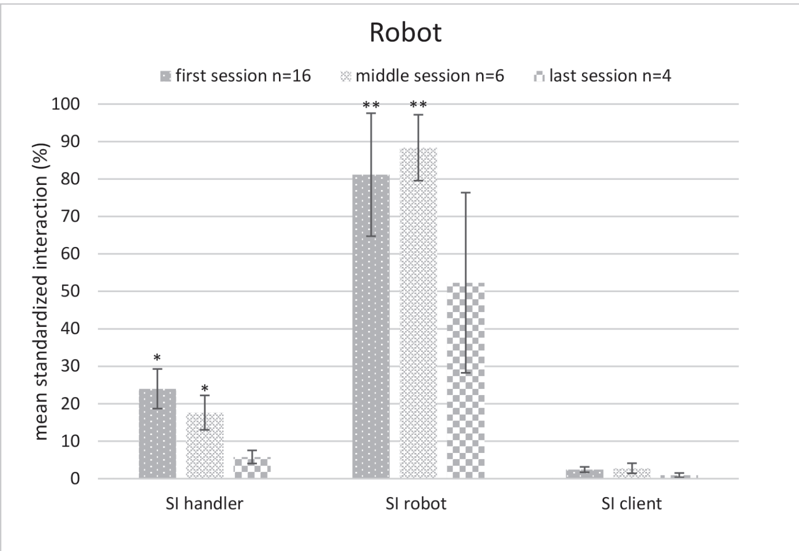
Note. Standard deviation in brackets, n.a. = not available due to absence of stimulus, * = significantly different (p < .05) when compared to test value of 0 (no interaction), ** = significantly different (p < .01) when compared to a test value of 0 (no interaction).

In figure 1, the standardised mean of each sum interaction variable (i.e. handler, dog/robot and other client) is plotted over time for each intervention group separately. In all groups, *handler interaction* is significantly increased while *other client interaction* is not. In the dog group (figure 1A), total interaction with the dog is similar to total interaction with the handler, while in the robot group (figure 1B) interaction with the robot is noticeably higher than the interaction with the handler.

1A



1B



1C

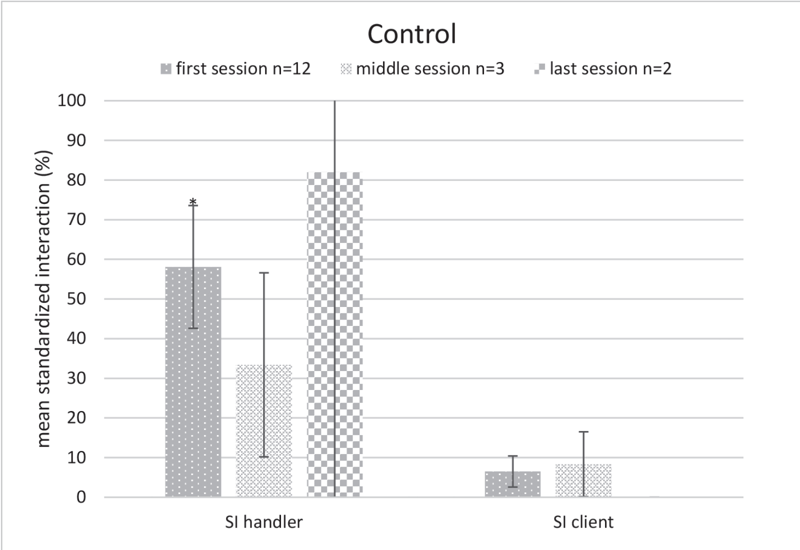


Figure 1. Sum Interaction Variables (SI) for Dog (1A), Robot (1B) and Control (1C) Groups over Time, Depicting Interaction with Handler, Client or Stimulus (dog/robot)
Note. * = significantly different (P < .05) when compared to test value of 0 (no interaction), ** = significantly different (p < .01) when compared to a test value of 0 (no interaction).

Discussion

In an attempt to explore whether the handler is an integral part of AAI in dementia care instead of only facilitating it (a conundrum abbreviated with the term 'handler effect') we observed social interaction behaviours in AAI, RAI and a 'handler only' control group and were specifically interested in the observed 'handler interaction' as a possible measure of the handler effect. A pattern emerges from these observations that seems stable over follow-up sessions. Handler interaction is significantly higher than 0 in all three groups. In the dog group the interaction of the participants with the handler is predominantly verbal and the sum interaction scores are similar to the dog interaction scores, albeit participants interact with the dogs predominantly through touch. Wesenberg and colleagues describe a similar pattern when comparing interaction with a handler and a dog (2018) and Beetz discusses that the ability for non-verbal interaction is one of the major discerning pathways in AAI compared to human interaction (2017).

In the robot group participant-handler interaction is significantly lower than participant-robot interaction. The setup might have preempted this: the participants in the robot group were seated at a table with the robot in front of them and the handler semi-behind, while in the dog group clients were situated on chairs in a semicircle with the dog and handler in front of them, thus possibly stimulating handler interaction. However, handler initiative does not differ between the three groups, suggesting all handlers displayed the same level of effort to engage participants, irrespective of the intervention and their location relative to the participants. In other words, the same level of cueing by the handler led to more client-handler interaction in AAI. This supports our hypothesis that a handler effect in AAI exists and is reflected in the handler interaction scores. A direct comparison between dog and robot groups shows a significant difference in handler interaction, with higher scores for the dog group, but the low sample size of 45 means these results can only be interpreted cautiously.

Kramer et al. (2009) found a similar difference in handler interaction when comparing a human visitor, a human visitor with a dog and a human visitor with a robot (AIBO). Interaction with the human visitor was increased during the dog visits compared to the AIBO visits. In their study, however, visitors accompanied by the dog more frequently initiated contact with the residents compared to visitors accompanied by AIBO and this could have influenced the results.

Interestingly, when analysing the behaviours that indicate interaction with dog or robot (i.e. touch, conversation, verbal or physical activity) a similar pattern is discernible that further supports the existence of a handler effect: participants in AAI are more engaged in a verbal activity related to the stimulus. Combined with the increased score for 'conversations with the handler' it seems a substantial percentage of the increased verbal activity is due to talking about the dog with the handler. In RAI, the situation is reversed: clients are more engaged in physical activity with the robot and talk more to the robot and less with the handler.

In all groups, inter-client interactions are not significantly increased from zero (no interaction). The previously mentioned Kramer et al. (2009) found different results: AIBO induced more interaction between participants. A more recent study compared a resident dog with Paro and found a greater number of residents were involved in discussion about Paro compared to the dog (Robinson et al., 2013b). The novelty of Paro versus the familiarity of the resident dog, however, could have influenced these results.

Robinson and colleagues also reported that clients were more engaged with Paro compared to the dog, but again the novelty effect could have influenced this. Other studies have reported equal levels of engagement when comparing a dog with a robot (Kramer et al., 2009; Thodberg et al., 2016). No study to date has reported less engagement with a robot, compared to a dog, but Thodberg and colleagues did find a decrease in Paro engagement over time, suggesting the robot, with its limited repertoire of interactions, loses its appeal over time, while the dog keeps engaging the participants. Our results show a similar drop in robot interaction in the last session, but the decrease is not significant, possibly due to the low number of participants in the last session.

In our introduction we hypothesised it would be possible to examine whether a handler effect exists in AAI by observing the interaction with the handler during AAI and RAI sessions from the perspective of enactive anthrozoology (Verheggen et al., 2017). We assumed AAI and RAI both require handler-participant attunement, but because in AAI the handler also needs to attune with the dog and the dog needs to attune with the participants, we expected these extra levels of attunement would result in additional handler-participant interactions. Our results support this theory: participant-handler and participant-dog interactions are high and on a similar level, indicating AAI is a combined effort of handler and dog.

In contrast, we hypothesised that the effectiveness of RAI would be solely related to the attractiveness of the robot as a stimulus for people with dementia, because attunement is not applicable to robots. During RAI the only level of attunement that is present is between the robot 'handler' and the participants. We assumed this would reflect in less handler interaction and possibly more robot interaction, depending on the attractiveness of the robot stimulus. Our results also support this hypothesis: while handler interaction is significantly increased, it is significantly less so than robot interaction. In fact, robot interaction seems more than double the level of handler interaction, indicating the robot used in our study is indeed a very attractive stimulus for people with dementia and does not require a lot of simultaneous handler interaction.

Strengths & limitations

To our knowledge, no other study has specifically tried to demonstrate the existence of a handler effect in AAI by observing social behaviours and isolating handler interaction during AAI, RAI and a handler only control group. The visitations in the study by Kramer et al. (2009) were of short duration (3 minutes) and not specifically intended as AAI or RAI. The controlled within-subjects study by Wesenberg et al. (2018) did not include a RAI group as a comparison to the dog-stimulus.

Our analyses, however, are hampered by the decreased power to detect effect-sizes in a between group comparison and the loss to follow-up at subsequent sessions – especially in the robot and control groups - further decreased power.

Nonetheless, we were able to observe behaviours within the intervention groups and take into account several, often overlooked, confounding variables, most notably handler initiative, medication usage, neuropsychiatric symptoms and dementia severity.

We have written about the challenges of AAI research in nursing homes, and especially in dementia care, elsewhere and refer to that article for more information about the lessons we have learned during our study (Schuurmans et al., 2019)

Implications for further research and practice

To measure the sole effect of the dog in AAI for dementia care the concept of construct validity requires the comparison of the exact same intervention with and without the presence of a handler. Even though such a follow-up study would be theoretically interesting, it does not seem practically and ethically feasible, not in the least from an animal welfare standpoint. Our and previous findings could be enhanced, however, by similar follow-up studies with more participants to increase statistical power for between group comparisons or by a cross-over within-subjects design in which the participants are subjected to all interventions and act as their own control. In depth video-analysis of the exact behaviours of both handler and dog that encompass attunement will also help to increase our understanding of the underlying pathways of AAI. The higher attendance in the dog groups over subsequent sessions, even taking into account the patients who died or were unable to attend due to illness, implies a higher compliance to AAI and is another observation that deserves follow-up.
Based on the theory of enactive anthrozoology, we assume the handler effect in AAI for dementia care is universal for all animal interventions and not specific to dogs, but without corroborating research this assumption remains theoretical.

Conclusions

We conclude that the conundrum of the handler effect does exist and that the handler is an integral part of AAI for people with dementia and not merely a facilitator. Dog-handler visitations are a valuable intervention to increase the social interactions of people with dementia, specifically the interactions with the dog and handler, through an embodied interaction that is specific to AAI, but absent in a robot alternative and complementary to a human only control group. We propose any AAI effect should always be considered as a combined effect of dog and handler and selection criteria for AAI teams should, therefore, include criteria that reflect all necessary levels of attunement, including the interaction of the handler with people with dementia, to achieve the best possible results.

Author Note
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Addendum - Ethical Considerations

The ethical considerations of both AAI and RAI are important and need specific attention. AAI have, rightly so, raised several questions about the welfare of the animals involved. The International Association of Human Animal Interaction Organizations (IAHAIO) has released and recently updated comprehensive guidelines for AAI to address these issues and ensure no animals are harmed during AAI (Jegatheesan et al., 2018). We have followed these guidelines in our research.

The use of robots in dementia care is not without controversy either (Sharkey & Sharkey, 2012). Presenting robots as substitute pets can be seen as deceiving vulnerable clients, while using children's toys can be perceived as infantilization. Furthermore, robots should not be introduced as a substitute for human contact or a way to decrease nursing staff costs. Instead, robots must be intended as complementary interventions to increase the quality of life of dementia patients (Bemelmans, Gelderblom, Jonker, & de Witte, 2015). As practitioners in dementia care we fully support this viewpoint.

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CHAPTER 5

Agitation during Dog and Robot Group Sessions for Nursing Home Residents with Dementia.

Lonneke Schuurmans
Inge Noback
Jos Schols
Marie-Jose Enders-Slegers

Publication
Submitted

Abstract

Objectives

Agitation behaviours of people with dementia have a high impact and require personalised interventions. Animal-assisted interventions are considered a suitable intervention for agitation based on the inherent nature of the human-animal bond and the insights from psychosocial theories used to explain agitation. In this study, we observed agitation during group sessions of psychogeriatric nursing home residents with either a dog or robot and a control group.

Methods

Residents with dementia (n=66) were randomised in three groups for weekly visits by either a dog and handler (n=22), a robot and handler (n=24) or a handler only control group (n=20). Video-observations were used to quantify agitation during the first session based on the Cohen-Mansfield Agitation Inventory (CMAI) and the proximity of the stimulus in relation to the participant. Individual CMAI scores were also monitored during the study period, as well as changes in psychotropic medication.

