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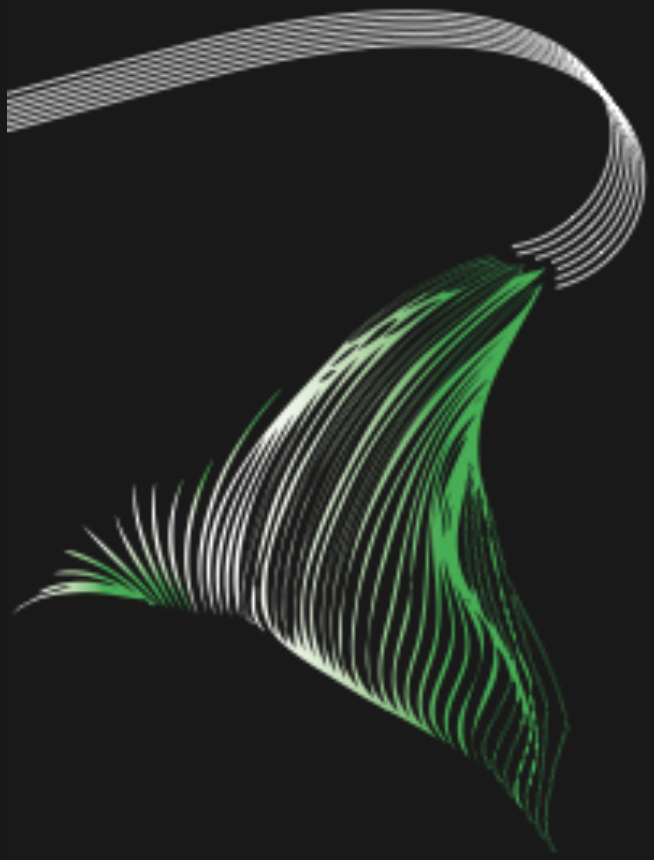

ANIMAL ASSISTED THERAPY AMONG ELDERLY PATIENTS WITH DEMENTIA
- A SYSTEMATIC LITERATURE REVIEW

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Abstract

The aim of this bachelor thesis was to examine effects of cognitive functions, behavioral and psychological symptoms of dementia, social aspects, physiological changes and other effects of animal assisted therapy - especially that of dogs - on people suffering from dementia. With the aid of a systematic review of literature the current state of research was analyzed systematically. Search engines used in the systematic literature review were PsycINFO, Scopus and PubMed. In addition, other relevant articles were obtained using free text search. A classification in categories of all search terms into five groups yielded an overall of 154 articles that were then analyzed after conclusive studying of their titles and abstracts and their final full text versions, while still keeping in mind the predefined criteria of inclusion and exclusion. Thus the research yielded a total of fifteen relevant articles. The results of the studies showed that especially in the field of social aspects the utilization of animal assisted therapy promotes a distinct increase of competences of those affected. In the other four categories an improvement of abilities and facilities through animal assisted therapy was not substantiated.

A fundamental problem when comparing the analyzed studies was the absence of comparability of the deployment of dogs, instruments of measurements, and missing control groups.

Samenvatting

Het doel van deze bachelorthese was, de effecten van cognitief functioneren, “behavioural and psychological symptoms of dementia” (BPSD), sociale aspecten, fysiologische veranderingen en overige effecten van “animal assisted therapy” voornamelijk met honden bij mensen met dementie te achterhalen. Met behulp van een systematische literatuur review werd de actuele stand van de wetenschap systematisch geanalyseerd. De zoekmachines PsycINFO, Scopus en PubMed werden gebruikt. Een classificatie in vijf categorieën welke de overkoepelende begrippen van alle zoektermen vormden, leverden in het geheel 154 artikelen op. Deze werden op basis van de titels en abstracts geanalyseerd. De “full text“ versies werden met de vooraf vastgelegde inclusie en exclusie criteria vergeleken. In het geheel leverde het zoeken vijftien artikelen op. De resultaten lieten vooral een verhoging van de competenties in relatie tot sociale aspecten zien, welke aan de inzet van “animal assisted therapy” gerelateerd waren. De anderen vier categorieën vonden geen effecten in de zin van een verbetering van de capaciteiten en vaardigheden door “animal assisted therapy”.
Het universeel probleem van de geanalyseerde studies bestond in moeilijkheid van de vergelijking van de inzet van de hond, van de meetinstrumenten en het ontbreken van de controlegroepen.

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Introduction

Dementia

The evolution of the way we age is becoming increasingly transparent. In Europe and especially Germany the share of the old-age population is continually increasing in consequence of rising life expectancy. Thus, the projected life expectancy in Germany according to the mortality table of 2009/11 in the case of a 60-year-old woman is a further 24.96 years while a man of the same age is expected to live another 21.31 years (Statistisches Bundesamt, 2013). Ageing itself brings with it specific problems and disorders. It is especially these ageing related illnesses such as dementia that are becoming more frequent. According to a study by the German Alzheimer's Association there are about 1.4 million cases of people falling ill to a disease related to dementia (Deutsche Alzheimer Gesellschaft, 2012). Estimates show that there is a good possibility that the number of people suffering from dementia will have increased to 3 million by 2050. The prevalence of dementia rises with increasing age. Thus, about 1.5% of 65-69 year-olds are affected by dementia, among 90 year-olds the proportion is already 30% and among those 100 years of age and older even 60% of people are affected. The approximate annual percentage of incidences based on worldwide observations forecast 0.4 % of 65-69 year-olds, rising to 10% among those older.

Women constitute over two thirds of all dementia sufferers, mostly due to the fact that they have a higher life expectancy. Almost half of people dependent on care have dementia, and with the increasing necessity for care this proportion of people suffering from dementia grows rapidly. Dementia is also usually the reason for patients to be required to be resident in a care home while the quota of residents with dementia has constantly increased in recent decades. Currently 60% of all care home residents are affected by this condition (Federal Health Report, 2005, p.7).

This has an impact on numerous bio-psycho-social issues, such as the treatment and care of dementia patients in old age, as well as therapeutic treatment options. Almost 70% of those in need of care receive treatment and care from their partners, adult children or other members of their family in the environment of their own home. This trend is not only the result of the costs of hospital and nursing charges, but is also motivated by other factors (such as gratitude, commitment and fear of loneliness). In view of these facts it can be observed that dementia is still regarded as a taboo issue, and embarrassment, ignorance and the fear of stigmatization lead to little coverage of such a topic within society. This gives rise to the fact

that there are still many people who treat their relatives at home without seeking the help of existing support services, such as counselling services for caring relatives, care points or self-help groups (Kaduszkiewicz, Röntgen, Mossakowski & van den Bussche, 2009). The result is an increasing burden on careers as well as on old people suffering from dementia (Vogt, 2001).

In order to specify this train of thought, the definition and classification of dementia after ICD-10 and DSM-IV will be concentrated on hereafter, furthermore the focus will be set on an extended form of treatment involving animal assisted therapy with dogs to treat demential illness. With the aid of a systematic literature review existing empirical insights will be considered and evaluated in order to determine the effectiveness of animal assisted therapy for dementia sufferers.

Definition and criteria of diagnosis

In the etymological sense the word dementia is derived from the Latin 'de mens', figuratively meaning "away from sense and soul". Furthermore the term dementia merely represents a category, or more specifically a syndrome which groups together a number of meta-categories or varieties of different pathological thought disorders and memory defects (Bowlby Sifton, 2011). In general it can be said that dementia refers to an acquired deficiency of memory combined with the decline of further brain capacity functions which in turn lead to an impairment of the ability to cope with everyday life. Various systems of classification are implemented internationally to categorise this disorder in a systematic manner. The common method in Germany is the 'International Classification of Diseases' (ICD-10) and the 'Diagnostic and Statistical Manual' - which is more prevalent in the United States - of which the latest issue is the DSM-IV. In part both systems of classification delineate the attributes of the illness differently. The ICD-10 refers to a decline of long-term and short-term memory as well as the decline of newly acquired cognitive abilities involving thought, orientation, language as well as the ability of judgement. Equally characteristic is the reduction of emotional control, drive and impairment of social interaction and behaviour as daily activities are affected by the impairment of memory and of cognitive skills. In order to be able to attempt a classification the impairment of cognitive abilities and of memory have to be prevalent six months or more while delirium has to be ruled out.

In contrast to this, the DSM-IV explicitly points out the combination of disruption of memory with at least one of the other following impairments:

- aphasia: impairment of language

- apraxia: impaired motor abilities
- agnosia: inability to identify or recognise objects
- impairment of executive functions such as planning, organising, or following a specific sequence.

The impairment of memory and a significant deterioration of social and vocational functions represent examples for further categorisation, as does the decline of performance level and other cognitive deficits that do not exclusively occur during delirium.

Forms of dementia and anamnesis

There are multiple forms of dementia that are differentiated according to development, progression and their effect on the patient. A distinction is made between primary forms (consequences of circulatory disorder or degenerative processes in the brain), and secondary forms of dementia that result from other diseases, such as the effect of intoxication by substance abuse, epileptic disease or brain tumour (Falk, 2009). The most frequent form of dementia is Alzheimer's disease, accounting for almost 55% of all cases, other neurodegenerative dementias - including front-temporal dementia and Lewy-body dementia as well as dementia involving Parkinson's disease - account for a further 10% - Vascular dementias encompass about 20% of all cases of dementia that may occur with microangiopathy and makroangiopathies, of which the last case is also known as multi-infarct dementia (Zeyfang, Hagg- Grün & Nikolaus, 2008). Different diagnostic procedures are required due to the special ethical and professional importance of diagnostic specifications that at the same time can also promote stigmatisation processes in addition to a temporary clarity of the development of a syndrome. The Deutsche Arbeitsgemeinschaft der wissenschaftlichen medizinischen Fachgesellschaften (AWMF) favours a two-step method in the diagnosis of dementia (AWMF, 2009). The first step involves an anamnesis as well as psycho-pathological findings and a neuropsychological screening process. The causative disorder is attempted to be determined during the second step. Thorough physical examinations are performed while taking other imaging modalities such as CT, MRI into account, as well as using chemical laboratory blood tests. Additional diagnostic instruments of the S3 guideline are dementia detection (Dem Tect), the mini mental state examination (MMSE) and/or the assessment of early detection of dementia applying a depression boundary (TFDD). Additionally, the clock test can also be applied. These diagnostic screening methods are often used for diagnostic classification and the observance of the course of dementia, but also to clarify and assess other cognitive disorders (Gosch &

Hofmann, 2012).

Treatment

The treatment methods for primary dementia are focused on the retardation and containment of the progression of the illness, as well as the relief of accompanying symptoms. In secondary dementia, the focus is placed on causative disorder. Dementias all progress differently. Thus, the development of the disease is as individual as the person affected, while distinctions can be made in respect of general structures. According to studies, vascular dementia tends to progress in steps and alternating rapid improvements and deteriorations can be observed. Alzheimer's disease, however, represents a continuous progression (Demenzkampagne Rheinland-Pfalz, 2013). Falk (2009) and Payk (2010) subdivide its course into three phases: initial stage, advanced stage and late stage. Analogous to the phases, the severity of impairments can be graded as slight, medium and severe. Likewise, a classification of clinical severity can be applied using the Reisberg spectrum. This includes seven classes differentiated as follows: "no symptoms", "forgetfulness", "failure to perform complex tasks in work and society", "necessity of assistance with difficult tasks of everyday life", "necessitating assistance when choosing clothes, assistance with dressing, bathing, using the toilet", "the reduction of speaking abilities down to six words", "loss of speech, impairment of walking, sitting, laughter, and the inability to hold their head straight". These categories are distinguished in accordance with their main symptoms and their severity (modified shortened version, Reisberg, 1986; in Zeyfang et al., 2008, p. 149).

The so-called 'depressive pseudo-dementia' is to be separated from the clinical picture of classic dementia as this variant is characterized by emotional impoverishment, inhibition of thought, drive disorder, and the compromise of memory and concentration. It does not classify as dementia because the necessary distinctive features of classification are not present.

The first step in primary treatment concepts is a pharmacological approach with substances that prevent the enzymatic degradation of the transmitter substance acetylcholine. These cholinesterase inhibitors are implemented especially when treating Alzheimer's disease in a moderate or mild stage of dementia. Alternatively memantines can be administered, which contain an active agent that protects neurones from the excessive influx of glutamate. The side effects of the administered drugs however are problematic, one of the most crucial being increased agitation of the patient under treatment (Zeyfang et al., 2008). Also, the medical goal of achieving a slowing down or even halting of the progression of the disease or

an improvement in cognitive and relevant everyday life skills and abilities has only been observed in rare cases depending on the severity of the disease. Thus, apart from the purely medical observation, bio-psycho-social processes are focused on, in particular involving aspects such as the protection of autonomy or an improvement of subjective well-being, which all require separate treatment orientations.

Currently, there are already numerous approaches aimed at the physical and mental activation and relaxation of patients, such as physiotherapy (physical therapy), occupational therapy, memory therapy (reading, viewing photos and movies, listening to music), milieu therapy (provision of a secure environment), aromatherapy, music therapy or multi-sensory stimulation (Snoezelen), all aiming to reduce anxiety (Deutsche Alzheimer Gesellschaft, 2013). Here validation can also be seen as a possibility of treatment.

Validation

Validation is a specific approach that should be mentioned (Feil, 2000), which literally means 'declaring something valid' and refers to the reality demented old people find themselves in. Feil supplemented Erikson`s model of development stages, comprised of life stages and tasks, with another stage in life: 'old age'. In this final stage she describes the processing stage which runs through four phases.

Feil describes the first phase as "*faulty/unfortunate orientation to reality*". In this phase the cognitive abilities are still largely intact, but the victims are aware of occasional confusion. However, they refuse to acknowledge feelings and memory gaps and blame others for their loss. Also, conflicts from the past are frequently projected onto people of the present. The fear of further losses leads to behavioural disorders such as 'hoarding' and 'stockpiling'. Dementia sufferers in this stage cling to reality and their socially prescribed roles. They feel vulnerable, reject tactile and eye contact and often assume a tense posture.

The second phase - "*temporal confusion*" - is characterised by the increase in physical and social losses that cannot be denied at this stage. Sufferers attempt to retreat into the past, and no longer orientate themselves to reality. In regard to the emotional level this involves a return to universal feelings such as love, hate, sadness and fear, as well as the attempt to reactivate pleasant emotions from the past. Dementia sufferers in this stage express their feelings directly. They lose the ability to exert their role in society as well as that of verbal communication, which is henceforth limited. Patients also exhibit a relaxed posture and respond positively to body and eye contact.

In the third phase - "*repetitive movements*" - the patient returns to pre-linguistic sounds and movements that replace sounds. Their language is incomprehensible and the use of early forms of speech and movement are a medium of transport into the past. Objects, body parts and specific persons take on a progressively significant symbolic importance in relation to days gone by. Those affected withdraw into isolation and self-stimulation in the form of repetitive movement or expressions of sound, and often communicate solely through eye contact and physical contact.

In the fourth phase - *"vegetating"* - the human loses contact with his immediate environment while at the same time no longer feeling the desire to gain control of his life (Feil, 2000, p. 60). There is minimal self-drive of sufferers to be observed, that merely satisfies the minimum requirements for survival. Those affected display little emotion, barely detectable movements and often keep their eyes shut.

During validation humanistic psychology is followed which allows one to *distinguish* three *basic needs* of mankind which encompass feeling secure, loved and accepted, being needed, and productive, and being able to freely express feelings and thoughts as well as being heard. As a communicative strategy a client- and person-centered approach is considered (Rogers, 2012), entailing the attempt to pay special attention to the dementia patient's inner emotions in order to identify and validate them.

Validation in this context is regarded as a form of communication and therapy, with which it is possible to connect with old and demented people who are disoriented, and more importantly to maintain this connection. Validation aims to build confidence and help patients to express their feelings and to complete unfinished life tasks. Hereby the primary objective lies in the provision and maintenance of dignity and self-esteem in order to prevent the patient from sliding into a more advanced state of disorientation. The verbal and nonverbal methods of validation are "centering", "restoring confidence", "using straightforward, non-judgmental words", "repetition", "enhanced employment", "imagining the opposite", "remembering", "speaking clearly, gently and softly", "eye contact", "distinct choice of words", "speaking clearly and lovingly", "mirroring", "connecting behavior with unfulfilled basic human needs", "recognizing and using preferred sensory organs", "touching" and "using music" (Feil, 2007). Feil points out, when using validation it is noticeable that the intended interaction between patient and carer leads to an increased quality of life in the affected patient. This is the reason why this method is implemented in many institutional care facilities. At the same time it is evident that the linkage to the patient's own reality and their resources is essential for increasing their quality of life.

The use of animals in order to enhance the well-being and quality of life of the old, multi-morbid and care-dependent patients is increasingly moved into focus (Zenneck, 2012). However, alternative forms of therapy frequently fail as a result of high costs and the necessary personal effort. Thus, action is evidently required at different levels and must be taken in an interdisciplinary manner in different professions. On the one hand, there are social and nursing obstacles to be tackled in order to ensure the care and support of dementia patients. With regard to medical diagnosis and treatment further research is required in order to improve the possibilities of influencing the development of dementia at an early stage. Concerning psychology, further therapeutic approaches for treatment and support are required that are not pharmacologically oriented in order to strengthen preventive approaches in terms of self-care with the support of relatives, which in turn should aid the slowing down of cognitive-emotional breakdown. In this respect one can speak of the need for a bio-psycho-social approach which is characterised by a close collaboration of professions and disciplines with the necessary involvement of the family and low-threshold accessibility. Thus animal assisted therapy could offer such an alternative approach.

Animal assisted therapy

Up to today different studies support the theory that animals contribute to the well-being of people (Olbrich, 1996). Based on this finding, programmes have been developed that structure animal-human interaction and initiate a particular therapy.

Animal assisted therapy that involves the deployment of animals as co-therapists was developed as an extension and alternative to treatment methods already available. Animals have the ability to positively affect therapy sessions. Levinson (1962) was able to show that animals influence the interrelationship between patient with dementia and therapist on the level of psychotherapy during and after the therapy session. Thus they are perfectly adequate to be utilised as a ‘door opener’, while also reducing any anxiety a patient may be experiencing as long as they are able to fixate on and interact with the animal during the session. McNicholas and Collis (2000) supposed in their study that the mere presence of a companion animal increases the number of spontaneous social initiations from strangers to individuals with disabilities.

It is the consequences of multi-morbidity that usually lead to serious limitations in the quality of life, especially affecting institutionalised patients. Banks et al. (2008) showed that the use of animal assisted therapy in nursing homes can help to reduce feelings of loneliness in older

people Fick (1993) concluded that the verbal interaction of the residents in nursing homes could be increased by means of animal assisted intervention. Especially contact with dogs contributes to a positive mental attitude in patients who would otherwise feel shunned by and isolated from society. This also favourably affects the climate in the institution because of the social behaviour of dogs and the nonverbal interaction that is experienced by all those involved, which can supplement the otherwise mainly functional services of the carers (Ruckert, 1987). Corson & Corson (1981) described this result as a "catalytic effect" of animals. Even the carers experienced an improvement of their working environment within the institution.

With regard to the animal assisted therapy of dementia patients Zenneck (2012) was able to demonstrate that the use of a therapy dog aided patients to structure their everyday lives. The mobilisation of otherwise bedridden people is made possible with the help of such animals and they are encouraged to get out of bed on the day the therapy dog is scheduled to visit them (Fine, 2000). Simply the tangible physical presence of the animal seems to enable the patient to relive nonverbal physical contact, which in turn seems to help them to communicate intersocially with other people. McCabe, Baun, Speich & Agrawal (2002) discovered that animal assisted therapy leads to an increase in prosocial behaviour and a reduction in the behavioural and psychological symptoms of dementia (BPSD). Even inner turmoil and aggressive behaviour are positively affected by the therapy dog (Elliot & Milner, 1991). Walsh, Mertin, Verlander & Pollard (1995) observed that the intensity of aggressive and loud outbursts by dementia sufferers are reduced by the presence of an animal in the care home. At the same time physiological effects such as a reduction in blood pressure or heart rate can be observed (Antonioli & Reveley, 2005). This phenomenon represents one of the goals of animal-assisted therapy, which includes the reduction of stress brought about through the deployment of such animals.

All in all animal assisted therapy seems to especially strengthen the self-confidence of patients, a factor which also contributes to an increase in social interaction with care staff and other people (Winkler, Fairnie, Gericevich & Lung, 1989). In addition positive effects on the general health of patients can also be observed (Stanley-Hermanns & Miller, 2002).

In contrast to Germany, the deployment of therapy dogs is already widespread practice in the United States and the Netherlands. In their meta-study Rowan and Thayer (2000) have discovered that there are about 2.000 animal-assisted therapy programmes, most of which utilise therapy dogs and are located in the United States. Dogs are very suitable animals for therapeutic purposes for a variety of reasons. On the one hand they are socially oriented

creatures, while also being very docile and able to be trained. Also, they are relatively resistant to stress in various environments. Current literature focuses primarily on various functional mechanisms. Even though there are numerous studies that support the fact that such contact with animals has a favourable effect on the quality in life of dementia sufferers (Cirulli, Borgi, Berry, Francia & Alleva, 2011), there is however a shortage of studies that is able to empirical belay the claim that therapy dogs have a positive effect on such people.
In order to understand the underlying mechanism of animal assisted therapy it is important to outline the basic theories. Firstly the theory of biophilia will be focused on, followed by the presentation of the theory of human-animal bond, as well as the relationship and attachment theory. Since the form of communication between humans and animals is an essential factor in animal assisted therapy, this aspect will also be taken into account, with special attention being paid to analogue and digital issues and forms of communication. After that, the pet owners/main effect-hypothesis will be described as this plays an important role in relation to the overall health of pet owners. Finally, the hypotheses of stress buffering and social support will be discussed in the context of dementia sufferers.

Biophilia

The concept of biophilia concerns the fundamental human characteristic of relating to lifeforms other than their own species. Olbrich (2003) speaks of a primal affinity of man to other forms of life. This affinity increases if a basic mutual respect exists. This is explained by the fact that in evolutionary terms the thin line between security and threat is the reason for the survival of man. Animals are described in this context as the dependent factor, which means that the conscious experience of the interaction between humans and animals leads to a basic feeling of being alive and thus the observation of an animal in a calm condition transmits certain internal signals and enhances feelings of security and well-being in people.

Human- animal bond

In prehistory human and animal maintained a more practical economic relationship to one another. Man was dependent on the animal's help to survive. These days pets merely have the function of a companion and friend to their owner, and their behaviour to one another contributes to the well-being of both parties. Dogs can be perceived as the prototypical success story of animal companions. It is possible to trace back the interaction of homo sapiens and canis familiaris about 10.000 years (Odendaal, 2000). The positive interaction between man and dog is rooted in the basic human need for significance and acceptance (Maslow, 1943). In particular the complementarity of the needs of humans and

dogs can be recognised as the catalyst since both parties do not regard each other's interests as intimidation, but rather they each have different specific needs which they strive for in such a relationship through interaction with each other. Dogs deployed as companion dogs are by nature and race usually very socially oriented animals. Their focus on people is very pronounced. The result is an intense relationship between dog and owner which leads to a distinct interaction between both parties. This corresponds to the objectives concerning the deployment of companion dogs to create a symbiotic relationship between human and animal. This symbiosis is obviously beneficial to man as well as animal and is achieved when an equilibrium is established. It was observed that dogs display the same physiological effects as their human owners (Odendaal & Meintjes, 2003). Companion animals - especially dogs - also have the ability to activate humans in such a way as to bring them into contact with their immediate environment. They contribute to positive physiological changes by regulating internal stress states in humans. The interaction between animals and humans promotes a significant decrease in cortisol levels, much like reading a book in a quiet and stationary state (Cirulli et al., 2010).

Relationship and attachment

An addition to the human-animal-bond theory is the research into relationship and attachment. The development of internal perception models concerns the manner in which attachment figures reflect effects on the personal representation of bonding (secure, insecure, ambivalent) (Bowlby, 1969;Grossmann & Grossmann, 2012).This issue can just as easily be transferred to animals. An intense bond with a pet often brings about a similar increase in personal self-esteem. Among the aged this phenomenon can be developed further in the sense of a second attachment in the way that targeted animal assisted therapy is then able to promote redevelopment of self-awareness, self-esteem and personal trust in dementia sufferers. Companion animals are supposed to have an effect on ill and old humans and they also have a stimulating effect of their mental and psychological health. In addition, they argued that they have a stimulating effect on their social interaction with other people (Fick, 1993).