Results

All video-observed agitation elements drop significantly (to zero) when the participants directly interact with the dog (p=.028, d=0.57). In the robot and control group, the decrease in agitation is not significant. Medication and CMAI scores do not differ between the three groups and do not change over time. Baseline CMAI scores are not correlated to the observed effect (τ=.091, p=.576).

Conclusions

Dog interactions are a suitable intervention to decrease agitation in people with dementia at a specific moment. We were not able to measure long-term effects beyond the intervention. Temporarily decreasing agitation, however, may be a valuable outcome for nursing home staff in and of itself.

Keywords

Animal-Assisted Interventions, Dementia, BPSD, Robotherapy, Psychosocial Interventions, Nursing Home, Agitation

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Introduction

Dementia is a progressive, neurodegenerative disease with an increasing prevalence in today's aging society (WHO, 2017). Dementia is characterised by loss of cognitive functions and leads to progressive dependency on others in several domains, including activities of daily living (ADL), mobility, communication and social interaction (Reisberg et al., 1984). This increased dependency often results in admission to a nursing home and is frequently accompanied by several neuropsychiatric symptoms, including agitation, depression and apathy (Cerejeira, Lagarto, & Mukaetova-Ladinska, 2012; Finkel, Costa e Silva, Cohen, Miller, & Sartorius, 1998; Zuidema, de Jonghe, Verhey, & Koopmans, 2007). Psychosocial models explaining these neuropsychiatric symptoms - also referred to as behavioural and psychological symptoms of dementia (BPSD) – include a diminished ability to communicate with other humans to express needs and desires, resulting in unmet needs, isolation, feelings of low self-esteem and ineffective coping strategies that are expressed through BPSD (Finnema, Dröes, Ribbe, & van Tilburg, 2000). A downward spiral often ensues, because BPSD further enhances isolation and ineffective coping. It is widely accepted that interventions aimed at diminishing BPSD should therefore specifically target this spiral (Droës, Mierlo, Roest, & Meiland, 2012).

All neuropsychiatric symptoms need specific attention, but agitated behaviours are especially problematic due to the high impact of agitation (sometimes culminating into aggression) on caregivers and on the immediate environment of the person with dementia, including other residents in a nursing home (Cohen-Mansfield & Billig, 1986). Medication is unable to satisfactorily influence agitation and has serious negative side effects, including diminished mobility and cardiovascular incidents (Kleijer, 2011). More and more research, therefore, focuses on psychosocial interventions to decrease agitation in people with dementia, including music therapy, sensory stimulation ('*snoezelen*'), aromatherapy and reminiscence (Finnema et al., 2000; Kverno, Black, Nolan, & Rabins, 2009; Vasse et al., 2012). In the last two decades, another field of interventions has emerged to help address agitation in dementia: animal-assisted interventions and robot assisted interventions.

Animal assisted interventions (AAI) are defined as structured, goal-oriented interventions that intentionally include animals for the purpose of therapeutic gains in humans (Jegatheesan et al., 2018). In the last decade animal assisted interventions have become increasingly popular in nursing homes as part of the regular activity program, especially in dementia care. A survey among Dutch nursing homes shows that a majority of responding homes offer animal assisted interventions, mostly in group sessions and mostly with visiting dogs and predominantly targeted at residents with dementia, but usually without specific therapeutic goals (Schuurmans, Enders-Slegers, Verheggen, & Schols, 2016).

AAI are considered as a suitable intervention for BPSD, because the inherent nature of animals can be linked with the psychosocial theories that are used to explain BPSD and with similar non-pharmacological interventions that target these pathways (Droës et al., 2012; Kverno et al., 2009). Firstly, the non-verbal multi-sensory interaction of animals, that in a sense mimics the multi-sensory stimulation of *snoezelen*, does not require higher cognitive functions and is therefore accessible for people with diminished cognitive abilities (Van Weert, Van Dulmen, Spreeuwenberg, Ribbe, & Bensing, 2005). Similar to *snoezelen*, animals can therefore help people with dementia to find a moment of quietness and relaxation, especially important in agitation (Holtkamp, Kragt, van Dongen, van Rossum, & Salentijn, 1997). Secondly, it is documented that animals offer comfort and support to elderly people in stressful times (Siegel, 1990) and it is very likely that this effect is still achievable in people with dementia. Since agitation can be the result of ineffective coping strategies, finding another source of comfort might greatly help to diminish problematic behaviour. Finally, research shows that introducing animals on a dementia ward increases social interaction between residents and between residents and staff (Jøranson et al., 2016; Yakimicki, Edwards, Richards, & Beck, 2019). Social interaction in turn can counteract feelings of isolation, loneliness or insecurity that often result in stress and subsequently agitation (Weiss, 1974).

Two (preliminary) studies suggest that AAI could be a promising intervention in managing agitation of people with dementia, by either delaying progression of agitation symptoms (Majić, Gutzmann, Heinz, Lang, & Rapp, 2013) or decreasing observed agitation during AAI sessions (Richeson, 2003). In these studies the effects are thought to be linked to increased social interaction and to a physically calming effect (lower heart rate) as observed in the presence of the dog.

Other studies do not report a statistically significant effect on agitation (Nordgren & Engström, 2012; Olsen et al., 2016). Research into the effectiveness of AAI on neuropsychiatric symptoms, however, is often hampered by methodological problems, as highlighted by three recent systematic reviews (Hu, Zhang, Leng, Li, & Chen, 2018; Yakimicki et al., 2019; Zafra-Tanaka, Pacheco-Barrios, Tellez, & Taype-Rondan, 2019).

The use of robots in elderly care has recently gained momentum with companion type robots being the most popular (Bemelmans, Gelderblom, Jonker, & de Witte, 2012). The most well-known companion robot in dementia care is Paro, an artificially intelligent harp seal robot created by AIST (Shibata & Wada, 2011), but other companion type robots have also been used in elderly care (Mordoch, Osterreicher, Guse, Roger, & Thompson, 2013). In Dutch nursing homes, Furreal Friends, robotic animal toys for children developed by

Hasbro, are used more often than Paro, mostly due to the favourable price tag of Furreal Friends compared to Paro (Schuurmans et al., 2016). Robot animals are increasingly used as substitute animals in interventions for people with dementia that are similar to AAI. In these robot assisted interventions (RAI), robots often mimic aspects of animals through appearance and pre-programmed behaviours. People with severe dementia often are unable to distinguish robot animals from living animals (Sharkey & Sharkey, 2012). It has been hypothesised, therefore, that robots might be a possible valuable alternative intervention to influence BPSD, especially when 24/7 availability is important and when AAI are not a viable option. Three studies find a decrease in agitation during RAI sessions with either Paro (Jøranson, Pedersen, Rokstad, & Ihlebæk, 2015; Moyle et al., 2017) or a therapeutic robotic cat (Libin & Cohen-Mansfield, 2015). The authors conclude the effects are due to a combination of calming effects (as measured by changes in hormone levels) and increased social interaction and expressions of happiness (as measured by observations) in the presence of the robot.

In the available AAI and RAI studies, the effect on agitation is either measured through baseline and follow-up questionnaires during the study period or by observing neuropsychiatric behaviours during AAI sessions. The latter seems especially valuable, because knowledge about how residents respond during AAI and RAI interventions can help nursing home staff in determining when dog and robot interventions might be helpful to counteract BPSD and what to expect during the intervention.

This study aims to deepen the understanding of interventions with (robot)animals on agitation in dementia by analysing agitated behaviours during group sessions with either a dog (AAI), a Furreal Friend robot (RAI) or a human facilitator only (control). The following research questions are addressed:

1) Do the general agitation scores of participants change during the study period and is there any difference between the AAI, RAI and control conditions?
2) Do people with dementia who participate in AAI, RAI or control sessions display agitated behaviours during these interventions and are these behaviours influenced by the proximity of the stimulus (i.e. dog, robot or human facilitator)?
3) Are the displayed behaviours during the three intervention conditions (AAI, RAI and control) correlated with the baseline agitation-scores of the participants?

Methods

Design

As part of a larger study into the effects of AAI in dementia care, this study was conducted as a prospective 12-week pilot study in nursing home locations of De Zorgboog, a large care organisation in the Netherlands. During an 8 week intervention period of weekly sessions with either a dog (and handler), a robot (and handler) or a handler only (control group) all sessions were recorded on video to analyse agitated behaviours during the sessions. General levels of agitation of the participants were recorded via repeated questionnaires at baseline, week 4 and 8 and after a 4 week follow-up washout period (week 12). The study was registered at ISRCTN (reference number: ISRCTN93568533) and approved by the regional committee for medical research ethics (METC Zuyderland).

Participants and recruitment

Clients with a registered dementia diagnosis in their medical history who lived 24/7 in the nursing home were eligible to participate and recruited through their legal representatives, including a written informed consent. Exclusion criteria were known allergies for dogs or a known fear of dogs and severe physical aggression (at the discretion of the ward psychologist) that could potentially harm other participants or the dogs.

Of the 183 eligible patients 69 were enrolled in the study via their legal representative (38%). Unfortunately this was below the required number (102) needed for sufficient statistical power to detect large effect-sizes (0.40) in a mixed ANOVA analysis. We lost three clients before the data collection started: one participant died, one participant was withdrawn after initial consent and one participant fell severely ill before the start and was unable to attend the sessions. Thus, at the start of the study 66 clients remained.

We aimed to create groups with a maximum of 10 clients per group as advised in previous, similar research (Kongable, Buckwalter, & Stolley, 1989). The largest nursing home location provided 28 participants and we randomised those clients over three groups (one dog, one robot, one control) using computer generated numbers, resulting in a dog group of 9 participants, a robot group of 9 participants and a control group of 10 participants. The 5 other nursing homes provided 41 participants, with no nursing home enrolling more than 10 participants and one nursing home providing only four participants. We treated each of these nursing homes as a unit and randomised the intervention per unit, resulting in two dog groups of 4 and 9 participants each, one control group of 10 participants and two robot groups of 9 clients each.

The actual group size during sessions could vary from week to week, because clients were asked to participate on a session-by-session basis and participants who displayed resistance upon invitation were not forced to attend the session, but were invited again the subsequent week. Clients were sometimes also indisposed for specific reasons (i.e. temporary sickness or personal appointments).

After the first session, we lost all clients of the control group in the largest nursing home location, because these clients preferred to attend the regular activities (like music, creative activities and exercise) that were provided for the residents of that nursing home and steadfastly refused to attend our sessions. We had no choice but to accept their decision and to treat this group as an 'activities as usual' group, meaning we continued data collection but could no longer videotape intervention sessions.

We have reported about the challenges of including people with dementia in AAI research extensively elsewhere and refer to that article for additional information about these issues (Schuurmans, Noback, Schols, & Enders-Slegers, 2019)

Intervention

During the 8 week intervention period all groups had weekly 45 minute sessions with one (groups with less than 4 participants) or two (groups with 5 or more participants) certified AAI dogs (dog group) or robots (robot group) and a qualified handler per dog/robot. The control group was visited by human facilitators (handlers) only. All groups followed the same protocol and started each session with an introduction-period of approximately 5-10 minutes, in which the dog, robot and/or handler was introduced to the participants, followed by an intervention period in which each participant was allowed an allocated time - in rotation, based on handlers discretion - to interact with the dog or robot individually (up to a maximum of 5 minutes). The total duration of the intervention period was 30 minutes. Individual activities included petting (dog and robot), grooming (dog and robot), giving treats (dog), puzzles (dog) or exploring functionality (robot), talking with the handler or other clients (dog and robot). The activities in the control group consisted of small-talk or non-verbal contact with the handlers (up to five minutes per client in rotation) while enjoying a beverage. All sessions ended with a period of leave-taking of approximately 5-10 minutes.

Dogs, robots and handlers

A veterinarian checked all participating dogs and all dog-handler teams were certified for AAI in dementia care. Five dogs participated in the study: a Labradoodle, a Kooiker, a Stabyhoun, a Bouvier des Flanders and an Icelandic herding dog. The dogs were primarily kept on a leash unless the type of interaction required otherwise (playing fetch). The well-being of each dog during sessions (through video-analysis) and after sessions (via behavioural questionnaires) was monitored by students and staff of the HAS University of Applied Sciences in 's-Hertogenbosch, who were not involved with the primary study.