Communication between animal and human

Communication is the basis of a working relationship between humans and animals. In the 16th century a French writer and philosopher Michel de Montaigne already claimed that animals are able to communicate with other animals through movements of the body, as well as being able to interrelate to each other. Montaigne was convinced that this communication

also works between animals and humans (Olbrich & Otterstedt, 2003, p. 23).

Further attempts to explain the functional mechanisms of communication between animal and humans are based on Watzlawick's distinction between verbal-digital and nonverbal-analogue communication (Watzlawick, Beavin & Jackson, 2011). Digital communication uses words to convey facts insofar as word and deed stand within a constructed context. Analogue communication uses emotional expressions which are expressed through gestures and facial expressions, eye contact, vocal tone or touch. The essential difference with digital communication is that the selection of expressed symbols does not stand in a constructed context, but rather that different aspects of analogue communication are directly related to one another.

It is difficult to create a congruence between digital and analogue communication. Thus it is possible to digitally reproduce a current emotional state, whereas gestures and facial expressions may convey quite a different impression on one's counterpart. Animals have the ability to transfer orders and words into action. It can be assumed that within limits animals can also recognize aspects of digital communication. It is however important that a vast amount of animal communication is allocated on the analogue level. An exchange of objective facts in communication is not possible as aspects such as facial expression and eye contact shape their communication. Animals react sensitively to analogue stimulation while it is insignificant whether a person transmits it knowingly or not (Frömming, 2006, pp. 20). Animals are particularly good at communicating with people who exhibit depressive symptoms, suffer from feelings of help- and hopelessness, or only possess limited language skills - which often is the case with patients already suffering an advanced stage of dementia. The nonverbal contact with animals represents an opposite pole to devaluing linguistic experiences involving other people in that demented patients are able to approach animals safely (Katcher & Beck, 1983). Marx et al. (2010) describe a dog as a neutral listener who does not react negatively to the verbal repetition which is common with dementia sufferers. At the same time, animals convey to the patient the feeling of being needed to the patient, which is something such a person often is increasingly lacking. This contact leads to tactile comfort, company and support in social interactions. "Specifically, the elderly population and individuals with psychiatric conditions may be particularly sensitive to interventions that ameliorate perceived social support and that buffer the impact of stressful experiences" (Virues-Ortega, Pastor Barriuso, Castellote, Población & Pedro-Cuesta, 2011, p. 5).

Pet owners / Main effect hypothesis

The pet owners/main effect hypothesis theory refers to the health effects that can be achieved through the direct interaction between animals and humans. Not only the improvement of mobility that dog owners achieve by having to take their dog for a walk is one notable aspect. Animals require the assumption of responsibility by their owners, for example when an owner is required to adjust his daily routine to the needs of his pet. Social integration and inclusion are promoted by the animals. One only has to mention the frequent contact dog owners have with other dog handlers when taking out their pet. Thus, a study in a nursing home was carried out with dogs, which showed that the willingness for contact of residents increased (Fine, 2000). The positive effects of human-animal relationships described here lead to an increasing interest in potential therapeutic applications making use of a human-animal relationship. However, to date there is insufficient empirical evidence that the improvement of health and pet ownership influence each other causally.

Stress buffering model

The stress buffering model (Virues-Ortega et al., 2011) focuses on the positive interaction between humans and companion animals, which leads to a reduction in the experience of stress in humans. Studies have shown that physiological and cardiovascular effects under stress are reduced when guided animals are present (Lazarus & Folkman, 1984; Kamarck, Manuck, & Jennings, 1990). In long-term as well as in short-term studies, results showed that their presence leads to reduced levels of triglycrides, plasma cholesterol and cortisol such as ß-endorphin and oxytocin (McNicholas et al., 2005). For dementia sufferers this is of particular importance as in many cases due to the nature of the disease it leads to new stress factors. For example patients are forced to leave their familiar living environment to move to a nursing facility, which is a life event that contributes to increased levels of stress. In this case animal-assisted therapy can act as a ‘stress buffer’. By means of an increase in social interaction the buffering of stress levels could be promoted, which in turn contributes to an improved condition of health. “This approach suggests that interacting with pets may be instrumental in enhancing social interactions by means of increased attention towards social stimuli and social attractiveness“ (Virués- Ortega et al., 2011, p.3).

Social support

Elderly people, especially those with health problems such as dementia, are characterised by a limited number of social contacts and reference persons. In the last decades of a patient’s life the number of close or even distant social contacts is reduced by half (Fung,

Carstensen & Lang, 2001). This has a major impact on the mortality and morbidity of those affected (Holt-Lunstad, Smith, & Layton, 2010). It could be shown that the risk of mortality among older people decreases by 25% when they are able to get emotional support (Rodriguez-Laso, Zunzunegui and Otero, 2007). As a result it can be said that humans with limited social support are considered to be at risk from social isolation, which may result in them being exposed to higher levels of stress.

Animal-assisted therapy seeks to draw upon the attempt to implement animals in order to counteract the social isolation of older people, which in turn is to enable them to have a controlled structure in their everyday life. Animals can thus be understood as 'social supporters' of the environment of reality and contribute to a reduction of stress levels through the promotion of participation and inclusion in the dementia sufferer's social context (McNicholas & Collis, 2006). This model suggests that social support may improve health by relieving cardiovascular and other physiological responses caused by acute and chronic stressors (Kamarck et al., 1990).

In comparison to Walsh (2009) the research in the context of animal assisted therapy is not unbiased as many authors merely presented the positive effects in health while disregarding unclear findings. The effect of animal assisted therapy on dementia sufferers - with special emphasis on the role of dogs - will be studied in the course of this bachelor thesis. The background of this subject of interest consists of the bio-psycho-social comprehension of humans, thus it is not sufficient for the effect of pharmacological therapies alone to influence this ailment as the quality of life of such patients cannot be completely affected by it. Furthermore the current state of research into pharmacology shows that the success rate in treating patients suffering from dementia is considered to be low. Thus there is a demand for alternative methods of treatment. Animal-assisted treatment utilising dogs may represent such an approach. The aim of this thesis is to empirically reprocess such animal-assisted therapy in order to verify bio-psycho-social factors. More precisely, cognitive functions, physiological changes, symptoms of dementia, social aspects and other effects not considered in the other four categories are treated.

Method

The method of choice in verifying the effectiveness of animal assisted therapy of patients with dementia is the systematic review of literature. In order to successfully perform

this review the following criteria have to be observed. Firstly, an exact research question is needed to be posed. The keywords and databases selected are required to be logically discussed and limited. Additionally, a suitable research strategy must be developed which then can be applied to the review of the literature obtained. Finally, the acquisition of relevant literature is necessary. In aid of better comprehension the term of animal assisted therapy will be abbreviated as 'AAT', which includes all forms of animal assisted therapy.

Procedure

The first step in the procedure was the search for relevant scientific literature in April 2013. This was conducted through the use of internet databases of which the total number was limited to three in interest of simplification and in order to better structure this process. Specifically, the databases concerned are 'PsycINFO', 'Scopus' and 'PubMed'. The terms to be searched were defined and specifically tailored to fit the query, investigating the effectiveness of AAT on patients with dementia when implementing dogs. The following search terms of the systematic review of literature were coined in five superior categories: Type of animal assisted therapy, clinical picture, effects, context in old age and social aspects.

Research

Various search terms were combined in different ways, large and small letters were changed, and a myriad of synonyms and translations of each keyword were searched for. Moreover hyphens and underscores were used. Truncations (*), wildcards ($ /?) and Boolean operators (AND, OR, and NOT) were also used in this systematic research. Additionally both tags as well as free text search were made use of. Free text search was used to identify shortcomings of the indexing of keywords (Perleth, Busse, Gerhardus, Gibis & Lühmann, 2008).

An example of the search criteria in the "Scopus" database is: ((TITLE-ABS-KEY("animal assisted therap*"OR "Pet assisted therap*" OR "canine assisted therap*" OR " Dog assisted therap*" OR "dement* assisted therap*)) AND (TITLE-ABS-KEY("demen*" OR "Alzheimer*")) AND(TITLE-ABS-KEY("effect*" OR "efficiency*")) AND (TITLE-ABS-KEY("age* " OR "home for the aged*")) AND (TITLE-ABS-KEY("social behaviour*" OR "interaction*")). For PsycINFO, the string was slightly adapted, resulting in: "animal assisted therap*" AND (dement* OR Alzheimer) AND (effect* OR efficiency*) AND (age* OR home for the aged) AND (social behaviour* OR interaction).
The exact combination of search criteria is elucidated in Appendix (Table A1).

Each search engine has its own catalogue of key terms. For example PsycInfo makes use of *The Thesaurus of Psychological Index Terms,* while PubMed uses *Medical Subject Headings* (MeSH).

All databases were searched for Dutch as well as German and English literature. The corresponding results were scanned based on their titles and abstracts, and the relevant threads concerning the overall topic were read as full-text.

Criteria for the use of literature

Criteria for the usability of the literature were defined according to the following inclusion and exclusion prerequisites. Inclusion criteria were studies based on:

(1) dog assisted therapy of dementia sufferers
(2) participants are older than 60 years
(3) participants living in a semi-hospital or inpatient facility (retirement or nursing home, hospital, hospice, day hospital)
(4) a clinical diagnosis of dementia being present
(5) the investigation is conducted with pre and post test

Criteria of exclusion are as follows:

(1) The use of dogs in households is considered.
(2) The person suffering from dementia and their carers are holders and owners of the dog.
(3) Other mental disorders such as depression or schizophrenia are considered as main diagnosis.
(4) Structural conditions and interests of carers, involved inpatient facilities or other people from the environment are focused on.
(5) The use of other animals is considered.

Data extraction

In order to analyze effects of AAT among elderly patients with dementia, it was important to define some characteristic features. The number of participants in the studies is considered, as well as sex and average age. The institution in which the subjects were treated, as well as the country in which the study was executed were taken into account. Also, the duration of the study as well as type of dog therapy were considered. The results were divided into five categories (cognitive functions and psychological symptoms of dementia, social aspects, physiological changes and other effects). Different types of AAT are reviewed and evaluated for their effectiveness.

Quality assessment

In this systematic review of literature, the studies are evaluated on the basis of validity of methodology of the studies considered by the Cochrane Collaboration (Higgins & Green, 2006). Similarly, these criteria are implemented in a meta-analysis of Bohlmeijer, Prenger, Taal and Cuijpers (2010).

The quality of the selected studies is examined based on seven criteria which in turn are based on an authoritative review of empirically supported psychotherapies (Chambless & Hollon, 1998). Adjustments for the review were divided into the following specifications:

(1) the study refers to a treatment manual, which can be either an existing manual or a manual designed specifically for this study

(2) the dog which is used for the therapy has been trained before the start of therapy

(3) the therapist who performed the animal-assisted therapy has been trained before the start of therapy

(4) integrity of treatment is continually evaluated and monitored during the study (various methods such as observing of therapists, video recordings of treatment sessions, screening protocols of standardised measurement instruments)

(5) data were analysed with intention-to-treat analyses,

(6) randomisation is performed by an independent third party.

(7) study with a control group.

Considering these seven specifications, the literature found is processed based on complete texts. In the analysis, important issues are raised. If one of the seven criteria appears in an article it is noted as positive, if this is not found the statement is recorded as negative. The final sum determining the quality of the articles is the result of the addition and the overall sum of positive points detected. Also, a ranking is rendered based on the seven criteria. Six or seven criteria met, represents high quality, medium quality is achieved when five or four criteria are met and less than 3 criteria met are considered low quality.

In context of the analysis, it is important to maintain an accurate overview. Thus it is helpful to include insights gained into the quality of the studies in the analysis and interpretation of the results. Studies of low quality run the risk not being able to show any significant effects due to their methodological shortcomings. In contrast, it is unlikely to expect a bias concerning studies with results classified as high quality, which ultimately leads to a greater insight into the effectiveness of the selected therapy.

Results

Selected Studies

Results yielded using the search function of three databases were (138) articles in Scopus, (13) articles in PsycINFO, and (125) articles in PubMed. Those articles obtained by PsycINFO and PubMed were also found in Scopus. Additionally, (16) texts obtained through free text search. The search was conducted in April 2013.

After further inspection of titles and abstracts, (108) articles were singled out. Disqualifying aspects of articles were the diagnosis of an existent psychiatric disorder which was not connected to dementia, as well as a patient under the age of 60 years. Also, studies were not considered if they were not drafted in either German, English or Dutch. Due to the fact that the main focus is set on dogs, studies were also not considered if they were merely concerned with the deployment of "synthetic or technical imitations" of dogs or other animals. Furthermore participants who were not living in an institution or care facility were also excluded. .

Of those studies considered (46) articles were viewed in full text. Of these articles the criteria of inclusion and exclusion were compared and graded. All in all, fifteen articles have been viewed and considered for this systematic literature review. An overview of the selection of search results is reproduced in figure 1.

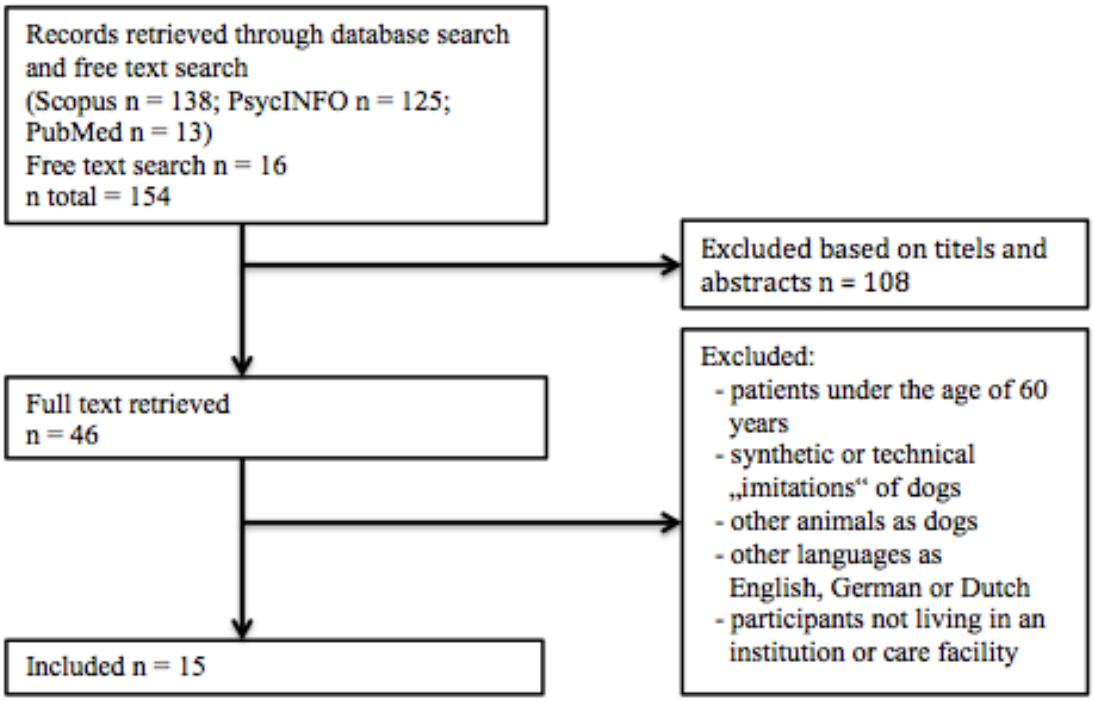

Figure 1. Study selection flow chart

Characteristics of the study

The systematic literature review encompasses two different forms of research design, namely studies with a control group and studies in one group pre to post test design. In order to simplify the overview, the characteristics were shown in one table (Table 1). In contrast the discovered results were arranged in two different tables based on their different research designs (Table 3 & 4). This concerns four studies with a control group (Kanamori, Suzuki, Yamamoto, Kanada, Matsui, Kojima et al., 2001; Moretti, De Rochni, Barnabei, Marchetti, Ferrari, Forlani, et al., 2010; Walsh et al., 1995 & Zisselman, Rovner, Shmuely & Ferrie, 1996) and eleven studies in one group pre to post test design (Batson, McCabe, Baun & Wilson, 1998; Berry, Borgi, Terranova, Chiarotti, Alleva & Cirulli, 2012; Churchil, Safaoui, McCabe & Baun, 1999; Kawamura, Niiyama & Niiyama, 2007; Kongable, Buckwalter & Stolley,1989; Marx, Cohen- Mansfield, Regier, Dakheel-Ali, Srihari & Thein, 2010; McCabe et al., 2002; Mosello, Ridolfo, Mello, Lorebzini, Mugnai, Picci, Barone et al., 2011; Motomura, Yagi & Ohyama, 2004; Richeson, 2003 & Sellers, 2005), of which the results will be classified in coherent manner.

The fifteen studies relevant for the analysis of AAT were mainly performed in the United States (9), while other studies were performed in Japan (3), Italy (2) and Australia (1). Of twelve of the present studies the majority of the subjects were female, while the male majority was prevalent in merely two of the studies. One study was solely concerned with female subjects (Motomura et al., 2004). The number of participants in the study range from four (Sellers, 2005) to fifty-eight subjects (Zisselman et al., 1996). The setting was always either a care facility (nursing home, special resident care, psychiatric hospital, geriatric psychiatry unit) or a day care centre (Alzheimer Day care centre, ADCC). All of the participants were older than 60 years of age and in all studies the deployment of dogs as a medium of AAT was described. The duration of the intervention varied between 2 sessions for 10 minutes and 5 months. It is notable that the therapy dog was used in specifically differing ways from study to study. Although AAT is a superordinate, it is not always meant in the same way, which leads to the necessity of an explication of its context for its analysis and assessment.

In aid of overall simplification, all findings of the studies were divided into five categories. Of interest were effects of AAT with dogs among older people with dementia, paying special attention to social aspects, physiological changes, behavioural and psychological symptoms of dementia, cognitive functions, and other effects. These categories seem especially suitable in representing the current scientific state of the study of the effects

of AAT. The elaboration of the characteristics of each single article is shown in the following table 1.

Table 1
Characteristics of the study

Author,Year	Design	Country	Setting	n	Diagnosis criteria (if reported)	age M (SD/range)	duration of study	Characteristics of intervention
Kongable et al. (1989)	one group pre to post test	USA	SCU	n = 12 m = 10, w = 2	Diagnosis AD	66 - 88 years	n.r.	Observation of 3 seperate occasions (absence of dog, temporary prescence the dog, permanent placement of the dog) dog visit unit 3 hours, 1 day a week
Walsh et al. (1995)	study with a control group	Australia	Psychiatric Hospital	n= 14 experimental group: n = 7 control group: n = 7	dementia, schizophrenia		12 weeks	dog visit for 3 consecutive hours twice per week
Zisselman et al. (1996)	study with a control group	USA	Wills Eye Hospital geriatric Psychiatry Unit	n = 58 m = 20 w = 38 control group: n = 33 AAT n = 25 EI Case/control blind	Chronic age related disabilities: medical neurologic conditions (depression, dementia, Parkinson disease, stroke, accompanying medical diseases)	76.4 (± 7.1) years	5 consecutive days	1h a day: pre-post treatment measure 1.animal assisted therapy 2. exercise control group subjects had contact with, fed visiting dogs, were encouraged to reminisce about their own experiences with pets and other animals, and heard a brief talk about the dogs. control group exercised for 1h a day
Batson et al. (1998)	one group pre to post test	USA	SCU	n = 22 m =10, w = 12	Diagnosis AD	79.9 (62 - 96 years)	10 min. session on 2 different days	HR, BP, skin temperature were measured every 2 min. during 10 min. session with or without, dog sessions videotaped, 2 meaurements visiting dog
Churchill at al. (1999)	one group pre to post test	USA	3 SCUs	n = 28 m = 7, w = 21	Diagnosis AD or related disorder	83.8 (± 6.8 years)		2 measurements studies conducted between 5:00 and 5:30, Participants are videotaped, 2 sessions of 30 min., researcher with dog, or researcher alone
Kanamori et al. (2001)	study with a control group	Japan	adult day care center provided by the special care unit in a psychiatric hospital	n = 27 experimental group: n = 7 m = 2, w = 5 control group: n = 20 m = 4, w = 16	experimental group: 5 = AD 2 = VD diagnostic criteria for DSM-IV control group: 7 = AD 13 = VD	experimentel group: 79.43 (± 6.06) years control group: 83.4 (± 7.22) years	12 weeks	normal activities in the control group

Table 1 *(continued)*
Characteristics of the study

Author,Year	Design	Country	Setting	n	Diagnosis criteria (if reported)	age M (SD/range)	Duration of study	Characteristics of intervention
Mc Cabe et al. (2002)	one group pre to post test	USA	SCU	n = 22 m = 7, w = 15	Diagnosis AD	83.7 (68 -96 years)	4 weeks	2measurements SCU: dog freely interacted with residents in common areas of SCU, spent time in individual resident rooms. It was not uncommon for the dog to accompany staff members as they assisted residents with activities of daily living
Richeson (2003)	one group pre to post test	USA	2 nursing homes which offered therapeutic reaction programs	n = 15 m =1, w = 14	Dementia Comorbidity data indicate 26% of the participants had a secondary diagnosis of depression, arthritis, or hypertension	86.8 (63 - 99 years)	5 weeks daily AAT intervention 3 weeks	3 phases: baseline (A) prior to intervention; post-test (B) after 3-week intervention; and follow-up (C) 3 weeks after intervention ended. - participants served as their own control Interventiongroup: therapeutic reaction staff members, therapy dog(s), therapy dog handler(s). - small group approach in which a therapeutic recreation professional, had contact with therapy dog and with a handler paricicipants play with the dog, pet it feed it, talk to it, brush it, reminisce about past pets, talk to the handler, and talk to the staff. Each morning, therapeutic recreation professional recorded PRN medications taken by the participants the previous day 2 weeks washout after the end
Motomura et al. (2004)	one group pre to post test	Japan	Local nursing home	n = 8 all women	n = 4 AD n = 4 VD DSM-IV NINCDS-ADRDA NINCDS-AIREN	84.8 (± 7.0 years)	4 consecutive days 1h	2 dogs 3 types of activities: 1. communication with dog 2. observe dogs exercise 3. dog interact with human
Sellers (2005)	one group pre to post test	USA	one long - term care facility	n = 4	dementia or AD presence of agitated behaviors as per the last MDS assessment	79 - 95 years	28 days Each phase 5 days, with 2 days washout period between phases, resulting in a total of 20 days of data collection	common withdrawal design involving baseline (B1), treatment (T1) and replication of these phases (B2, T2). during 5 days of each baseline phase, elders participated in their normal routine. Elders were videotaped for 15 min. each day

Table 1 *(continued)*
Characteristics of the study

Author,Year	Design	Country	Setting	n	Diagnosis criteria (if reported)	age M (SD/range)	Duration of study	Characteristics of intervention
								5 interventions were implemented in week 2 of study with each elder, and were then replicated in week 4 AAT sessions: overview, opening song, "things to do" discussion, 1 activity per session with canine (introductions, petting, playing ball grooming, and feeding treats) & closing song
Kawamura et al. (2007)	one group pre to post test	Japan	Residental nursing home	n = 10 m = 1, w = 9	6= VD 4 = senile dementia with impairment in mental function for daily living	85 (75-95 years)	Data was collected 4 times for each subject in 12 month	Subjects played with dogs (game), held, petted, watched & talked to dogs. Some were able to play with dogs by themselves and some needed volunteer's help Visits were made 2 time a month, 2h session
Marx et al. (2008)	one group pre to post test	USA	2 nursing homes	n = 56 m = 12, w = 44	Diagnosis of dementia DSM-IV criteria and the report of the National Institute of Neurological and Communicative Disorders and Stroke, AD and Related Disorders Association	87 (61 - 101 years)	Observation during two session activities	Assessed degree of engagement / response with dog-related stimuli: puppy video, dog-coloring activity, pulsh dog, robotic dog, smal dog, medium dog, large dog (individual engagement trials were separated by an intertrial interval of at least 5 minutes) Each trial lasted a minimum of 3 min.
Moretti et al. (2011)	study with a control group	Italy	nursing home	n = 21 m = 1, w = 20 n = 10 AAT n = 11 control group	AD, VD, second dementia, mood disorder, psychotic disorders ICD-10 dementia most (47.6%), psychotic disorders (33.3%) depression (19.0%)	84.7 years	6 weeks	AAT (90 min., 1 a week) bringing dogs in contact with all participants, hold, stroke, walk, talk and play with the animals, under supervision of dog educators. CG: allowed to see animals coming into nursing home, not allowed to interact with them, although informal and unstructured contacts were not prohibited.
Mosello et al. (2011)	one group pre to post test	Italy	ADCC	n = 10 m = 6, w = 4	elderly patients with AD NINCDS-ADRDA	79 (± 6 years) (69 - 85 years)	8 weeks	study time-schedule 3 periods: 2 weeks' pre-intervention (UDC), 3 weeks' contol activity (CA), 3 weeks' AAT. Each patient underwent a cognitive, behavioral and psychological assessment before CA (t0), at the end of CA before AAT (t1), and the end of AAT