The robots used in the study were a specific type of FurReal Friends robot, called Daisy Plays-With-Me Kitty, produced by Hasbro (2019). Daisy had tactile sensors in her front right paw and back as well as movement sensors in her eyes. She responded by moving, jumping, standing, purring or meowing melodically. We specifically choose Daisy because of the various options to play with the robot, even though the argument can be made that a kitten cannot be compared to a dog. Previous research with Paro, however, seems to indicate that the recognizability of the animal is not an important factor in a companion robot for people with dementia (Robinson, MacDonald, Kerse, & Broadbent, 2013; Shen, Xiong, Chou, & Hall, 2018; Shibata & Wada, 2011).

All handlers were trained to be a volunteer in dementia care. Control and robot group 'handlers' were either dog-team handlers, who did not make the final selection as a dog-team, or psychology master students. Control group handlers followed the same general protocol as dog or robot group handlers.

Measurements

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Figure 1 presents an overview of the baseline and repeated measurements during the study period. Baseline characteristics (T0) included age, gender, type of dementia, medical history, previous history as a pet-owner and cognitive state (as measured by the *Clinical Dementia Rating* scale, CDR). CDR is a classification scale to quantify the severity of the dementia based on exhibited symptoms and cognitive performance and results in a composite score ranging from 0 (no dementia) - 3 (severe dementia), with a high inter-rater reliability both for physicians and non-physicians (Morris, 1993). The CDR scores of all patients were determined by researcher L.S. Baseline characteristics will be further discussed in the results.

CMAI Agitation

To monitor the general agitation scores of the participants during the entire study period, individual agitation scores were obtained at baseline and every four weeks (T0-T3) via the *Cohen-Mansfield Agitation Inventory* (CMAI, Finkel, Lyons, & Anderson, 1992). CMAI measures 29 agitated and aggressive behaviours and is used extensively in nursing homes (Cohen-Mansfield, 1996). The frequency of each symptom is rated on a seven-point scale (1-7) ranging from 'never' to 'several times an hour'. Higher scores thus indicate a higher frequency of agitated or aggressive behaviours. The Dutch version of the CMAI has been validated by de Jonghe and Kat (1996). CMAI scores were rated by the primary nurse of the participant.

During the intervention period (T0-T3) any changes in medical state (i.e. illness, hospitalisation) or prescribed medication (specifically psychotropic drugs) were also recorded by researcher L.S.

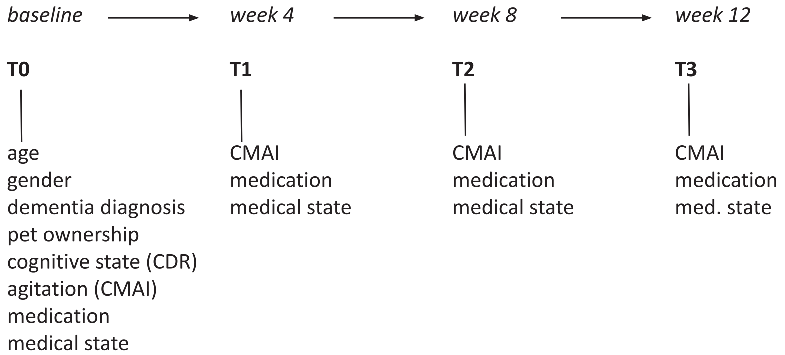

Figure 1. Graphical representation of the baseline and repeated measurements during the study period. CDR = Clinical Dementia Rating scale, CMAI = Cohen-Mansfield Agitation Inventory

Observed agitation elements

To monitor agitation behaviours during the interventions, all sessions were recorded on video with at least one, but usually two or three cameras per session depending on the size of the group and the available space in the room. Researchers who were instructed not to interact with the participants or interfere with the intervention protocol in any way operated the cameras. The cameras were placed in the room before the participants arrived. The six clients whose legal representative had not given permission for video recording were placed outside camera view.

Similarly to other studies, (Olsen et al., 2016; Wesenberg, Mueller, Nestmann, & Holthoff-Detto, 2018) all first, middle (fourth week) and final (eighth week) sessions - 22 videos in total - were analysed by two trained observers using Solomon Coder (Péter, 2017), coding software for Windows. The agitated behaviours of the CMAI were defined in a so-called coding sheet based on the three factor analysis by Zuidema, de Jonghe, Verhey, and Koopmans (2007) resulting in three, mutually exclusive, coding variables (physically non-aggressive behaviour, physically aggressive behaviour and verbally agitated behaviour, table 1). Each participant was analysed separately, meaning that a video of 4 participants was coded 4 times, each time focusing on a different participant. The Kappa coefficient for inter-rater agreement between the two observers was 0.7. We standardised each coding variable as a percentage of the time that was available for the behaviour to occur. We combined the three observed agitation variables into a sum score resembling the total score on the CMAI questionnaire and used this sum score in overall statistical analyses. Behavioural coding has been recognized as a valuable tool to analyse AAI interventions in addition to questionnaires (Thodberg, Berget, & Lidfors, 2014). We specifically chose the CMAI as the basis of our coding sheet so we could compare the video data with the data of the CMAI questionnaires.

As explained above, attendance varied on a session per session basis. We were able to code 47 participants during the first session, 34 participants during the fourth session and 30 participants during the last session.

Table 1. Description of coding elements based on the three factor structure of the CMAI with corresponding CMAI behaviours as well as the stimulus proximity variables.

coding element	Description
behavioural	
physically non-aggressive	Pace or aimless wandering, hiding things, hoarding things, trying to get to a different place, handling things inappropriately, general restlessness, inappropriate dressing or disrobing, repetitive mannerisms.
physically aggressive	Hitting (including self), pushing, scratching, cursing or verbal aggression, grabbing, screaming, spitting, strange noises.
verbally agitated	Constant unwarranted request for attention/help, complaining, repetitive sentences or questions, negativism.
proximity	
one-on-one	Stimulus is directly interacting with the observed participant (i.e. the period of allocated stimulus interaction time for that participant).
group	Stimulus is not directly interacting with the observed participant, but is present in the group, interacting with another participant (i.e. it is not the observed participant's allocated interaction time).

CMAI: Cohen-Mansfield Agitation Inventory (Finkel et al., 1992). Factor structure based on (Zuidema et al., 2007).

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Stimulus proximity

Stimulus proximity was recorded to differentiate between the periods the stimulus (i.e. respectively dog, robot or handler) was either in the group, but not interacting with the observed participant ('stimulus group') or the stimulus was directly interacting with the observed participant ('stimulus one-on-one', table 1). Agitated behaviours were recorded for both variables and used in further analysis to determine the effect of stimulus proximity.

Analysis

Due to the loss to follow-up in subsequent sessions and thus the loss of statistical power - especially in the control group - we focused our video-analysis on the data of the first session.

We compared baseline variables via one way ANOVA analysis. We used one way and mixed ANOVA to test for the possible confounding effects of dementia severity and medication usage. To answer the first research question we used a Wilcoxon test to compare the CMAI questionnaire scores over time (T0 vs. T3) and a one way ANOVA to analyse the differences in CMAI questionnaire scores between the groups (T0-T3). For the second research question we used one way ANOVA to compare the first session video-coding variables between the three groups A paired samples T-test was used to analyse the impact of stimulus proximity per intervention by comparing the one-on-one agitation scores with the group scores.

Because of the small sample size - we used the non-parametric Kendall's tau correlation analysis to determine the correlation between baseline CMAI score and observed agitation during the first session (research question 3).

Results

Baseline Characteristics

We started the intervention period with 66 participants (46 female, 20 male) in three groups: dog (n = 22), robot (n = 24) and control (n = 20). Due to the inclusion of a location with people with young-onset dementia age differed between the intervention groups, with a significantly lower mean age in the dog group (M = 76.00, SD = 10.87) compared to the control (M = 82.57, SD = 10.04) and robot (M = 83.69, SD = 6.84) groups, $F(2,63) = 4.433$, $p = .016$, $\omega2 = 0.09$. The other fixed baseline characteristics - gender, diagnosis, history of pet ownership and cognitive state - did not significantly differ between the groups. Alzheimer's disease was most prevalent (29), followed by vascular dementia (20), Parkinson's dementia (4), frontotemporal dementia (3) and Korsakoff's disease (1). Nine participants were diagnosed with dementia NOS (not otherwise specified). The majority of participants suffered from moderate-severe (CDR 2, n = 39) or severe dementia (CDR 3, n = 17), while nine participants had moderate dementia (CDR 1) and only one participant had mild dementia (CDR 0.5). Medication usage was standardized following the relevant dosage equivalence protocols (Andreasen, Pressler, Nopoulos, Miller, & Ho, 2010). A mixed ANOVA analysis revealed a mean baseline medication score of 1.94 for the dog group (SD = 3.46), 1.44 for the robot group (SD = 2.63) and 1.70 for the control group (SD = 3.19) and no significant difference between the groups, $F(2,47) = 0.114$, $p = .893$, $\omega2 = -0.04$. Medication use also did not change significantly between the groups during the course of the study, $(F\ 2.48,58.23) = 0.442$, $p = .687$, $\omega2 = 0.05$.

Baseline & Follow-up Agitation Scores

General agitation behaviours of the individual participants, as measured by the CMAI questionnaire, did not significantly differ between the three groups at baseline (T0) and follow-up measurements (T1-T3, table 2). Nor did agitation scores change over time during the study period (T0 vs. T3, p = .753).

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Table 2. CMAI questionnaire scores and statistics for T0-T3, per intervention and combined.

Group	T0 (n = 62)	T1 (n = 56)	T2 (n = 32)	T3 (n = 16)
Dog	*M* = 49.77, *SD* = 17.43, n = 22	*M* = 48.45, *SD* = 16.94, n = 20	*M* = 45.25, SD = 11.57, n = 12	*M* = 56.29, SD = 21.66, n = 7
Robot	*M* = 44.25, *SD* = 16.36, n = 20	M = 44.88, *SD* = 16.61, n = 17	*M* = 40.87, *SD* = 19.04, n = 15	*M* = 45.57, *SD* = 18.30, n = 7
Control	*M* = 46.25, *SD* = 18.07, n = 20	*M* = 45.37, *SD* = 13.84, n = 19	*M* = 40.60, *SD* = 5.94, n = 5	*M* = 42.00, *SD* = 9.90, n = 2
Combined	*M* = 46.85, *SD* = 17.18	*M* = 46.32, SD = 15.64	*M* = 42.47, *SD* = 14.85	*M* = 49.81, *SD* = 19.09
Between group statistics	*F*(2,59) = 0.552, *p*=.579, *ω*2=-0.01	*F*(2,53) = 0.285, *p* =.753, *ω*2=-0.02	*F*(2,29) = 0.323, *p*=.727, *ω*2=-0.04	*F*(2,13) = 0.715, *p*=.508, *ω*2=-0.04

Observed Agitation Behaviours During the First Session

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Figure 2 shows the video-observed agitation behaviours during the first session for all three interventions in two conditions based on stimulus proximity. Observed agitation in the dog group drops significantly to zero when the dog is interacting with the participant (*M* = 14.88, *SD* = 26.26, *p* = .028, *d* = 0.57), while in both robot (*M* = 8.16, *SD* = 36.44, *d* = 0.32) and control (*M* = 1.82, *SD* = 6.83, *d* = 0.40) group the decrease in agitation is not significant (*p* = .384 and *p* = .507 respectively).

It is plausible that observed agitation during the intervention could be related to the baseline agitation of each client and that baseline agitation could even be a predictor for the expected effect. A Kendall's tau correlation analysis however revealed observed agitations scores were not significantly correlated with the baseline (T0) CMAI scores for each client (stimulus group: τ = .139, *p* = .292 and stimulus one-on-one: τ = .091, *p* = .576).

In figure 3 we have further specified the different categories of observed agitation behaviours (i.e. physically non-aggressive (PNA) behaviour, physically aggressive (PA) behaviour and verbal agitation (VA) behaviour) and again plotted these for the three interventions and two stimulus conditions (group vs. one-on-one). PNA behaviors are most prevalent overall and seem to decrease when the stimulus is interacting with the participant. As confirmed by a paired samples T-test, the decrease in observed PNA behavior for group vs. one-on-one in the dog group is significant (*M* = 14.76, *SD* = 26.27, *p* =.029, *d* = 0.56), but the differences in the robot group (*M* = 10.66, *SD* = 31.45, *p* = .195, *d* = 0.46) and control group (*M* = 2.24, *SD* = 5.94, *p* = .356, *d* = 0.38) are not. PA behaviors are not observed in the dog group, VA behavior in the dog group is very low and not significantly different between the two stimulus conditions (*M* = 0.11, *SD* =.49, *p* =.331, *d* = 0.00). PA behaviors seem to increase in the robot group when the stimulus is in close proximity (*M* = -2.54, *SD* = 10.14), but the increase is not significant (*p* = .333, *d* = 0.35). PA behaviors in the control group are absent. VA behaviors are nearly absent in the robot group in both conditions (*M* = 0.035, *SD* = 1.26, *p* = .913, *d* = 0.02). VA behaviors are more prevalent in the control group and do not change with stimulus proximity (M = -0.42, SD = 3.04, p = .727, *d* = 0.03).