Table 1 *(continued)*
Characteristics of the study

Author,Year	Design	Country	Setting	n	Diagnosis criteria (if reported)	age M (SD/range)	Duration of study	Characteristics of intervention
								(t2). Dog intervention: actions with dog (plush), including talking, stroking, playing, feeding, brushing and taking for a short walk, AAT operator and 2 dogs used for intervention.
Berry et al. (2012)	one group pre to post test	Italy	Nursing home	n = 19 m = 6, w = 13	Diagnosis AD	85 (70 -90 years)	2 times a week for 5 months, at the same time each week	2 types of dog-assisted interventions 1. physical therapy sessions 2. socialisation therapy sessions sessions were video-recorded using a digital video camera

Abbreviations. n: total number; M= mean; SD= Standard deviation; SCU= special care unit, m= men; w=women; AD= Alzheimer dementia, AAT : Animal Assisted Therapy; EI: exercise control group; HR: heart rate; BP: blood pressure; VD: vascular dementia; PRN: Pro re nata; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, fourth edition; NINCDS-ADRDA: National Institute of Neurological and Commincative Disorders; NINCDS-AIREN: National Institute of Neurological Disorders and Stroke and Association International pourl la Recherché et l'Enseignement en Neurosciences; MDS: Minimum Data Set; ICD-10: International classification of Diseases10th revision; CG: control group; ADCC: Alzheimer day care center; UDC: ususal day care activities; CA: control activities; n.r.: not reported

Quality assessment

Table 2
Quality assessment of 15 studies of AAT among elderly patients with dementia

Author	Control group	$Manu_T$	$Train_D$	$Train_H$	$Integ_T$	ITT	Ind_{random}	Total score	Total Quality
Batson	0	0	1	0	1	0	0	2	Low
Berry	0	1	1	1	1	0	0	4	Medium
Churchill	0	1	1	0	1	0	0	3	Low
Kanamori	1	1	0	0	1	0	0	3	Low
Kawamura	0	1	0	0	0	0	0	1	Low
Kongable	0	1	1	1	1	0	0	4	Medium
Marx	0	1	0	1	1	0	0	3	Low
Mc Cabe	0	1	0	1	0	0	0	2	Low
Mosello	0	1	1	1	1	0	0	4	Medium
Moretti	1	1	1	0	1	0	1	5	Medium
Motomura	0	1	0	0	1	0	0	2	Low
Richeson	0	1	0	1	1	0	0	3	Low
Sellers	0	1	0	1	1	0	0	3	Low
Walsh	1	1	1	1	1	0	0	5	Medium
Zisselman	1	1	0	0	1	0	1	4	Medium

Abbreviations. $Manu_T$: Use of treatment manual; $Train_D$: Dog was trained before using it for AAT; $Train_H$: Handler/Human was trained before AAT; $Integ_T$: Intergrity of study; ITT: intention to treat; Ind_{random}: independet randomisation by a third party

None of the fifteen studies achieved high quality. Merely two articles conformed to five of the seven criteria that were prescribed (Berry et al., 2012; Kongable et al., 1989; Mosello et al., 2011; Moretti et al., 2010 & Walsh et al., 1995). Four articles were able to fulfil four criteria (Churchill et al., 1999; Marx et al., 2010; Richeson, 2003; Sellers, 2005 & Zisselman et al., 1996). This means that six of fifteen articles have moderate quality. A further nine articles were of low quality due to the fact that they only satisfied three or fewer than the predetermined criteria (Batson et al., 1998; Kanamori et al., 2001; Kawamura et al., 2007; McCabe et al., 2002 & Motomura et al., 2004).

Only four of the fifteen articles had a control group. What is interesting is that all but one of the studies made use of a treatment manual which was adapted to conform to the design of the study. In all studies a schedule of the proceedings was kept. In the study by Batson et al. (1998) however, a precise description of the deployment of the dog is missing. A

second criterion was that the dog utilised was required to have been previously trained, in order to be completely prepared for the use on elderly patients with dementia, which was realised by seven of the fifteen studies (Batson et al., 1998; Berry et al., 2012; Churchill et al., 1999; Kongable et al., 1989; Mosello et al., 2011; Moretti et al., 2010 & Walsh et al., 1995). In eight studies the therapist was especially trained for performing AAT, which means that a further criterion has been fulfilled (Berry et al., 2012; Kongable et al., 1989; Marx et al., 2010; McCabe et al., 2002; Mosello et al., 2011; Richeson, 2003; Sellers, 2005 &Walsh et al., 1995). Other studies left it open to interpretation if such a preparation had taken place. Another aspect of the quality assessment is the protection of integrity of treatment which includes specialised revision of a therapist by means of supervision, also encompassing the manner of documentation and evaluation of the procedure. When incorporating the external observation of the therapist, video recording, screening protocols or standardised measurement instruments have also been used. Apart from two studies that did not encompass any specific measures of evaluation (Kawamura et al., 2007 & McCabe et al., 2002), all others fulfilled this criterion. None of the studies performed an Intention to treat analyses and randomisation by a third party was only performed in just two of the fifteen studies (Moretti et al., 2010 & Zisselman et al., 1996).

When interpreting all the results of the different studies examined, this quality assessment has to be taken into account that the study outcomes may be biased and result from methodological deficits.

Effects

In the following, all studies were analyzed related to their effects. There were no decisive effects based on the different research designs (studies with a control group & one group pre to post test).

Table 3

Effects of AAT on demented persons; one group pre to post test design

Author,Year	Measures used	Results				
		Cognitive function	BPSD	Social aspects	Pysiological changes	Other effects
Kongable et al. (1989)	Observational checklist			+ social behavior (during observational sessions according to treatment condition) & during second observational phase & third phase - difference between weekly visit, permanent placement & observational setting + increase over time for: + smiles, laughs, lens, touches & verbalization negative reactions: dog present (2 patients); dog temporary present, within group setting (5 patients); dog permanent present (8 patients)		
Batson et al. (1998)	Kendall model blood pressure monitor (BP, HR) YSI Tele-Thermometer (skin temperature) BDRS social behvaviors			+ social interaction dog present - smiles; + tactical contact; - looks; + physical warmth + praise; - duration of leans toward; + smiles,+ tactical contact;+ looks + frequency/duration of social behavior during AAT	- BP, mean BP, pulse, or peripheral skin temperature	
Churchill et al. (1999)	BDBRS ABMI DDCP			+ frequency/duration of social behaviour in the presence of a dog + (ABMI) agitated behavior during AAT in early evening compared to control group		
Mc Cabe et al. (2002)	NHBPS (days and evenings) (1week before & 4 weeks after AAT) medication review form		+ day shift: fewer behavioral problems across 4 weeks - evening shift: behavioral problems	+ day shift:mean score for each subscale of NHBPS - evening shift: mean score for subcale of NHBPS		

Table 3 *(continued)*
Effects of AAT on demented persons; one group pre to post test design

Author,Year	Measures used	Results				
		Cognitive function	BPSD	Social aspects	Pysiological changes	Other effects
Richeson (2003)	MMSE CMAI AAT flow sheet PRN medications	- differences between MMSE & agitated behavior of participants recorded in CMAI		+ agitated behavior (week 3 vs. week1) & after study conclusion + social interaction (pre-test to post- test (week 5 vs. week 1)		- differences in PRN medication from baseline to follow- up
Motomura et al. (2004)	apathy scale irritability scale GDS PSMS MMSE (before&after AAT)	- change in MMSE before / after AAT	- irritability scale before / after AAT	- apathy state before/ after AAT		- change GDS bevor/after AAT - change PSMS before/ after AAT
Sellers (2005)	(MMSE) SBOC ABMI			+ social behaviors from baseline to treatment + agitated behavior		
Kawamura et al. (2007)	GBSS-J MENFIS	GBSS-J: sign. + impaired spatial orientation during first 6 month + impaired wakefulness + impaired concentration + impaired thinking in abstraction during last 6 month MENFIS:+ overall score tended to decrease during first 6-month but increased from 6 month to 12 months scores for + cognitive, motivational & emotional functions decreased during the first 6 months of study and then increased during final 6 month	+ intellectual,emotional functions + spontaneous activity, & different symptoms common in dementia decreased during first 6 months - during final 6 months GBSS-J: + emotional lability during first 6 months MENFIS: + emotional functions + suitability of emotional expression, + stability of emotional expression over 12-month period	+ all subjects were able to call dog's name or remember that they played with the dogs at the next session.		+ motor insufficiency in eating over 12-month period
Marx et al. (2008)	ADL (MMSE) Chart review One on one interview OME SIQ			+ attitude against dogs		Highest respons during puppy video followed by the real dog twice as many residents refused medium or small dog as refused the large dog greatest number of responses by real dogs, fewest responses seen with the plush dog &

Table 3 *(continued)*
Effects of AAT on demented persons; one group pre to post test design

Author,Year	Measures used	Results				
		Cognitive function	BPSD	Social aspects	Pysiological changes	Other effects
						coloring stimuli highest number of spoken comments with the AAT vs. observations without stimuli especially with real dogs
Mosello et al. (2011)	MMSE SIB ADL CMAI NPI CSDD OERS ABMI MoBOF	- Cognition changed (MMSE)	- CSDD - NPI total score + single NPI item anxiety, sign. + single NPI item anxiety	- CMAI + OERS, pleasure & general alertness during AAT session compared both with UDC & CA + sadness comparing CA & AAT - Anger&anxiety/fear items of OERS unchanged + emotional status during afternoon,OERS - Other afternoon OERS scores unchanged across 3 study periods		- change across time for SIB - ABMI changes in the morning & in the afternoon MoBOF: increase across study + period for motion + vocal expression + attraction to the environment + motor activity post-hoc analysis: + attraction to environment + motion during AAT was marginally greater compared with UDC, but did not differ sign. with CA; - "vocal expression" increased equally during AAT and CA compared with UDC + increase in interaction to the enviroment from CA to UDC was confirmed in non-parametric analysis
Berry et al. (2012)	radioimmunassay kit (CORT-CT2, CIS-Bio International, Gif-sur-Yvette, France) GDS Cortisol levels with specific cotton swabs			SS: + interactions occured overall during CA: patients interacted for same amount of time with dogs & humans play activity: + patients spent sign. more time time interacting spontaneously	+ Interaction between time (pre-post intervention & session with / without dogs) was found when SS groups were compared control group (SS-CG): + circadian rhythm-based decrease in salivary cortisol	+ SS & PT interacting with dogs lower depressive state - effect of time

Table 3 *(continued)*

Effects of AAT on demented persons; one group pre to post test design

Author,Year	Measures used	Results				
		Cognitive function	BPSD	Social aspects	Pysiological changes	Other effects
				with the dog than with humans. over time, interactions with dogs changed. + Spontaneously interacting with the dog increased during the 5 month while mediated interactions decreased over the same period smile episodes: + during contact activities & play activities patient were smiling more often while spontaneously interacting with spontaneously interacting with dogs than while interacting with humans or during mediated interactions with the dog - changed during course of therapy + PT: patients engaged mostly in + PS: smiles occured more often during activity play than during all other activities	- decrease in SS group - PT& PT-CG physiological circadian decrease in cortisol - cortisol levels collected at the beginning & end of the study	