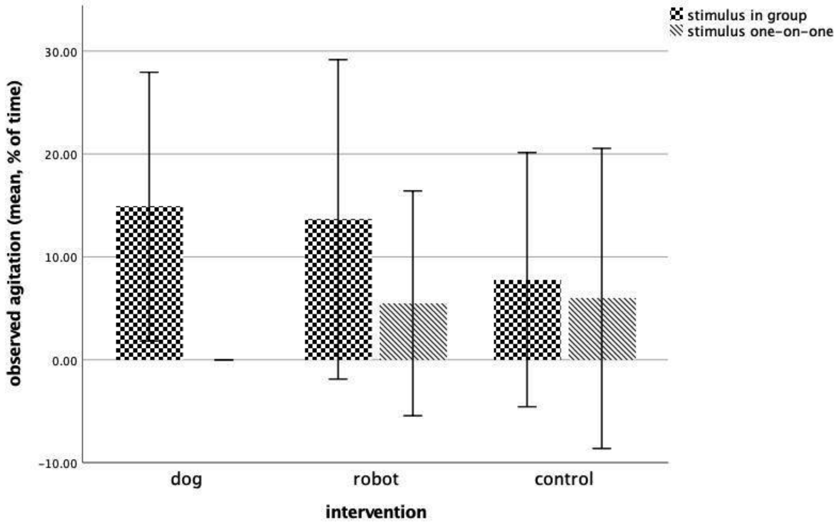

Figure 2. Observed agitation behaviours and stimulus proximity during the first session for all three intervention groups (dog, robot and control). Stimulus in group: stimulus is in the group, but not interacting with the observed participant. Stimulus one-on-one: stimulus is interacting with the observed participant. N = 47.

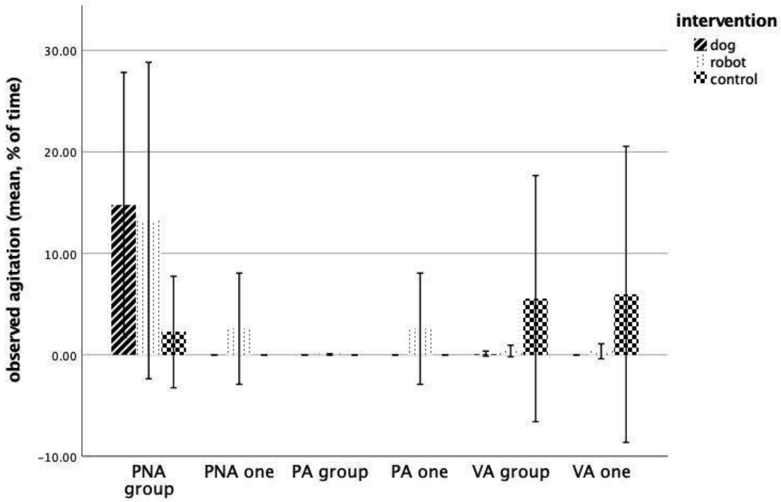

Figure 3. Intervention and stimulus proximity (*group* versus *one-on-one*) for the sub-categories of agitated behaviours, based on the factor structure of the CMAI (*Cohen-Mansfield Agitation Inventory*). PNA = physically non-aggressive behaviour, PA = physically aggressive behaviour, VA = verbally agitated behaviour. *Group* = stimulus is in the group, but not interacting with the observed participant, *one(-on-one)* = stimulus is interacting with the observed participant. N = 47.

Discussion

In an attempt to explore the effect of AAI and RAI group interventions on agitation behaviours of people with dementia we measured baseline and follow-up agitation behaviours displayed by participants during the course of the study period and specifically observed agitation behaviours during AAI, RAI and control sessions. The prevalence of agitation behaviours - as measured by the CMAI - in this study population was low compared to the level of agitation behaviours as described by Zuidema et al. (2007) in a similar population. Nor did these agitation behaviours differ between the intervention groups or change over time during the study period. This answers our first research question and differs from findings by Jøranson et al. (2015), who describe significant decreases in agitation in a 12 week, bi-weekly RAI intervention study period and Majić et al. (2013) who describe a significantly delayed progression of agitation symptoms in a 10 week, weekly AAI intervention period compared to a control group. Our findings however are similar to studies by Olsen et al. (2016) and Nordgren and Engström (2014) who both do not report significant differences in agitation during an AAI study period. The low prevalence of physical aggressive behaviour in our study can be explained by the exclusion criteria: people with extreme aggressiveness could not participate due to safety concerns for other participants and the animals. Possibly, the low prevalence of agitation in our study population made detection of changes more difficult. The small sample size, also, could have influenced the power to detect changes. It is plausible, however, that weekly AAI or RAI activities simply do not have a lasting effect on the behaviours of people with dementia, but must predominantly be valued for their effect during the interventions.

In our study the effect during the intervention is most obvious in the dog group: agitation behaviours (and more specifically physically non-aggressive behaviours) drop to zero when participants are interacting with the dog. The robot group also shows a reduction of agitation, but this effect is not significant. The second research question therefore can be confirmed: participants do display agitation behaviours during the sessions - especially when they are not interacting with a dog or robot - and these behaviours are positively influenced by the proximity of the stimulus to the extent that dog interaction completely reduces agitation. To our knowledge no other studies have specifically observed agitation behaviours during AAI interventions, focusing instead on observing social interaction. When including research into other psychosocial interventions, however, a decrease of agitation behaviours during the sessions is described for interventions like music therapy and massage therapy (Brotons & Pickett-Cooper, 1996; Hicks-Moore & Robinson, 2008).

Based on our observations, individual contact with the dog seems to be a sufficient stimulus for people with dementia to suppress any need to display agitation at that moment. The robot, in comparison, does not seem to be as powerful a suppressor of agitation. Agitation scores do drop when participants are interacting with the robot, but not significantly. We cannot compare our results with other studies, because similar observations of agitation during RAI sessions are not available in the current literature. Baseline CMAI scores of each participant are not a predictor of the observed effects during the interventions in this study. Instead the effect seems to be similar for all participants irrespective of whether they regularly display agitation behaviour or not (research question 3).

Strengths, limitations and implications for further research

To our knowledge our study is the first to specifically observe agitation behaviours during AAI and RAI interventions. The smaller sample size and the low prevalence of agitation in general, however, could possibly have influenced the ability to detect changes, especially in the robot group. Loss to follow-up, mostly in the control group, also made it impossible to study the effect during the interventions in follow-up sessions. We were only able to study the first sessions in each group and this could have included the so-called novelty effect, meaning the intervention effect was due mostly to its newness. Because people with dementia often experience recurring activities as new however, we think this novelty effect will not have impacted the results to any significant degree. Larger sample sizes, however, would make it possible to study whether the effect in the dog group remains in follow-up sessions. This would be a valuable avenue for further research. In our study we randomised the participants over the three different interventions, but another valuable comparison would be to compare the effect of the different interventions (dog, robot) in the same participant (i.e. each participant is his or her own control).

Concluding, our study suggests that individual contact with a dog is effective in decreasing agitation behaviours of people with dementia at that specific moment, but does not have a long lasting effect beyond the intervention. This temporary effect, however, is still very relevant because providing pleasant activities that decrease agitation of people with dementia, is a continual challenge. Agitation can result in a downward spiral of increasing agitation and other BPSD. Halting this spiral, therefore, is always valuable, even temporarily. Adding AAI interventions to the activity program in a nursing home will, therefore, provide an additional option to momentarily decrease agitation of people with dementia.

Robot interventions do not significantly decrease agitation in this study. Robot interventions are effective, however, in increasing social interaction, even without the presence of a handler, as described in our previous study (Schuurmans, Noback, Schols, & Enders-Slegers, 2021). Depending on the desired effect (decreasing agitation or increasing social interaction) recreational therapists can therefore choose to use one intervention over the other. This further underscores the importance of patient-centred care in dementia: what activity is most beneficial for this specific patient at this specific moment for this specific problem.

Conflicts of Interests Declarations
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Description of Author Roles
L. Schuurmans designed the study, collected the data and wrote the paper. I. Noback supervised the statistical analyses and assisted with writing the article. J. Schols and M.J. Enders-Slegers supervised the design of the study, the data collection and assisted with writing the article.

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CHAPTER 6

Summary and general discussion

The aim of this thesis was to explore the prevalence and characteristics of animal assisted interventions (AAI) in Dutch nursing homes and the possible challenges of conducting AAI research in a nursing home. We also investigated the effect of AAI group sessions with a dog on social interaction of people with dementia and the presence of agitation behaviours during the sessions. AAI interventions always include the animal handler and the additional effect of the handler has been theorised, but not specifically included in previous research studies. We, therefore, also focused on the possible additional effect of the presence of the handler on social interaction. In the following sections, a summary of the main findings, the methodological considerations, the implications for the theoretical framework and the usability in the nursing home practice are discussed in more detail.

Summary of the main findings

AAI in Dutch nursing homes, a survey

We invited all listed nursing homes (457) to participate in an online survey about their AAI practice. A total of 244 surveys (representing 165 nursing homes) were returned. Of this number, 125 nursing homes used AAI in one way or another and 40 did not. Those nursing homes that did not offer AAI cited allergy, hygiene and safety concerns as the most important reasons for this. Most nursing homes offering AAI used visiting animals, mostly dogs (108), farm animals (101) or rabbits (76). A smaller number of nursing homes had resident animals, either living on the ward or in a meadow outside. Most frequently, the resident animals were birds (70) followed by fish (50). All AAI programs involved animal-assisted activities with a recreational purpose; none of the participating nursing homes provided animal-assisted therapy with therapeutic goals. In the majority of nursing homes, AAI sessions were supervised by recreational staff (93) and volunteers (81). Psychogeriatric residents were most frequently invited to participate. A total of 88 nursing homes used alternatives when animals were not an option or not available. The most popular alternative was the use of stuffed animals (83) followed by FurReal Friends robotic toys (14). The sophisticated robot seal Paro was used in 7 nursing homes. A large percentage (80%) of nursing homes that worked with animals did not have AAI-specific health protocols or animal welfare and safety protocols underlying the animal activities or specific selection criteria for the selection of suitable animals and volunteers/handlers.

Challenges of AAI research in nursing homes

During our research study in which we compared weekly group sessions with participants with dementia and either a dog (and handler), a robot animal (and handler) and a control group (human facilitator only), we encountered several challenges related to both the preparation phase and the executive phase of the study. We organised these challenges based on the PICO(TS) strategy of evidence-based practice (i.e. population, intervention, comparison, outcome, time horizon and setting). In this paragraph these categories will be briefly summarised, an extensive discussion can be found in Chapter 3.

Participants (population)

Participant-related challenges included the legal implications of working with vulnerable patients and the necessary steps to acquire approval from the various ethical boards as well as the practical implications of a progressive neurodegenerative disease with accompanying memory loss and behavioural problems that influence both the motivation of participants as well as their ability to participate.

Animals and robots (intervention)

Another very important consideration during our study was animal welfare and the selection of the participating animal-handler teams. We teamed up with other professionals in the animal-field to ensure our study fulfilled all conditions related to animal welfare and overall safety and hygiene protocols. Using robot animals for people with dementia also required ethical considerations related to possible infantilization and the importance of not deliberately deceiving participants.

Nursing home (setting and time horizon)

During our study, the nursing home setting posed several practical challenges due to its inherent unwieldy, organisational structure, the high workload of nursing home staff and sometimes high rate of staff turnover, and an often suboptimal environment for a controlled randomised trial, especially when comparing nonpharmacological interventions. Balancing the desire for scientifically sound procedures with the practical limitations of a nursing home setting was often difficult and required specific considerations of which intensive contact between dedicated research assistants and the nursing staff proved to be of the most importance. Unforeseen external factors also had a challenging impact. An influenza outbreak during the study period, for example, impacted not only participants but also research staff.

Methodology (comparison and outcome)

Methodological challenges were related to the core dilemma of how to measure and value small effects that might be very relevant clinically, but are often not scientifically significant. We used video-analysis to address this issue, but using video cameras was not without issues of its own, especially related to the sensitive nature of video data and applicable privacy laws. Specific methodological considerations related to study design and possible bias will be addressed in another paragraph of this summary.

Social interaction during AAI sessions and the handler effect

During our 8-week intervention study with weekly dog (n=22), robot (n=24) and control (human facilitator only, n=20) group sessions, we used video analysis to observe and code the interaction of participants with either the handler, the stimulus (dog or robot) or the other participating clients. In the coding sheet, we defined 4 social interaction variables: conversation (talking to dog/robot/handler/other client), touch (direct physical contact with dog/robot/handler/other client), activity type (either physical or verbal activity with dog/robot/handler/other client), social engagement level (either solitary activity or involvement of handler/other clients). Additionally, we measured the initiative of the handler to engage participants during the sessions. Several baseline characteristics, including dementia severity, neuropsychiatric symptoms and medication usage, were recorded as possible confounders.

When compared to a test score of no interaction, the variable 'touching the stimulus' (i.e. dog or robot) was significantly increased in both dog and robot groups, while the variables 'touching the handler' and 'touching other clients' were not. The variable 'conversations with the handler' was significantly increased in all three groups, while the variable 'conversations with other clients' was not. The activity type variables (i.e. verbal or physical activity) were significantly increased in both dog and robot groups, but with a different pattern: verbal activity was higher in the dog group, while physical activity was higher in the robot group.

In the dog group, the sum-score of all participant-handler interaction variables was similar to the participant-dog interaction sum-score, indicating the participant spent an equal amount of time interacting with the handler and the dog. In the robot group, participant-handler interaction sum-scores were significantly lower than participant-robot interaction sum-scores, indicating that the participant spent significantly more time interacting with the robot than interacting with the handler. The effect on interaction scores and observed differences between dog and robot groups remained the same during the entire study period of 8 weeks. Handler initiative during the sessions did not differ between the three groups. Nor did any of the baseline characteristics.

Agitation during dog and robot sessions

We observed agitation behaviours – via a video analysis coding sheet based on the *Cohen Mansfield Agitation Inventory* (CMAI) – during the first week of the group sessions with either a dog and handler (n=22), a robot animal and handler (n=24) and a handler (human facilitator) only control group (n=20). Agitation behaviours were scored for two variables based on proximity of the stimulus (dog or robot) or handler (control group): either the participant was interacting with the dog, robot or handler ('stimulus 1-on-1') or the participant was part of the group, but not directly interacting with dog, robot or handler ('stimulus group'). Based on the three-factor analysis of the CMAI, three behavioural categories were defined: physically non-aggressive behaviours (PNA), physically aggressive behaviours (PA) and verbal agitated behaviours (VA). All scores were standardised as a percentage of the time available for the behaviour to occur. A CMAI sum-score (PNA + PA + VA) was also calculated as a measure of total agitation behaviours.

Several baseline characteristics were also recorded, including dementia severity (as measured by the *clinical dementia rating scale*, CDR), dementia type, baseline CMAI scores, medical status and medication usage (i.e. psychotropic medication).

In all three groups, agitation behaviours were present when the participants were not directly interacting with dog, robot or handler. PNA behaviours were most prevalent, followed by VA behaviours. PA behaviour was not present in any of the groups. In the dog group, the combined agitation score (CMAI sum-score) dropped significantly (to zero) when the participants were directly interacting with the dog. In the robot and control group, a decrease in total agitation was visible when participants were directly interacting with the robot or handler, but this decrease was not significant. Baseline CMAI scores were not correlated to the observed effect. Nor did medication usage, dementia severity, dementia type and medical status differ between the groups.

Methodological Considerations

Study protocol

A randomised controlled trial is difficult to execute in the nursing home setting due to randomization issues (for example, attrition of participants due to death or illness) and research protocol contamination (for example, due to staff movements). As suggested by Maas et al. (2002), we therefore aimed for a quasi-experimental design as a compromise. Participants were randomised over the three interventions and during the sessions a specific protocol was followed. Participants and nursing home staff were not blinded for the intervention, but through video-analysis we managed to objectively record behaviours during the sessions. Behavioural coding has been recognized as a valuable tool to analyse AAI interventions (Thodberg, Berget, & Lidfors, 2014). The video-analyst, logically, was also not blinded for the intervention. We tried to account for possible bias by using several trained video observers and by comparing inter-rater agreement for sample sessions of all intervention groups. All observers also coded videos from different groups and interventions, thereby considerably reducing possible bias.

Due to the explorative nature of this study and the challenging practicalities, an additional qualitative approach with a focus on the experience of participants, staff and family members through participant observations, focus groups and interviews could have enhanced the results. Dugmore and colleagues reviewed qualitative studies focused on psychosocial interventions in dementia and concluded that qualitative research can provide valuable insights and pick up on those effects that are too fleeting to detect statistically in quantitative research (2015).

We used several questionnaires to determine baseline and follow-up characteristics – i.e. NPI-Q, – and monitored medication usage through standardised medication scores. These choices were based on both nursing home practices as well as previous studies (Zuidema, Koopmans, & Verhey, 2007). Nevertheless, other questionnaires could have provided additional insights. One such example is a quality of life questionnaire with a focus on the specific aspects of quality of life in dementia (Ettema, Dröes, de Lange, Mellenbergh, & Ribbe, 2007; Ettema et al., 2005). Ettema and colleagues have defined dementia specific quality of life as '*the multidimensional evaluation of the person–environment system of the individual, in terms of adaptation to the perceived consequences of the dementia*'. This definition shares common ground with the integrative model of human-animal interaction and would therefore be an interesting outcome in follow-up research.

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The initial smaller than expected sample size of our study (n = 66) and the subsequent loss to follow-up due to illness, death or refusal to attend, significantly hampered the power to detect effect-sizes in between group comparisons. The smaller than expected sample size reflects the difficulty of enrolling participants from a nursing home environment, both due to legal issues (informed consent by proxy, Kim, 2011) as well as practical issues (approaching large numbers of proxies in a short span of time, Cohen-Mansfield, Kerin, Pawlson, Lipson, & Holdridge, 1988). The issue of recruiting and retaining older adults – especially those with health concerns – in research studies is a well-known challenge and has in itself been a subject of intensive study (Mody et al., 2008).

The loss to follow-up was especially affected by an unforeseen influenza outbreak as well as the loss of a control group. In this particular control group, the participants deemed the control activity as too boring. In hindsight, it possibly would have helped to create a control activity that was more appealing, without losing the aim of the control group (i.e. observing behaviours in a handler only group). Marx and colleagues (2010) have looked at the effects of different dog-related stimuli for people with dementia and based on this research the use of dog videos (on a tablet for example) could be a possible solution to this problem. In their study, puppy videos especially created a high level of engagement between people with dementia, more so than plush dogs, robotic dogs or dog-colouring activities.

Comparability with other studies

Other AAI studies have found increased social interaction for people with dementia during dog activities (Bernstein, Friedmann, & Malaspina, 2000; Fick, 1992; Kongable, Buckwalter, & Stolley, 1989; Olsen, Pedersen, Bergland, Enders-Slegers, & Ihlebæk, 2016; Wesenberg, Mueller, Nestmann, & Holthoff-Detto, 2018) or robot activities (Jøranson et al., 2016; Libin & Cohen-Mansfield, 2015; Robinson, MacDonald, Kerse, & Broadbent, 2013). However, as far as we know, no other study has specifically tried to demonstrate the existence of a handler effect in AAI by observing social behaviours and isolating handler interaction during dog, robot and handler only control groups.

Most studies that researched the effect of AAI on agitation in people with dementia, did so by using questionnaires to measure agitation behaviours during the study duration. Results are mixed, some studies report a positive effect (i.e. a decrease in agitation during the study period, (Majić, Gutzmann, Heinz, Lang, & Rapp, 2013) other studies report no effect on agitation (Nordgren & Engström, 2014; Olsen, Pedersen, Bergland, Enders-Slegers, Patil, et al., 2016). In our study, we decided to focus on observed agitation during the dog or robot sessions instead of possible questionnaire effects over time. In our experience as nursing home practitioners, it is difficult to influence behaviours of people with dementia over a longer period of time, mostly due to the inherent progressive nature of the disease, while finding successful interventions that influence behaviour at a specific moment in time is usually more promising.

This is supported by a review by Smith and D'Amico (2019). They compiled a qualitative database of sensory based intervention studies for people with dementia and summarised the effectiveness for the different interventions. They found strong evidence for (short-term) effectiveness of massage, followed by moderate evidence for music, dance, mealtime interventions, light, gardening, AAI and yoga. A decrease in agitation during sessions, as visible in our study, was found for massage, music and gardening. Similarly, an increase in social interactions was described for AAI and mealtime interventions. A similar review of sensory interventions for dementia by Strøm and colleagues concludes that direct comparisons are difficult due to the high amount of variation, but that group sessions seem most promising (Strøm, Ytrehus, & Grov, 2016). They also emphasise the importance of providing a theoretical foundation to explain effects.

Towards An Integral Theoretical Framework

With our study, we tried to add knowledge to the integrative model of embodied human-animal interaction as proposed by Verheggen et al. (2017). In this model of enactive anthrozoology human and animal continuously reference each other and coregulate behavioural patterns (i.e. adapt to each other's behaviours). This cycle ultimately leads to attunement (i.e. mutual coordination) between human and animal. This mutual coordination concept is important for a successful handler-dog relationship. Furthermore, our results suggest that handler and dog act as a unit while responding and adapting to the behaviours of the participants. In contrast, handler and robot do not perform as a unit, but are separate entities without an embodied relationship and with separate effects on participants.

Due to diminished cognitive functions people with dementia have problems adapting their behaviours to others. This can result in negative behaviours like agitation or aggression. In our study, the participants are still able to react and adapt to the behaviours of the dog-handler unit and the resulting behavioural change is positive (i.e. less agitation). Apparently, the cycle of embodied dog-human interaction, the ability to 'experience' and to react to the stimulation of the senses, is still intact in people with dementia, possibly because this adaptive cycle is based on more sensorial behavioural components and does not rely on higher cognitive functioning.

Implications

Implications for nursing home practice

Based on our study, we have the following recommendations for daily nursing home practice:

- Dog activities are a successful intervention to increase social interaction and decrease agitation behaviours of people with dementia in that specific moment. It is often challenging to find suitable activities to provide people with dementia with positive experiences. Dog activities, therefore, are a valuable addition to activity programs in nursing homes. Dog activities are suitable for all levels of dementia severity and the various dementia types, if the behaviour of the participants does not endanger the other participants or dogs involved. Aggressive behaviour with potential harm to others, therefore, should be a contra-indication to participate in dog activities.
- When selecting dog teams nursing homes should be aware that both dog and handler are important for optimal results. Selection protocols should not only include dog criteria, but also handler criteria to ensure optimal fit with

the target population (i.e. people with dementia). Dogs should be trained to participate in these sessions. Selecting untrained dogs is a severe error in judgement, not only from an animal welfare and general safety viewpoint, but also because stress due to an unfamiliar environment, negatively impacts the ability for optimal attunement and thus negatively impacts the desired results. Handlers, equally, should be trained in how to interact with people with dementia to ensure optimal attunement. Nursing homes, therefore, should only select teams that are trained (dog and handler) and are officially qualified to do the work, for the sake of the safety and wellbeing of clients, handlers and dogs.

- Robot animal activities increase social interaction and do not require the continuous presence of a human facilitator. This means nurses can use robot animals to provide an activity without having to continuously supervise the participants, creating time to do other necessary tasks on the ward. Robot animals do not have to be specifically complex in technical functioning, are easily accessible (both in availability and price) and most importantly, especially when compared to dogs, are available 24/7. An upset resident, for example, who responds well to (robot-)animals, can be comforted with a robot animal at night without any issues. Each ward, therefore, should have at least one robot animal in their activity toolkit.

Implications for future research

6

Our results could be enhanced by similar follow-up studies with more participants to increase statistical power for between group comparisons or by a cross-over within-subjects design in which the participants are subjected to all interventions and act as their own control (Charness, Gneezy, & Kuhn, 2012). Additionally, a follow-up study could look at possible additional effects of more interventions per week - compared to once a week in our study - as well as the robustness of the effect over a longer period of time. As discussed above, a more qualitative approach seems also valuable, including the participant perspective with a specific focus on possible effects on experienced quality of life.

To further analyse the handler effect, a comparison of the exact same intervention with and without the presence of a handler would theoretically be interesting, but dog interventions without the presence of a handler are not practical and ethically unfeasible, not in the least from an animal welfare standpoint. Based on the theory of enactive anthrozoology, we assume the handler effect in AAI for dementia care is universal for all animal interventions and not specific to dogs, but without corroborating research this assumption remains theoretical.