Abbreviations. BPSD: behavioral and psychological symptoms of dementia; BP: Blood Pressure;HR: Heart Rate; AAT: Animal assisted therapy; BDRS: Bourke Dementia Rating Scale; BDBRS: Bourke dementia Behavioural Rating Scale; ABMI: Agitated Behaviour Mapping Instrument; DDCP: Daubenmire's Data Coding Protocol; NHBPS: Nursing Home Behaviour Problem Scale MMSE: Mini Mental Status Examination; CMAI: Cohen-Mansfield Agitation Inventory; PRN: pro re nata; GDS: Geriatirc depresion scale; PSMS: Physical self-maintenance Scale; SBOC: Social Behvior Observation Checklist; GBSS-J: GottfrieseBrâneeSteen-Score, Japanese Version; MENFIS: Mental Function Impairment Scale; ADL: activities of daily living; OME: Observational Measurement of Engagement; SIQ: self- identity questionnaire; CSDD: Cornell Scale for Depression in Dementia; SIB: Severe Impairment Battery; NPI: Neuropsychiatric Inventory; CA: control activity; UDC: usual day care activities; MoBOF: Motor Behavior Observation Form; OERS: Observed Emotion Rating Scale; SS: socialisation session; PT: Physical session;SS-CG:socialisation session control group; PT-CG:physical session control group

Table 4

Effects of AAT on people with dementia; studies with a control group

Author,Year	Measures used	Results				
		Cognitive function	BPSD	Social aspects	Pysiological changes	Other effects
Walsh et al. (1995)	LPRS BCABS before & after AAT		- LPRS/BCABS after 12 weeks experimental period	+ lower noise levels + social interaction (short term) during dog visits + fewer loud/aggressive outbursts	- blood pressure + heart rate	
Zisselman et al. (1996)	MOSES before and after AAT MMSE at the time of hospital admission daily attendance records	- differences in MOSES scores between or within groups	- Women received either intervention had improved (decreased) irritable behavior scores after treatment - irritable behavior			
Kanamori et al. (2001)	MMSE Behave-AD N-ADL salivary CgA	- Differences in MMSE		AAT group: - average baseline score on Behave-AD - N-ADL change in scores control group:- average baseline score	+/- After 1 session increase of CgA in 2 subjects / decrease in other 2. pmol/ml: - mean values before & after first AAT sessions - mean values before & after last AAT session control group: + changes in CgA for 14 subjects (salvia collected at fixed times, before & after AAT)	
Moretti et al. (2011)	MMSE GDS self-perceived quality of life questionnaire before & after AAT	Mean improvement in MMSE - for case , - for controls				+ self-perceived quality of life in 5 subjects belonging to AAT & 2 participants in contol group GDS: + within group comparison - between group comparison 9/10 reported calming effect of animal & 1 reported recalling past memories

Abbrevations. BPSD = Behavioral and Psychological Symptoms of dementia; LPRS = London Psycho-Geriatric Rating Scale; BCABS=Brighton Clinic Adaptive Behaviour Scale; MOSES=Multidimensional Observation Scale for Elderly Subjects; MMSE = Mini Mental State Examination; AAT = animal assisted therapy; sign .= significant; Behave-AD = Behavioural Pathology in Alzheimer's Disease; N-ADL=Nishimura's Activities of Daily Living; CgA = Salivary Chromogranin A; GDS = Geriatric depression scale

Effects of AAT on cognitive functions among patients with dementia

Seven of a total of fifteen studies deal with the effect of AAT on changes in cognition of older people suffering from dementia. (Kanamori et al., 2001; Kawamura et al., 2007; Mosello et al., 2011; Moretti et al., 2010; Motomura et al., 2004; Richeson, 2003 & Zisselman et al., 1996). Here only one study made by Kawamura yielded significant results related to spatial orientation, general alertness and abstract thought.

A total of five studies (Motomura et al., 2004; Richeson, 2003, Moretti et al., 2010; Mosello et al., 2011 & Kanamori et al., 2001) used the mini mental status examination (MMSE), to determine the cognitive abilities of the patients. In all of the five studies no noteworthy changes of cognitive abilities relating to AAT could be determined. In order to measure the cognitive abilities Zisselman et al. (1996) used the multidimensional observation scale for elderly subjects (MOSES) which meters the way patients act in their everyday routine as well as the way they react to the treatment. However, no significant differences in cognitive ability of the test subjects within and between the groups could be distinguished in result of AAT.

Other methods of assessment of cognitive abilities were used by Kawamura et al. (2007). The result of the observation showed significant improvement of cognitive abilities. During the first six months the figures of the GBSS-J showed a significant reduction of impaired spatial orientation (p= 0.047) of the patients. In addition during the last six months a significant increase in alertness of the patients was observed (p= 0.014) as well as an improvement in abstract thought (p= 0.034). The value of the MENFIS presented a diminution during the first six months of treatment with AAT, however these functions deteriorated within the last six months of the observation. Moreover no control group was used and the study was also considered of low quality.

Effects of AAT on BPSD among patients with dementia

In total six of the fifteen studies measured changes of behavioural and psychological symptoms of older patients with dementia treated with AAT. Here effects of problem behaviour, reduction of emotional lability, emotional functioning, emotional expression, emotional stability and reduced feelings of fear could be detected in three of fifteen studies (Kawamura et al., 2007; McCabe et al., 2002 & Mosello et al., 2011).

In contrast findings of three studies made by Walsh et al. (1995), Zisselman et al. (1996) and Motomura et al. (2004) did not yield significant effects, focusing on the level of agitation of dementia sufferers. In the study by Zisselmann et al. (1996) no differences between the

control group and the experimental group ($p < 0.76$) were found. Merely demented women, in the AAT group as well as in the control group, displayed a reduction of agitated behaviour in their scores which were (12.11 vs. 10.82; $p< 0.02$). Thus, no effect was found because the values of both groups improved similarly. Furthermore, results of the study by Walsh et al. (1995) who used the London Psycho Geriatric Rating Scale (LPGRS) and the Brighton Clinic Adaptive Behaviour Scale (BCABS) did not show differences in the scores after a 12 months period of AAT. In comparison three studies showed positive effects of AAT on BPSD among patients with dementia (Kawamura et al., 2007; McCabe et al., 2002 & Mosello et al., 2011). McCabe et al. (2002) revealed that patients presented an improvement in problem behaviour as a result of AAT. Scores of NHBPS showed improvements in problem behaviour as a result of AAT ($p< 0.05$) during the course of a day, but this could not be transferred to problem behaviour in the evening. Kawamura et al. (2007) found significant short term effects in the reduction of emotional lability ($p= 0.046$) within the first six months using the Gottfriese Brânee Steen score, Japanese version (GBSS-J). Figures of the Mental Function Impairment Scale (MENFIS) also showed a short term effect of general reduction within the first six months of implementation of AAT. All these results support a tendency of improving emotional and motivational abilities of the patient, on the other hand a decline of these abilities could be observed within the last six months of treatment. One exception are the statistical significant values of emotional functioning, especially concerning emotional expression ($p= 0.004$) and emotional stability ($p= 0.004$) of the patient, measured over twelve months period. The figures of the GBSS-J exhibited a distinct increase which in turn belayed an improvement of emotional expression. Mosello et al. (2011) used the Cornell Scale for depression in dementia (CSDD) and the Neuropsychiatric Inventory (NPI) Figures of the CSDD showed significant effects ($p= 0.035$), but this effect was not shown in the post hoc analysis. Thus, there were no significant effects of AAT to be noted. Additionally, overall scores for the NPI did not show significant effects. Only the item of the NPI for fear - showed significant improvement after AAT ($p= 0.039$). Here a significant difference between the first measurement of AAT (t1) and that performed later (t2) ($p= 0.04$) can be detected.

Effect of AAT on social aspects among elderly patients with dementia

Almost all fifteen studies were focused on the effect of AAT on social aspects among elderly people with dementia. In most studies effects of social behaviour could be detected (Berry et al., 2012; Kongable et al., 1989; Batson et al., 1998; McCabe et al., 2002; Sellers, 2005; Richeson, 2003 & Churchill et al., 1999). More precisely reduced ward noise levels in

the study made by (Walsh et al., 1995), aggressive and agitated behaviour in the study made by Churchill et al. (1999) improvements of apathy state in the study made by Motomura et al. (2004), improvements of memory (Kawamura et al., 2007) and improvements of the emotional state (Kanamori et al., 2001 & Mosello et al., 2011) could be observed.

Kongable et al. (1989) were mainly focused on the observation of effects on the social behaviour of the test subjects, which were grouped into eight categories (smiles, laughs, looks, leans toward stimulus, touch stimulus, verbalisations, name-calling, other). Results of the study showed a considerable difference in social behaviour of the patient which was dependent on whether temporary or permanent contact with the dog was established. In the second (weekly visits) and third (permanent placement) phase of observation a significant increase in social behaviour was detected when comparing these phases to those in which a dog was not utilised ($p< 0.001$). In regard to effects of weekly visits in comparison to permanent placement phases, no changes in could be detected, this was also true for the group and individual setting. In the defined categories of social behaviour an increase in smiles ($p= 0.001$), laughs ($p= 0.11$), leans ($p= 0.020$), touches ($p= 0.000$), and verbalisations ($p= 0.024$) could be detected, which means that the overall increase of social behaviour is statistically significant ($p= 0.000$). The touches in each setting ($p= 0.032$) and the time in each setting ($p= 0.009$) also showed a statistically significant increase of social behaviour. Furthermore negative effects were discovered. Two patients presented a negative reaction towards the dog in an individual setting. When the dog was present they screamed or displayed aggressive behaviour including them kicking the dog. This action of defence even increased to five persons within the groups settings in which the dog was temporary present, and to eight persons in settings where the dog was permanently present.

Like results of the study of Kongable et al., Batson et al. (1998) showed a distinct increase in social interaction of the patients while a dog was present. Thus, the following increases took place: smiles ($p< 0.05$), tactical contact ($p< 0.01$), looks ($p< 0.05$), physical warmth ($p< 0.01$), and praise ($p< 0.01$). The intensity of social interaction - which included frequency and duration - yielded statistical significant scores as follows: leans toward ($p< 0.05$), smiles ($p< 0.01$), tactile contact ($p< 0.01$), and looks ($p< 0.01$). This is also true for the results related to social interaction made by Sellers (2005). Here figures showed a distinct increase of social interaction from the baseline to implementation of treatment ($p< 0.000$). Moreover statistically reliable differences in the total number of agitated behaviour ($p< 0.000$) could be detected.

The studies by Churchill et al. (1999) and Richeson (2003) also revealed an increase in social behaviour as well as a reduction of agitated and aggressive behaviour. Results of Churchill are based on an improvements in the hours of early evening during AAT, using the Agitated Behaviours Mapping Instrument (ABMI). Here results are not influenced by the degree or progression of the demential illness. More precisely outcomes of the study made by Richeson (2003) demonstrated improved scores of agitated behaviour in the third week when compared to the first week of intervention (p= 0.001). However after completion of the therapy the figures of agitated behaviour increased. Furthermore figures of the measurement of the pre to post test concerning social interaction of the patients (p= 0.009) show a notable augmentation.

McCabe et al. (2002) showed short term effects related to problem behaviour. They proved that the mean value of the sub-scale of the Nursing Home Behaviour Problem Scale (NHBPS) decreased over the course of the day. In contrast this drop was not observed in the evening.

Furthermore Walsh et al. (1995) analysed ward noise levels with the aid of two methods of measurement of general ward noise; the Bruel and Kjaer Precision Sound Level Meter, which they used before and after each session of AAT intervention. The results of the measurements made over a period of twelve weeks showed a reduction of ward noise levels in the experimental group, proving that AAT also has long-term effects. On the level of loud spontaneous vocalisations and aggressive verbal outbursts there were also positive changes to be observed in the experimental group when compared to the control group.

In the study of Motomura et al. (2004) statistically significant improvements of the state of apathy before and after therapy were observed (p< 0.05). The scores were (19.4 ± 3,7) before and (14.0 ± 3.5) after AAT. A further effect of AAT was discovered by Kawamura et al. (2007), they noticed that all patients were able to remember the dog's name, as well as recalling the activity they performed with the dog. Moreover Marx et al. (2010) recognised an improvement of attitude against dogs, which was triggered by a variety of stimuli including puppy videos, plush dogs, real dogs, colour activities and a robotic dog. The test statistic here shows a clear interaction term related to attitude (p= 0.026). Thus, it was shown that AAT affects the rating of the respective stimuli. In most terms a positive attitude was triggered by a real dog, followed by the robotic dog, puppy video, and the plush dog.