Concluding Remarks

A lot has been written about the positive effects of the human-animal bond, both in popular and scientific literature. Similarly, many articles and books have been published about the challenges in dementia care and the difficulty of providing people with dementia with positive experiences. By bringing both worlds together – as we tried to do in this study - dog interventions are a valuable addition to the dementia care toolkit. Even though in this research field, as with other complementary interventions, it is often difficult to achieve scientific significance, we should not lose sight of what is most important: clinical relevance. Every smile, every touch, every positive moment of relaxation is worth it.

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CHAPTER 7

Nederlandse samenvatting

Dementie is een progressieve neurodegeneratieve ziekte met een enorme impact, zowel op de persoon zelf als op diens naasten. De typische klachten die bij dementie horen zoals geheugenverlies, problemen in plannen, organiseren, het uitvoeren van handelingen en algehele desoriëntatie, leiden met progressie van de ziekte tot een steeds grotere zorgbehoefte en afhankelijkheid van naasten (WHO, 2021). Bijkomende problemen als agitatie, agressie of apathie - ook wel neuropsychiatrische symptomen genoemd - leiden vaak tot een grote lijdenslast bij de persoon zelf en vormen een extra uitdaging voor mantelzorgers en andere zorgverleners. Mantelzorgers worstelen vaak met de balans tussen de zorgbehoefte van hun naaste, hun eigen welbevinden en de beschikbare professionele hulpverlening. Als deze balans niet houdbaar meer is, verhuizen mensen met dementie vaak naar een 24 uurs zorginstelling (WHO, 2021). In de laatste 20 jaar is binnen de zorg voor mensen met dementie (ook wel psychogeriatrische (PG) zorg genoemd) een duidelijke verschuiving merkbaar van het medisch model naar het persoon-georiënteerde model met een meer holistische inslag. PG zorg richt zich nu in de eerste plaats op de persoon die dementie heeft en diens specifieke behoeften. Deze behoeften kunnen breed zijn en variëren van lichamelijke en psychische hulpvragen tot aspecten gerelateerd aan de leefomgeving waarin de persoon verblijft, diens levensgeschiedenis en de specifieke schade in het brein die is ontstaan door het dementieproces (Kitwood & Bredin, 1992).

Deze verschuiving heeft de weg geopend voor psychosociale interventies als alternatief voor (regelmatig niet effectieve) medicatie inzet (Hulme, Wright & Crocker, 2010). Voorbeelden van psychosociale interventie bij dementie zijn muziektherapie, creatieve therapie, snoezelen, MiMakkers en bewegingsagogie. Al deze interventies hebben gemeen dat ze specifieke zintuigen prikkelen en de deelnemers activeren en stimuleren. Een andere psychosociale interventie die ook in dit rijtje past zijn dier-ondersteunde interventies, in het Engels Animal Assisted Interventions (AAI) genoemd.

Een dier-ondersteunde interventie is een doelgerichte en gestructureerde vorm van activiteit, therapie, coaching of educatief programma, waarbij dieren bewust worden ingezet als ondersteuning op het gebied van gezondheid, onderwijs en persoonlijke dienstverlening (bijv. sociaal werk) met als doel een positief therapeutisch effect op mensen te bewerkstelligen (IvA, 2022). De effectiviteit van AAI is gebaseerd op de unieke kwaliteiten van een dier, waarbij met name de non-verbale communicatie en de mogelijkheid om diverse zintuigen te prikkelen (zoals tast, visus, geur etc.) vaak genoemd worden. Ook het feit dat een dier - in tegenstelling tot mensen - niet oordeelt en een persoon, ongeacht diens beperkingen, altijd op dezelfde manier zal ontmoeten, wordt door deelnemers aan AAI sessies benoemd als waardevol. Het er toe doen, nuttig zijn en iets kunnen betekenen voor een ander staat vaak onder druk als iemand zelf zorg nodig heeft; een dier kan dan juist bijdragen aan het gevoel er nog steeds te mogen zijn.

Als mens en dier elkaar ontmoeten vindt er continue (vooral zintuiglijke) afstemming plaats in gedrag en emotie. Door dit proces ontstaan er nieuwe gedragspatronen en worden er nieuwe emotionele ervaringen opgedaan, zowel bij mens als dier. Op deze manier ontstaat een circulair proces van aanpassen aan elkaar en dit wordt samengevat in het theoretische model van integratieve mens-dier interacties, zoals opgesteld door Enders-Slegers (2022).

Ondanks hun cognitieve beperkingen zijn mensen met dementie nog steeds in staat om afstemming te vinden met een dier. Afstemming vindt immers instinctief plaats en zit ingebed in evolutionaire gedragspatronen en puur fysiologische reacties in het lichaam van mens en dier. Deze fysiologische reacties zijn veelvuldig beschreven (Friedman, Son & Saleem, 2015). Voorbeelden zijn verlaging van de bloeddruk bij zowel mens als dier en veranderingen in hormoonspiegels. Ook mensen met dementie kunnen dit proces doorlopen en op deze manier tot synchronie met een dier komen. Hiervoor zijn geen hogere hersenfuncties nodig.

AAI wordt steeds meer ingezet bij mensen met dementie en verschillende studies laten positieve effecten zien op psychosociale en fysieke uitkomsten. Zo verhogen groepssessies met een hond sociale interactie en kwaliteit van leven (Bernstein, Friedmann, & Malaspina, 2000; Olsen et al., 2016; Wesenberg, Mueller, Nestmann, & Holthoff-Detto, 2018). Tegelijk laten voorzichtige resultaten zien dat agitatie gedrag en depressieve symptomen kunnen worden verlaagd (Majić, Gutzmann, Heinz, Lang, & Rapp, 2013; Richeson, 2003).

Om de kennis over de effecten van AAI bij mensen met dementie verder te vergroten, worden in dit proefschrift 4 vragen op het gebied van AAI en dementie nader onderzocht:

- wat is de prevalentie van AAI in Nederlandse verpleeghuizen?
- welke uitdagingen komen kijken bij het uitvoeren van AAI onderzoek in het verpleeghuis?
- is er een effect van de begeleider op de uitkomst sociale interactie bij groepssessies met honden en robotdieren?
- wat is het effect van de aanwezigheid van een hond of robotdier op agitatie gedrag van mensen met dementie tijdens de interventies.

Enquête ‘AAI in Nederlandse verpleeghuizen’

Hoofdstuk 2 beschrijft de resultaten van een enquête onder Nederlandse verpleeghuizen over de mate waarin AAI wordt ingezet en de specifieke kenmerken ervan. In totaal 165 verpleeghuizen hebben deelgenomen aan de enquête, waarvan 125 verpleeghuizen benoemen met AAI bezig te zijn, veelal in de vorm van activiteiten met bezoek dieren. Het meest genoemde dier is een hond (108), gevolgd door boerderijdieren (101) en konijnen (76). Sommige verpleeghuizen hebben een inwonend huisdier, waarbij vogels (70) en vissen (50) het meest voorkomen. De verpleeghuizen die geen AAI in hun programma hebben (40) noemen zorgen over allergie, hygiëne en veiligheid als de belangrijkste reden.

Alle AAI programma's in de deelnemende verpleeghuizen zijn onderdeel van het activiteitenprogramma en hebben ten tijde van het onderzoek geen therapeutische doelstellingen. Dit type AAI wordt ook wel AAA, animal-assisted activities genoemd. De AAA sessies in de deelnemende verpleeghuizen worden veelal begeleid door een activiteitenbegeleider (93) en vrijwilligers (81). Over het algemeen worden de activiteiten georganiseerd voor mensen met dementie.

Indien een dier niet beschikbaar is of in de betreffende situatie geen haalbare optie, worden door een grote groep verpleeghuizen (88) alternatieven geprobeerd, zoals knuffels (83) en FurReal Friend robot knuffels (14). De geavanceerde zeehondrobot Paro wordt bij 7 huizen ingezet.

Een groot percentage van de deelnemende verpleeghuizen (102) heeft ten tijde van de enquête geen onderliggende AAI-protocollen rondom dierenwelzijn en veiligheid.

Uitdagingen bij AAI onderzoek in het verpleeghuis

Hoofdstuk 3 staat stil bij de uitdagingen van AAI onderzoek in het verpleeghuis. In ons onderzoek vergelijken we wekelijkse groepssessies van mensen met dementie met ofwel een hond (en begeleider), een robot (en begeleider) of alleen een begeleider (controle groep). Onderzoek met kwetsbare doelgroepen, zoals mensen met dementie, vraagt extra aandacht. Zo is er vooraf toestemming nodig van de medisch-ethische toetsingscommissie (METC) en van de wettelijke vertegenwoordigers. Ook blijkt in de praktijk dat juist de kenmerkende symptomen van dementie - geheugenproblemen, apathie, agitatie - van invloed zijn op de motivatie en mogelijkheden van mensen om deel te nemen aan de groepen. Afstemmen op de persoon en diens behoefte op dat moment blijkt essentieel - maar soms ook heel moeilijk - en in dat opzicht verschilt wetenschappelijk onderzoek eigenlijk niet van de dagelijkse praktijk van werken met dementie.

Dierenwelzijn is een belangrijk speerpunt bij AAI en om dit goed te borgen hebben medewerkers en studenten van de HAS in Den Bosch via videobeelden, post-sessie vragenlijsten en observaties ter plaatse het welzijn van de honden gemonitord. Ook de inzet van robotdieren vraagt een moment van ethische reflectie gerelateerd aan thema's als misleiding en verkindsen (Sharkey & Sharkey, 2012).

De verpleeghuis omgeving brengt ook haar unieke uitdagingen. Een gecontroleerde, geblindeerde studie is door de aard van de interventie niet mogelijk en de hoge werkdruk bij personeel en hoge turnover onder personeel zetten de wetenschappelijke voorwaarden soms verder onder druk. Een continue afstemming tussen de onderzoeksassistenten en het verplegend team blijkt hierbij een belangrijke factor. Onvoorziene omstandigheden, zoals een influenza-uitbraak ten tijde van het onderzoek, kunnen eveneens verstorend werken, maar zijn nu eenmaal onderdeel van het wonen en werken in een zorginstelling.

Een belangrijke uitdaging in dit werkveld zit in het meten van effecten die moeilijk kwantificeerbaar zijn, maar in de dagelijkse praktijk als zeer relevant worden ervaren. We hebben in onze studie getracht dit op te lossen door gebruik te maken van videocodering. Alle sessies zijn op video opgenomen en later gescoord op gedragingen en interacties. Hiermee kunnen we effecten beter objectiveren. Tegelijk vraagt het maken van opnames extra zorgvuldigheid vanwege de privacywetgeving en zeker wanneer het een kwetsbare groep als mensen met dementie betreft.

Sociale interactie tijdens hond en robot sessies

Hoofdstuk 4 beschrijft de resultaten van het onderzoek naar sociale interactie tijdens de groepssessies. Gedurende de onderzoeksperiode van 8 weken zijn alle sessies met een hond en begeleider (n=22), een robot en begeleider (n=24) en de controlegroep (alleen begeleider, n=20) op video opgenomen en is de interactie tussen deelnemers onderling, tussen deelnemers en de hond/robot en tussen deelnemers en de begeleider gecodeerd. Hiertoe zijn vier variabelen gedefinieerd: *conversatie* (praten met hond/robot/begeleider/andere deelnemer), *aanraken* (direct fysiek contact met hond/robot/begeleider/andere deelnemer), *type activiteit* (fysieke of verbale activiteit met hond/robot/begeleider/andere deelnemer) en de *sociale vorm* (solitaire activiteit of juist het betrekken van andere deelnemers of begeleider). Daarnaast hebben we gegevens verzameld over de mate waarin de begeleider initiatief neemt om de deelnemers bij de activiteit te betrekken. Ook zijn baseline karakteristieken verzameld over ernst van de dementie, aanwezigheid van neuropsychiatrische symptomen en medicatiegebruik, omdat deze mogelijk de resultaten kunnen beïnvloeden.

Indien de gescoorde sociale interactie via ANOVA analyse vergeleken wordt met een score van 0 (geen sociale interactie) is de variabele *aanraken van hond en robot* significant verhoogd in de respectievelijke groepen hond en robot. De variabele *aanraken van de begeleider* en *aanraken van andere deelnemers* is niet verhoogd. *Praten met de begeleider* is significant verhoogd in alle groepen, *praten met andere deelnemers* is juist in geen enkele groep significant verschillend van de 0 score. In de hondengroep is vooral *verbale activiteit* verhoogd, terwijl in de robot groep men vooral *fysiek* met de robot bezig is.

Een opvallende bevinding is dat in de hondengroep de totale score van interactie met de begeleider vergelijkbaar is met die van de interactie met de hond, wat weergeeft dat de deelnemer ongeveer evenveel tijd met de hond als met de begeleider bezig is. In de robot groep daarentegen is de interactie met de robot veel hoger dan die met de begeleider, wat aangeeft dat de deelnemer veel meer tijd met de robot dan met de begeleider bezig is. Hierbij is er gecorrigeerd voor de mate waarin de begeleider het initiatief neemt tot interactie. Dit verschil in interactie blijft gedurende de volledige 8 weken zichtbaar. Er is geen verschil in baseline karakteristieken tussen alle groepen.

Bovenstaande bevindingen ondersteunen de hypothese dat de aanwezige begeleider van de hond ook een bijdrage levert aan de sociale interactie uitkomst en dat hond en begeleider dus als een duo opereren. Bij de robot is dit effect er niet. Het effect van begeleider en robot vindt onafhankelijk van elkaar plaats. In de praktijk betekent dit dat bij inzet van een hond interventie niet alleen een selectieprocedure voor de hond van belang is, maar dat ook de begeleider bij de doelgroep moet passen. Een robot kan effectief zonder begeleider worden ingezet, wat maakt dat het een ideale interventie is om 24/7 toe te passen.

Agitatie tijdens hond en robot sessies

In hoofdstuk 5 wordt de analyse van agitatie gedrag tijdens de sessies beschreven. Door de Cohen Mansfield Agitation Inventory (CMAI) om te zetten naar variabelen die kunnen worden gecodeerd op basis van videobeelden zijn alle eerste sessies van de hondengroep (n=22), de robot groep (n=24) en de controlegroep (n=20) geanalyseerd. Hierbij zijn drie groepen van gedragingen geclusterd: *fysiek niet-agressief gedrag* (PNA), *fysiek agressief gedrag* (PA), *verbaal geagiteerd gedrag* (VA) en er is ook een somscore (PNA+PA+VA) vastgesteld. Alle scores zijn gestandaardiseerd op basis van de tijd waarin het gedrag kon worden vertoond. De agitatie gedragingen zijn voor twee verschillende situaties vastgelegd: (1) de geobserveerde deelnemer is zelf bezig met de hond of robot en (2) een andere deelnemer is bezig met de hond of robot.

Diverse baseline karakteristieken zijn vastgelegd, waaronder ernst van de dementie, type van de dementie, baseline CMAI scores en intercurrente ziekten en medicijngebruik die agitatie gedrag kunnen beïnvloeden.

In alle drie de groepen is agitatie gedrag aanwezig op het moment dat de deelnemers niet zelf met de hond of robot bezig zijn. Hierbij komen PNA gedragingen het meeste voor, gevolgd door VA gedrag. PA gedrag wordt niet gezien. Zodra een deelnemer met een hond bezig is, verdwijnen de agitatie gedragingen volledig (de som-score PNA+PA+VA gaat naar 0). In de robot groep en controlegroep daalt het agitatie gedrag ook, maar deze daling is niet significant. De baseline CMAI scores zijn niet gecorreleerd aan het effect. Ook medicijngebruik, dementie type, ernst, en intercurrente ziekten verschillen niet tussen de groepen.

De resultaten uit deze studie laten zien dat de hond een effectieve prikkel is om agitatie gedrag op het moment zelf te verminderen, ongeacht type en ernst van de dementie.

Discussie & Aanbevelingen

In het laatste hoofdstuk (hoofdstuk 6) worden de bevindingen uit de verschillende studies geïnterpreteerd vanuit het integratieve model van mens-dier interacties en worden enkele algemene aanbevelingen gedaan.

Onze studie ondersteunt het model van integratieve mens-dier interacties. De resultaten op het gebied van sociale interactie en agitatie laten zien dat hond en begeleider als een duo opereren en het effect niet los van elkaar kan worden gezien. Hierbij vindt er niet alleen continue afstemming plaats tussen deelnemer en hond, maar ook tussen deelnemer en begeleider en tussen begeleider en hond. Het feit dat iemand dementie heeft doet hier niets aan af. Het blijkt nog steeds mogelijk om de cirkel van afstemming en reageren op elkaar rond te maken, zelfs zodanig dat een activiteit met een hond agitatie gedrag van mensen met dementie volledig kan reduceren. Bij de robot daarentegen - als inert voorwerp per definitie niet in staat tot continue afstemming op de omgeving - fungeren robot en begeleider als twee separate entiteiten en heeft de begeleider nauwelijks een rol in het geheel. Het is de robot zelf die het effect op sociale interactie en agitatie bewerkstelligt, zij het in wat mindere mate dan het duo hond en begeleider.

Aanbevelingen voor de dagelijkse praktijk:

- groepsactiviteiten met een hond zijn bij mensen met dementie een succesvolle interventie om sociale interactie te verhogen en agitatie gedrag te verminderen. Hiermee is AAI een waardevolle aanvulling op het activiteitenprogramma in een verpleeghuis. Zolang het gedrag van een deelnemer geen gevaar is voor andere deelnemers of de hond, kan de activiteit worden ingezet bij alle fasen en alle verschillende vormen van dementie.

- bij de selectie van hondenteams moet er rekening mee worden gehouden dat het effect ook bepaald wordt door de begeleider die er bij is. Selectie procedures moeten dus niet alleen criteria op het gebied van de hond bevatten, maar ook rekening houden met welke kwaliteiten de begeleider moet hebben om goed om te kunnen gaan met mensen met dementie. Ongekwalificeerde honden en begeleiders inzetten bij honden activiteiten in het verpleeghuis is een ernstige inschattingsfout en kan zowel op het gebied van dierenwelzijn als algemene veiligheid negatieve gevolgen hebben. Ook het resultaat wordt negatief beïnvloed als hond en begeleider niet goed op elkaar zijn ingespeeld.
- robotdieren verhogen sociale interactie en hebben geen continue aanwezigheid van een begeleider nodig om hun effect te bewerkstelligen. Hoewel het effect wat lager is dan het gecombineerde effect van een hond en begeleider, is het toch aan te bevelen om op een woongroep voor mensen met dementie de beschikking te hebben over een robotdier. Deze robots kunnen immers 24/7 worden ingezet en vragen niet continu monitoring door de zorgmedewerker. Een FurReal Friend of vergelijkbare robot knuffel is daarmee een zinvolle aanvulling op de 'activiteitenkist' van iedere woning.

Er is veel geschreven over de positieve effecten van de band tussen mens en dier, zowel in populaire als wetenschappelijke literatuur (Beetz, Uvnäs-Moberg, Julius, & Kotrschal, 2012; Fine, 2010; Friedmann & Son, 2009). Even goed is er veel geschreven over de uitdagingen in dementiezorg en hoe belangrijk het is om mensen met dementie een positief moment te bieden (Ministerie van Volksgezondheid, 2020, Alzheimer's Research UK, 2022; WHO, 2021). In deze studie hebben we geprobeerd om beide werelden samen te brengen en concluderen we dat interventies met honden - en in mindere mate robotdieren - een waardevolle aanvulling vormen op de al aanwezige psychosociale interventies binnen de dementiezorg. Binnen dit onderzoeksveld is het vaak moeilijk om de effecten in getallen van wetenschappelijke significantie uit te drukken. Als professionals in de zorg moeten we vooral ook niet uit het oog verliezen waar het in de praktijk om gaat: de klinische relevantie. Iedere glimlach, aanraking en elk positief moment van ontspanning is het waard.

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CHAPTER 8

Addendum

At the start of this PhD project the underlying integrative conceptual model of human-animal interaction as presented in the introduction was not developed yet. Instead we used well-known theories from dementia care and theoretical constructs from human-animal interaction studies as the underlying basis for this study. We added this addendum to explain how these models fit together and how our perspective changed during the study period.

In dementia care the biopsychosocial (BPS) model is often used to analyse neuropsychiatric symptoms (NPS) like agitation or aggression. The BPS model was first described by psychiatrist George Engel as a conceptual model to evaluate patient care and treatment (1980) and is also suitable to evaluate NPS symptoms. Using the BPS model practitioners can investigate all possible contributing factors to NPS by systematically gathering information in three categories: biological factors (i.e. all factors related to physical well-being, for example pain), psychological factors (i.e. all factors related to the person, personality traits, dementia type, biography etc.) and social factors (i.e. the social environment of the person with dementia). Analysing the contributing factors can subsequently steer the practitioners in the right path to finding solutions. A well-known model in dementia that is based on BPS is the model of Kitwood (Finnema, Dröes, Ribbe, & van Tilburg, 2000; Kitwood & Bredin, 1992): a 'formula' based on 5 BPS-like categories that is very useful in everyday practice.

Behaviour = P + B + Ph + N + S

P = personality and coping

B = biography

Ph = physical well-being

8

N = neurological damage

S = social and environmental factors

All factors pose challenges when a person is diagnosed with dementia, but especially the personality and coping variables. These variables are often less clear - compared to for example pain - and more difficult to influence. People with dementia often experience insecurity, have a low self-esteem, feel no longer valuable or useful and - due to cognitive decline - previous successful coping strategies can become unsuccessful or even harmful (dos Santos, Rocha, Fernandez, de Padua, & Reppold, 2018; Finnema et al., 2000). Even one variable that is disturbed or imbalanced can lead to neuropsychiatric symptoms.

In the last decades a paradigm shift has taken place in dementia care, away from medication and towards psychosocial interventions to influence the variables involved. Interventions like music therapy, physical exercise, creative therapy, elder clowns and 'snoezelen' all have become popular within the nursing home (Abraha et al., 2017). All these interventions have in common that they stimulate the senses, the body or the brain in various ways without the need for high-level verbal interaction. Snoezelen specifically is a passive intervention for stimulating senses in end-stage dementia via smells, sounds and visuals (Van Weert, Van Dulmen, Spreeuwenberg, Ribbe, & Bensing, 2005). The focus on psychosocial interventions and - more importantly - the underlying needs of people with dementia, also resulted in a better understanding of how people with dementia can fulfil those needs, even though they have cognitive impairments. Robert Weiss first described a set of basic but essential human needs (1974) and these needs can become compromised when a person suffers from cognitive decline (Finnema et al., 2000). Examples of the basic needs are attachment to others, feelings of self-worth, sufficient social support and the need to be there for or take care of others (being needed). Weiss also coined the term *emotional loneliness* as the lack of a close, intimate attachment to another person.

With the advent of animal-assisted interventions (AAI) in various (psychiatric) fields, it is not surprising that AAI were also deemed a possible valuable intervention in dementia care (Yakimicki, Edwards, Richards, & Beck, 2019). Animals are known to have positive effects on the well-being of humans, both physically and emotionally. Interacting with animals can lower blood-pressure, increase physical activity and lower stress hormones (Beetz, Uvnäs-Moberg, Julius, & Kotrschal, 2012; Feng et al., 2014; Handlin et al., 2011). Caring for animals has been shown to raise life satisfaction, especially in older adults, with or without cognitive impairment (Gee, Mueller, & Curl, 2017). Animals also provide emotional support and a source of attachment (Beetz, 2017). Research has shown that animals can even relieve the emotional loneliness as described by Weiss, especially during periods of bereavement (Sable, 2013). Animals are also able to mediate between humans, especially in those circumstances that are deemed threatening, like therapy sessions. Examples exist - especially in psychiatry - in which therapy sessions are more successful in the presence of a dog (Jones, Rice, & Cotton, 2019; Wijker, Leontjevas, Spek, & Enders-Slegers, 2019).

At the start of this research project we combined the dementia models and the possible AAI pathways into one model (figure 1). In this model we propose two possible pathways for AAI to influence the Kitwood model.

Animal interventions, firstly, fit seamlessly in the same category as other psychosocial interventions. Animals stimulate various senses and are in fact very adept at providing *snoezel*-experiences because they move, make noise, smell and have a warm, often cuddly, body. Petting animals has been shown to relieve stress (Handlin et al., 2011; Polheber & Matchock, 2013). Playing with animals increases movement (Feng et al., 2014). Animals communicate non-verbally and this is especially valuable for people with dementia with diminished verbal skills. Animals are known to be a powerful stimulus for people. This attraction to animals is part of the *biophilia* concept, i.e. the innate love for living beings (Beetz et al., 2012; Wilson, 1984). When an animal is in the room, it always draws the attention of humans.