The study made by Mosello et al. (2011) did not show any significant effects related to social aspects using the CMAI. The scores confirm the predication before the control activity (61.2 ± 21.1 (33-95), at the end of the control activity (55.9 ± 23.9 and after AAT (51.2 ±

22.3, *p* for trend =0.068). Furthermore, Mosello et al. made use of direct observations in the morning using the observed emotional Rating Scale (OERS) to measure the emotional status of the patient. Figures showed a statistical significant increase in the ability of patients to feel pleasure (p= 0.002). Also, compared to the pre-intervention (UDC), a general increase in attention during the course of AAT could be determined (p= 0.02). In juxtaposition to the control activity, significant values were also determined, here figures of the ability to feel pleasure (p= 0.001) and those of the overall attention of the patient (p= 0.003) were detected. Compared the control activity with the AAT a statistically significant reduction of sadness could be reported (p= 0.000). Items for anger, anxiety and fear did not show any significant change using the OERS. The emotional constitution concerning the feeling of sadness was reduced at a statistically significant level within the afternoon during the therapy session in comparison to the control group (p= 0.002; p= 0.007). Other figures measured with the OERS did not change during the three periods of study.

Berry et al. (2012) observed a high frequency of interaction between patients in the socialising sessions, as long as contact to a dog could be established. Patients then interacted with dogs as much as they did with other people. Patients invested more time in spontaneous interaction with the dog in playful contact as they did with humans. Berry et al. also note periods in which patients were smiling. The statistics during the contact activities (F (2,16) = 12.53; p= 0.005) and the play activities (F (2,2)= 8.42; p= 0.005) were significant, while also an increase in smile episodes could be observed. The patients smiled more often during spontaneous activity with dogs than in contact with humans or in mediated interaction with the dog. Overall, the observed frequency of smile episodes did not change for the duration of AAT (F (1,8)= 0.001; p= 0.920). In the physical therapy sessions mediated interactions had the greatest impact of the social interactions of the patient. Smile episodes could be observed during the physical therapy sessions as well, which occurred more frequently in playful activity than in any other of the proceedings (F (5,14)=12.44; p= 0.000). During physical therapy no change of the frequency of smiling could be observed (F (1,3)= 0.23; p= 0.664).

Kanamori et al. (2001) found significant differences in the decline of the Behave-AD. Here, the values indicate a significant difference before (11.14 (± 4.85)) and three months after AAT (7.29 (± 7.11)) (p< 0.05). These values represent a significant improvement of aggressiveness (p= 0.045), anxiety (p= 0.004), and caregiver burden (p= 0.047) as a result of AAT. In comparison the control group did not yield any significant results, of which the average baseline of the figures was (5.45 (± 3.27)) and after three months (5.63 (± 3.59)); (p< 0.359). Using Nishimura's Activities of Daily Living (N-ACL) they also attempted to create

an inventory of the general emotional and social performance of the patients. However, no significant results before (28.43 (± 14.00)) and after AAT (29.57 (±14.47)) were found.

Effects of AAT on physiological changes among patients with dementia

Four of the fifteen studies are concerned with the effect of AAT on physiological changes among elderly patients with dementia (Batson et al., 1998; Kanamori et al., 2001; Berry et al., 2012 & Walsh et al., 1995). Effects could be detected in two of four studies for heart rate and circadian rhythm based effects on salivary cortisol levels. (Walsh et al., 1995 & Berry et al., 2012).

The focus of the study by Walsh et al. (1995) was set on blood pressure and the heart rate of the patient. Measurements were always made before and after the session of AAT. The measurements of systolic and diastolic blood pressure were made using a mercury sphygmomanometer and a stethoscope. Measurements of heart rate and pulse were always made immediately before the measurement of blood pressure. The results showed no effect in systolic and diastolic blood pressure between the experimental and control group. Nevertheless, measurements show a significant reduction of the figures of heart rate when comparing measurements of the experimental group's pre and post assessment (p= 0.021).

A second study performed by Berry et al. (2012) used a radioimmunoassay kit (CORT-CT, CIS, BIO International Gif surYvette) which is able to define cortisol levels. They observed physiological changes that could also be determined in differentiation of the physical therapy session and the socialisation therapy sessions. The figures of the socialisation session showed significant interactions between pre and post intervention, which was true for the session with dog as well as for those without (p= 0.030). In the control group of the socialising sessions a notable reduction of the value of salivary cortisol in connection with the circadian rhythm could be observed, which did not improve during the normal socialisation therapy session. On the other hand, no significant results were yielded during the physical therapy session. In the control group as well as the experimental group no reduction of the cortisol levels indicated physiological effects of the circadian rhythm. According to Berry et al. these figures may have resulted because of physical activity rather than by coming in contact with the dog (p= 0.373).

Kanamori et al. (2001) used the salivary CgA (chromogranin A), which illustrates a mental stress index. Results of the study did not show any significant changes in stress levels of the patients. Only in two subjects did the levels of the CgA rise, whereas in further two the figures dropped. Thus, the mean score of the CgA before the first AAT session was at (0.266

(± 0.069)) and after that it was (0.258 (± 0.108)) pmol/ml. Measurements made before (0.327 (± 0.043)) and after the last AAT session were (0.141 (± 0.115)) pmol/ml (p= 0.084) and did not show any significant changes. The measurements at fixed times made before and after normal activity in the control group showed that fourteen people displayed changes in the salivary chromogranin A (CgA).

The study made by Batson et al. (1998) found no effect of statistically significant interaction for blood pressure, mean blood pressure and peripheral skin temperature.

Other effects of AAT on patients with dementia

Seven of the fifteen studies are also concerned with further effects of AAT on older dementia sufferers (Richeson, 2003; Moretti et al., 2010; Motomura et al., 2004; Kawamura et al., 2007; Marx et al., 2010; Mosello et al., 2011 & Berry et al., 2012).

Effects of motor abilities were measured in three of seven studies (Mosello et al., 2011; Kawamura et al., 2007 & Motomura et al., 2004). Two of the studies made by Kawamura et al. (2007) and Mosello et al. (2011) yielded significant effects. The only study who did not find improvements in motor activity during their study of AAT for dementia patients were made by Motomura et al. (2004) using the Physical self-maintenance scale (PSMS). Scores showed no significant differences before (5,2 ± 2.1) and after (5.02 ± 1) AAT. In contrast Kawamura et al. (2007) observed a significant increase in motor insufficiency in eating (p= 0.038) after AAT in the study they performed over the course of twelve months. The same was done by Mosello et al. (2011) who used the Motor Behavior Observation Form (MoBOF) to demonstrate increased effects of motor ability. Results showed a change in the figures before the pre-intervention (UDC) (2.3 ± 0.8), the control activity (CA) (2.4 ± 1.3), and after utilisation of AAT (3.1 ± 0.7). Here results showed effects of physical activity during AAT of dementia sufferers (p= 0.001) and a statistically significant increase of the frequency of vocal expressions made by the patients. The pre-intervention (UDC) encompassed a value of (1.4 ± 1.1), which increased during the control activity and AAT (CA 2.4 ± 0.6; AAT 2.4 ± 0.5, p for trend = 0.002). This was also true for the figures of vocal expression of the patients in the post hoc analysis when compared to the pre-intervention (UDC), which was (p= 0.006) during AAT and (p= 0.013) in the control activity. Both figures are significant, thus no effect of AAT could be determined.

Even though a short term of manoeuvrability by means of AAT could be proven. This was seen in the results of the post hoc analysis when compared to the control activity (p= 0.05). Figures representing attraction to the environment also increased significant as a result

of AAT (UDC 2.5 ± 1.0; CA 2.3 ± 0.9; AAT 4.0 ± 1.3; *p* for trend = 0.014). Figures support this result in the post hoc analysis in comparison to the control activity (p= 0.006) and compared to the pre-intervention (UDC) (p= 0.042). This was also true for the item attraction to the environment (p= 0.009). Additionally Mosello et al. (2011) used the Agitated Behaviour Mapping Instrument (ABMI) (baseline range 0-8.0) in order to measure agitated and motor behaviour. Compared to the MoBOF the measurement of the ABMI did not yield any statistically significant figures in the observations made in the morning (UDC 3.6 ± 3.0, 2.4 ± 2.1 CA, AAT 2.5 ± 2.5, *p* for trend = 0.133) and in the afternoon (UDC 3.8 ± 3.9, CA 2.7 ± 2.5, AAT 2.5 ± 2.6; *p* for trend = 0.078). Moreover, scores of the serve impairment battery (SIB) did not prove any significant changes in the patients during the course of the performed study. Supporting this result, the values were (21.0 ± 31.6) by the control activity, before (18.9 ± 29.3) and (21.1 ± 32.7) and after completion of AAT.

Additionally, three of seven studies focused on changes of the symptoms of depression (Berry et al., 2012; Motomura et al., 2004 & Moretti et al., 2010). In order to estimate these symptoms all of them implemented the Geriatric depression scale (GDS). Only one of three studies could detect changes in depressive symptoms. Berry et al. (2012) showed a short term effect for both forms of therapy, paired with the deployment of a therapy dog, which leaded to reduced values of depression when compared to the control group (p= 0.021). But over time no significant figures referring to long-term improvement of the symptoms of depression could be encountered (p= 0.376). In contrast studies made by Motomura et al. (2004) and Moretti et al. (2010) did not yield any significant effects. In the study of Moretti et al. the comparison of the within group comparison (p= 0.001) and that of the between groups (p= 0.070) showed that in the within group comparison symptoms of depression were reduced by 50%. As a result no significant difference with the control group was found in regard to the use of AAT. Moreover Moretti et al. focused on effects of AAT on the self-perceived quality of life of the patient. In five out of ten patients an increase of the self-perceived quality of life could be detected in the AAT group. Merely two of eleven people in the control group gave an account of improvement of their overall quality of life, but the results are not further tested or statistical belayed, they are only based on subjective assumptions of the patients. Further results show that nine of the ten subjects reported a calming effect of animals, and one patient even told of the recurrence of memories of the past.

Richeson (2003) focused on the connection of medicinal treatment and AAT for dementia patients. In the hypothesis of the study she assumes that specialists of recovery are able to influence the physiological and social environment with the use of interventions, be it

measures of AAT or medication by offering especially adapted programmes of therapy (PRN). The results showed that there are no significant differences in the PRN medication at the time of measurement at the beginning and of the follow-up measurement.

A study of Marx et al. (2010) expanded the term of AAT that especially concentrates on a variety of stimuli, resulting in the implementation of dog related stimuli such as a puppy video, dog colouring activity, plush dog, robotic dog, small dog, medium dog, and large dog. In contrast to other studies in which a single animal - preferably a dog - was used, the study also relied on the patient's reaction to different stimuli. The highest attention ratio was achieved by the puppy video with an average period of viewing of 160.500 seconds. The real dog was viewed a total of 120.200 seconds. Additionally, the authors of the study observed differences concerning size of the dog. While a large dog was looked at the longest (154.900 seconds; $p = 0.009$), a medium-sized dog was viewed 133.600 seconds ($p = 0.041$) and a small dog merely 75.200 seconds. In general a real dog generated the highest response rates triggered by a stimulus. Compared to the real dog as well as the puppy video, the 'dog colouring activity' generated the lowest response rate of 96.700 seconds.

No significant changes in the duration of engagement were noted when using dog related stimuli. Marx et al. (2010) also note remarks made by their test subjects during the observation. A total of 108 comments were collected during AAT, while there were only two comments made in the control group, where whether stimuli nor screening assistant were present. This proves that the highest response rate was triggered by a real dog, which means that a plush dog as well as the colouring stimuli performed more ineffectually.

Discussion

General effects

In a conclusive reflection of the fifteen articles, divergent findings can be found in regard to the effectiveness of AAT - especially that involving dogs - on dementia sufferers. In doing so it should not be misjudged, that in this context the ailment of dementia does not allow the observation of improvement of abilities and skills of the patient in a long-term observation, so that it can not be foregrounded due to the progressive health process.

Comparing all of the five selected categories related to the results, only meaningful effects of AAT on social aspects could be detected. Here the only major short-term and long-term effects of AAT on dementia sufferers are those observed on the level of social aspects. Almost all studies were able to yield measurable figures of interactional behaviour of the patients, which could still be observed after completion of the intervention. This means that not only the stabilisation of the changes achieve greater importance, but also the positive influence and alteration of the changes. Churchill et al. (1999), Sellers (2005) and Richeson (2003) all discovered an increase in social behaviour which was also shown in the multidesign by Berry et al. (2012). Here Berry et al. also noted an increase in positive emotion; for example the occurrence of smiling of patients increased, especially during interaction with the dog. Batson et al. (1998) also noticed an increase of smiles, looks, tactile contacts, physical warmth and praise in their study. Occurrence and duration were increased especially on the levels of forward leans, smiles, tactile contact and looks. In addition, Motomura et al. (2004) also attested an improvement of the apathy state. Furthermore Marx et al. (2010) observed a change in the patient's attitude, which improved considerably after contact with the dog. Mosello et al. (2011) showed an increase in the experience of pleasure and a reduction of sadness as a consequence of AAT. Here an effect could be achieved, that lasted beyond the active phase of therapy.

Walsh et al. (1995) showed a long term effect of the reduction of noise levels as well as a reduction of loud spontaneous vocalisations and aggressive vocal outbursts. The only study which also focused on negative aspects were made by Kongable et al. (1989). In the Study negative reactions of the patients towards the deployed therapy dog could be detected. Furthermore like Batson et al. (1998) increase in smiles, laughs, leans, touches and verbalisation can be achieved through AAT. These findings pointed out, that AAT is not suitable for all kinds of patients, and automatically changing their life situation for the better. Obviously, AAT is also able to promote a limited, temporary reduction of agitation and

aggressive behaviour of the patient (Richeson, 2003; Churchill et al., 1999; McCabe et al., 2002 & Kanamori et al., 2001), however, these effects all seemed to merely occur during the active phase with the dog, as these effects started to diminish without actual contact to the dog being established. This means that no long-term effect could be achieved. The effect was not even stable during the course of one day (McCabe et al., 2002). Kanamori et al. (2001) were able to note that AAT contributes to a reduction of anxiety, aggressiveness and caregiver burden, but the aspects of emotional and social behaviour, as well as their coping with everyday tasks could not be statistically belayed. Results found by Mosello et al. (2011) concerning the assessment of agitated behaviour, such as inappropriate verbal or motor activity that is connected to dementia, did not yield any remarkable findings.

In contrast when cognitive effects of AAT on dementia patients were examined only one of seven studies showed appropriate changes in those of the patients. This was the case in the study of Kawamura et al. (2007), which exhibited a distinct short term effect in form of an improvement of cognitive abilities such as spatial orientation during the first six months of the twelve month long period of AAT. Also, within the last six months of the intervention, there were considerable improvements in awareness, ability of concentration and ability of abstract thought to be observed. Even though there can be a tendency of improvement of cognitive, emotional and motivational functions through AAT to be discerned, one can only regard this effect as a short-term effect because the figures diminished as from half way through the intervention and especially within the last six months of the therapy period.

Six of the fifteen studies focused on behavioural and psychological symptoms of AAT among elderly patient with dementia. A short term effect of improvement in problem behaviour during the course of the day was found (McCabe et al., 2002). Also a short term effect related to emotional lability within the first six months and a long term effect of emotional stability and expression of the patients over a twelve month period was detected in the study of Kawamura et al. (2007). Mosello et al. (2011) observed reduced feelings of fear relating to AAT. Thus, the supposition must be made that AAT barely has any notable on behavioural and psychological symptoms of dementia, that in turn should also remain stable.

Four of the fifteen studies analysed physiological effects of AAT on elderly patients with dementia. Merely two of these studies - Berry et al. (2012) and Walsh et al. (1995) - found distinct results. With the aid of measurements of the cortisol level that Berry et al. (2012) found a reduction of cortisol levels through AAT. However, these findings concerned the socialisation therapy session alone, and did not concern the physical therapy session. In the control group a reduction could also be seen, but the reduction here pertains to the figures

of salivary cortisol. Walsh et al. (1995) detected a long-term effect on heart rate. Still, the observations of the studies at hand regarding possible physiological effects seem to be limited, while the level of influence of cortisol level and heart rate through alternative medication obviously also have to be taken into account. In general, dementia sufferers are multi-morbid people.

The last category is concerned with the effects that could not be allocated to any other classification. One aspect involves motor skills, manoeuvrability and a possibility for an increase in vocal expression of the patient through AAT. Mosello et al. (2011) noticed an improvement of motor activity as well as an increase in vocal expression, that remained stable even after completion of the therapy programme. Thus, long-term effects of the attraction to the environment could be proven. Opposite results were found in the study of Motomura et al. (2004) who did not observe any improvement of motor activity. The overall impression of these findings are whether uniform nor diagnostically conclusive. This tendency is further reflected in the effect of AAT on symptoms of depression which was measured in several studies. The study of Moretti et al. (2010) presented a distinct improvement of 50% within the group taking part in AAT, however an improvement was not observed between the groups. Berry et al. (2012) detected a notable reduction of symptoms of depression in the two provided physical therapy and socialisation therapy sessions, but the effects did not remain stable and were only to be observed within a short time period. In contrast, a long-term effect could be observed within twelve months in regard to the increase of motor insufficiency in eating in the study made by Kawamura et al. (2007). Furthermore the level of the amount of administered medication no drop in medication through AAT could be belayed (Richeson, 2003). According to accounts of the patients self-perceived quality of life Moretti et al. (2010) showed distinct improvements. The calming effect of the animals and the development of animal related memory were established, although definite evidence is not provided. Of particular importance is that the deployment of therapy dogs yields a higher response rate among the patients compared to “technological imitations” (Marx et al., 2010). This seems to prove the existence of a “biophilia hypothesis”, which shows the special relationship of man and animal.

New questions and recommendations

Due to the results of the review of literature shortcomings, enhancements and further instructions have to be discussed. More precisely, the general distribution of participants in the different studies (4 - 58 persons) prevented a achievement of clear, valid and reliable

results to the studied subject. Here the heterogeneity of the study groups represented a further problem as it hinders the possibility of concrete statistical analysis. Therefore a homogeneous structure should be strived for, which would then enable assertions of a specific area of focus. In terms of increasing the validity of possible studies it is an absolute necessity to take the use of control groups into account. Only few studies examined in the systematic literature review had a randomised controlled trial design. However with this alone the phase of exploratory and individual case based studies can not be overcome. It could be conceivable that for example when carrying out a study, at the same time all test subjects are compiled in a waiting list for AAT. Additionally, a uniformity of methods, instruments and time periods in which the studies were performed is necessary.

Moreover, the used inventories used different focal points and are combined in numerous ways, which in turn also impaired their validity. A uniform design of research would have been an advantage that enables clear assertions, which then should be transitionally used across all countries involved in the study. A further point of critique in immediate connection to the research design was that in the literature review only studies from the United States, Japan, Australia and Italy were able to be examined. Established empirical insights that originate from the European region especially, as well as other proof of the effectiveness of AAT were missing. Regarding the already initially mentioned problematic distinction of the overall term “animal assisted therapy” it has to be mentioned that it was impressively conveyed by the studies that the use of different unprotected terminology leads to uncertainty and confusion. Clear guidelines related to AAT were missing, which in turn would have increased the diagnostic conclusiveness of the findings. The different forms of intervention with the animal described in the studies do not seem particularly homogeneous.

It is also important to point out that no more than one of the studies concerned itself with possible negative aspects of the utilisation of dogs on dementia sufferers. The approaches solely focused on positive effects of AAT, that begged the question whether in doing so the goal is that the results of the survey become socially more accepted. This affirms the suspicion that a differentiated demonstration of limits and possibilities is not able to be completely provided. However in order to responsibly implement AAT this is an essential necessity. Thus, it has to be assumed that in order to assess permanent changes or stabilisation of the state of health, further research is required that is not solely concentrated on the utilisation of AAT.

A further difficulty is the lack of a interdisciplinary cross-linkage of study projects of AAT. Even though different disciplines (psychology, pedagogy, psychiatry, social services, nursing science, etc.) occupy themselves with this subject area, the objectives of the individual studies differ vastly from each other, depending on the central basic discipline.

Further studies should include therapy plans that are relevant to illness and the animals used, that would enable information to indication and goal of the AAT utilised. Also, exact details of the length of attendance of the animal and the procedure of the intervention are required in order to distinguish the effects of the human-animal-encounter from those with the animal handler present.

General conclusion

When conclusively viewing all effects it can be said that AAT is especially suitable for the improvement of social aspects of dementia sufferers. The targeted therapeutic utilisation of dogs mainly leads to an intensification of the social interaction between patient and animal, which in part then results in the same effect between the patient and other people. This increase is belayed by numerous accounts of patients connected to an improvement in quality of life. In terms of social behaviour dogs have the ability to contribute to a pacification of the patient and to an increase in their expression of emotion. The possibility of an increase in physical activity or the reduction of symptoms of depression seems as promising as the reduction of behavioural and psychological symptoms. However the studies do not show uniform results, even presenting contradictory findings. In consequence, the effects are not able to be clearly evaluated. In addition, morbid processes that often lead to a more severe degree of demential illness are not regarded in the studies. Cognitive abilities and skills are at the very least temporarily influenced. Long-term effects that last beyond the temporary development of animal related memory are hardly able to be achieved through the utilisation of a therapy dog. In this regard it has to be said that an absence of a decline can be viewed as a success when keeping the symptoms of the illness in mind. However physiological effects are hardly affected by AAT.

Conclusively, it can be said that all the studies picked up in the systematic literature review were of low quality. Further research is required focusing on improvements of the shortcomings of the studies. Furthermore, short-term and long-term effects, as well as the possibility of aiming for a stabilisation of the progression of the overall illness of dementia must be regarded. It is desirable that AAT is practiced using predefined general guidelines for the use of intervention, which can then be replicated in further studies.

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Appendix

Table A1

Combination of serach terms

Type of therapy	Clinical picture	Effects	Context of old age	Social aspects
Animal assisted therap*,	Demen*	Effekt*	Pflegeheim	Soziale isolation
animal asissted therap*,	Alzheimer	Effect*	Hospiz	social isolation
"animal assisted therap*"	Alzheimer disease	Effizienz	Altenheim	Interaction
animal_assisted therap*	Vaskul* demen*	Efficiency	Elderly care	Interaktion
Tiergestützte therap*,	Frontotemporal	Ausführung	Home for the aged	Einsamkeit
tiergestützte-therap*,	Lewy-body demen*	Verlaufsstudien	Hospital	loneliness
"tiergestützte therap*"	Psychological disorder		Zickenhuis	Stress
tiergestützte_therap*	Psycholog* Störung		Krankenhaus	Scham
Hund assisted therap	Psychatric desease		Nutritional assessment	Aggression
Hund-assisted therap	mental health		outcome assessment	Depression
Hund_assisted therap	mental disease		patient care	Physiologische veränderung*
"Hund assisted therap"	cognitive impairment		Gerontopsychiatr*	Angst
Demen* assisted therap	cognitivly impaired		Lebenssituation	fear
Demen*-assisted therap*	ICD-10 Demen*		Life situation	Anxiety
Demen*_assisted therap*	F00-F03		Familienstand	Social behavior
"demen* assisted therap*"	DSM-IV Demen*		Alter	Sozial verhalten
Alternativ* medi*	DSM-IV 290-294.8		Age	Bio psycho sozial
Begleithunde	Stadien		Status	responsivness
Therapiehunde	Geriatric psychatric patients		Hochbetagt	
Therap* dog	Psychatric elderly person		elderly	
Animal bond			old	
Human animal bond			Program* Netzwerke	

Table A1 *(continued)*

Combination of serach terms

Type of AAT	Clinical picture	Effects	Context of old age	Social aspects
Animal assisted intervention			Network*	
Animal_assisted intervention			Geriatr* Netzwerke	
Animal-assisted intervention			Geronto* Netzwerk	
"Animal assisted intervention"			Beratung	
Animal assisted activities				
Animal-assisted activities				
Animal_assisted activities				
"animal assisted activities"				
Hunde				
Dogs				
Begleithunde				
Canine assisted therap*				
Canine-assisted therap*				
Canine_assisted therap*				
"canine assisted therapy"				
dog assisted therapy				
dog-assisted therap*				
dog_assisted therap*				
Behandlungskriterien				
Behandlung				
Behandeling				
Treatment				

Abbrevations: AAT: animal assisted therapy