Secondly, as described above, interacting with or taking care of animals can directly influence the basic human needs as formulated by Robert Weiss. An animal will not judge you for your diminished cognitive abilities, nor will it make you feel less worthy because you cannot hold your own in a conversation. Instead animals often provide a source of comfort, support and attachment without discrimination and increase feelings of self-worth and being needed (Lasher, 1998).

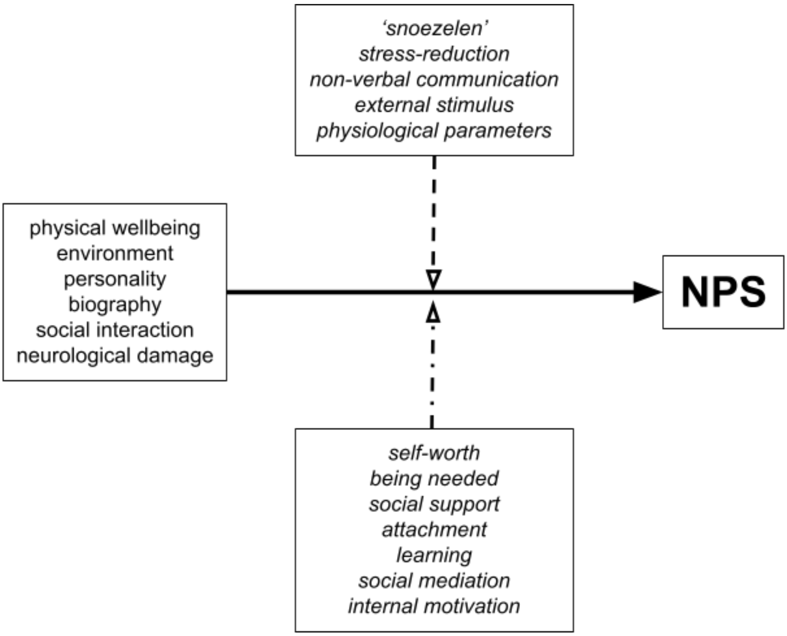

Figure 1. On the horizontal axis are listed the Kitwood variables that are involved in the expression of neuropsychiatric symptoms (NPS) and on the vertical axis are summarised the hypothetical pathways for AAI to influence these variables, either via similar effects as known dementia care interventions (top) or fulfilling basic human needs, based on Weiss (bottom).

Even though this model was developed at the start of this research project, without taking the broader picture of human animal interaction into account, it does - in fact - align with the integrative embodied model that has been developed at our research institute in the past 10 years (figure 2).

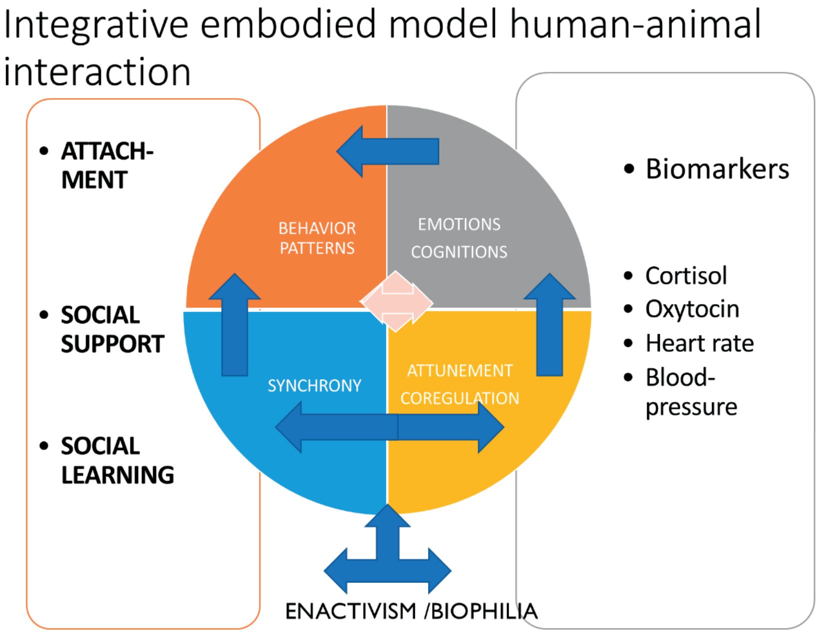

Figure 2. An integrative model for human-animal interaction with the psychological constructs on the left and the involved biomarkers on the right (Enders-Slegers, 2022).

The psychosocial constructs of attachment, social support and social learning are based on the same needs as described by Weiss. Even though in our study we chose not to use invasive procedures to measure biomarkers (due to ethical considerations) other studies found that biomarkers are accurate parameters for stress and relaxation (Odendaal, 2000). The constantly evolving inner circle of behavioural patterns, emotions, attunement and synchrony between human and animal seems to apply equally for people with dementia. This is - in a way - a logical assumption, because these patterns are not only based on basal animal principles, they also do not require higher levels of brain functioning, but instead are primary body responses (Verheggen, Enders-Slegers, & Eshuis, 2017).

Therefore, we decided to use the integrative model as the underlying model in this thesis, even though in the initial research protocol we used figure 1 as the theoretical foundation. Using the same model between research projects is not only useful in comparisons, but also contributes to expanding and understanding the model further.
Another change that occurred during our research project is a shift of focus towards the possible effect of the handler that is always present during an AAI session. During sessions the participants do not only interact with the animal, but also with the handler. The handler and animal in turn are also continuously interacting with each other following the same integrative model of continuous attunement and adjustment of behavioural patterns as described above. This insight, coupled with a lack of research in this area, led us to an adjustment in our protocol to include handler interaction in our measurements. This resulted in the – to our knowledge – first analysis of the handler effect on social interaction during dog and robot sessions with people with dementia and the valuable conclusion that dog and handler seem to operate as a unit, in contrast to robot and the 'robot-handler' (Schuurmans, Noback, Schols, & Enders-Slegers, 2021, Chapter 4). This, subsequently, is important knowledge for daily nursing home practice and the selection criteria needed for finding dog-handler teams to work with people with dementia. It is not only the dog that needs careful selection, but also the handler.

During our study we experienced quite a loss to follow up in the participants that greatly influenced the statistical power to detect changes over time. This loss to follow up was partly due to the inherent progressive nature of dementia and partly due to specific challenges related to research in nursing homes (Schuurmans, Noback, Schols, & Enders-Slegers, 2019, Chapter 3). Questionnaires over time are often seen as the gold standard in research and the best way to measure effects. The loss to follow up, however, created a dilemma: continue or quit? Instead of declaring the study as a lost cause, we instead felt it justified to focus on the data we were able to gather, specifically the session video data. This felt even more justified based on the daily practice of dementia care. Dementia is a progressive neurological disease that will eventually decline, despite all interventions. Even though effects over time can be useful indicators, the main aim in daily practice is to make people with dementia feel better in the here and now. It is especially challenging to find the right interventions when needed. Nurses or caregivers often struggle with specific behaviours at specific times, behaviours like agitation or apathy, and having a toolkit of possible interventions to try at that moment is extremely valuable. Research has shown, for example, that a person with frontotemporal dementia and agitation can be helped through a technique called *focusing*: repetitive tasks that require high concentration (Prins & Hendriks, 2017). This means that wards with people with frontotemporal dementia need to be equipped in providing these focus interventions. Equally so, people with other forms of dementia can have different needs. Based on the diversity of NPS and the complexity of the variables involved, it is important to expand the available toolkit within nursing homes to a broad range of interventions that can be used in specific situations. In daily practice we aim to have a set of usable interventions on each ward that can be tailored to the specific needs of each resident. Based on our research we feel confident in stating that regular dog interactions as described in this project, but also the 24/7 access to a robot animal are both valuable additions to this toolkit and can each be used for different needs.

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Er komt heel veel kijken bij de praktische uitvoering van een onderzoek, niet alleen wat betreft personele inzet en praktische ondersteuning, maar ook doorzettingsvermogen binnen het team en een zekere mate van flexibiliteit om te kunnen schakelen wanneer nodig. Het begint echter allemaal met vertrouwen, het vertrouwen dat het onderzoek dat je voor ogen hebt waardevol is voor de praktijk en steun verdient in de uitvoering. Gelukkig ben ik in het allereerste begin precies die mensen tegengekomen die me dat vertrouwen hebben gegeven.

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Ook Jos was vanaf het begin enthousiast voor een dierenproject, ook al was het een heel ander soort project dan de reguliere medische onderzoeken binnen de ouderenzorg. Jos, jouw vertrouwen, steun, waardevolle adviezen en scherpe blik hebben me heel erg geholpen om dit project te voltooien. Heel veel dank daarvoor!

Ook aan de kant van de Zorgboog heb ik heel veel steun en vertrouwen mogen ontvangen. In de eerste plaats van Ton en Henri, die direct enthousiast waren om een onderzoek dat echt voeling had met de dagelijkse praktijk te ondersteunen, hoe onconventioneel het onderwerp ook was. Ook in die situaties dat het soms wat moeilijker liep, bleven jullie mij steunen. Dit is niet altijd vanzelfsprekend als het gaat om financiering van onderzoeken en ik kan niet vaak genoeg herhalen hoe dankbaar ik daarvoor ben. Het blijft verschrikkelijk dat Ton er niet meer is om het uiteindelijke eindproduct in handen te kunnen houden. Zijn onverwachte overlijden voelt nog steeds onwerkelijk.

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Ook wil ik al mijn collega's binnen de antrozoölogie club bedanken voor hun support en gezelligheid. New York en Parijs springen eruit als highlights, maar er zijn zoveel meer mooie en leerzame momenten geweest. Ik kijk met veel plezier terug op de pre-covid PhD dagen, waarbij we een kijkje namen in elkaars keuken. Achter de schermen bij diverse dierenprojecten bleek het ontzettend leerzaam en leuk! Carolien, Richard, Geza, Tynke, Karin, Roeslan, Riki, Peter, Ine, Mascha, Steffie, Theo en Ruth, dank allen! Ook een bedankje aan het secretariaat voor hun hulp bij vragen mijnerzijds.

Tot slot een bedankje aan alle mensen die me vanaf de zijlijn hebben aangemoedigd en ondersteund. In de eerste plaats al mijn lieve collega's van de voltallige medische vakgroep van de Zorgboog. Jaren geleden noemden we onszelf het Dream Team en dit predicaat is wat mij betreft nog steeds van toepassing. Wat prijs ik me gelukkig met zulke fijne collega's en alle steun, die ik heb mogen ervaren in de afgelopen jaren. Niet alleen gerelateerd aan mijn promotie, maar ook toen ik persoonlijk met tegenslag te kampen had. Het is gemakkelijk om dingen voor vanzelfsprekend aan te nemen, maar ik ben me er ten volle van bewust dat ik geen beter team van collega's had kunnen hebben. Heel veel dank vanuit de grond van mijn hart!

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met het doorlezen van alle teksten - de komma's, de komma's, de komma's! - maar vooral ben ik je dankbaar voor alle gezellige momenten samen. Of het nu op vakantie in Engeland of Schotland is of op de fiets in Noord-Holland of in de boekhandels in Amsterdam, het zijn deze momenten die de batterij weer doen opladen. Ellen, ook met jou heb ik veel fijne en waardevolle momenten beleefd. Of het nu tijdens een wandeling is, in een museum of bij het samen kijken van een vrouwenvoetbalwedstrijd (in een stadion of op tv), wat ben ik je dankbaar voor je positiviteit, je luisterend oor en je enthousiasme.

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Curriculum vitae

CV

Lonneke Schuurmans is geboren in Veghel op 21 juli 1979. Zij behaalde haar VWO diploma aan het Zwijsen College in Veghel. In 2002 voltooide zij haar universitaire studie in de Fundamentele Biomedische Wetenschappen aan de Universiteit van Utrecht en in 2006 studeerde zij af als basisarts aan de medische faculteit van dezelfde universiteit. In 2009 voltooide zij de Vervolgopleiding tot Verpleeghuisarts aan de Radboud Universiteit om zich daarna verder te specialiseren tot kaderarts psychogeriatrie aan de Vrije Universiteit van Amsterdam (2012). Sinds 2009 werkt zij als specialist ouderengeneeskunde bij de Zorgboog en vanaf 2022 werkt zij bij deze organisatie tevens in de rol van medisch directeur.

Als bioloog en arts heeft de interactie tussen mens en dier haar altijd gefascineerd. In 2013 is zij daarom - met steun van de Zorgboog - gestart als promovendus bij de vakgroep Antrozoölogie van de Open Universiteit om zich verder te verdiepen in de effecten van dieren bij mensen met dementie.

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