Research in the use of animals as a treatment for humans

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Introduction

Accounts in the media and popular science books can easily lead to the impression that owning a companion animal has profound positive effects on human health. A growing body of research does confirm the existence of such positive relationships. For example, owning a pet such as a dog, cat, bird, fish, or horse is associated with fewer visits to the doctor (Headey and Grabka, 2007), being more physically active (Cutt et al., 2007; Christian et al., 2013), feeling less lonely (Black, 2012), having a better survival rate after heart attacks (Friedman et al., 1980), and having reduced blood pressure during stressful tasks (Allen et al., 2001).

However, not all studies report positive effects (Winefield et al., 2008; Mathers et al., 2010), and some even find negative results. A study of Peacock et al. (2012) found that strong attachment to companion animals was the strongest predictor of psychological distress.

Consequently, it is a challenge to conduct scientific experiments in this new research field, and the studies of pet ownership are often inconclusive, suffering from problems with design, an insufficient number of study ob-

jects, and standardization of the multiple background parameters, which to some extent, can explain the different findings and why the causation of eventual effects is difficult to establish (Wilson and Barker, 2003; McNichol-olas et al., 2005; Herzog, 2011). Due to the fact that there are divergences in outcome on interaction with animals on human health and well-being, obvi-
ous questions are: What do we gain from the therapeutic use of animals? What are the effective elements? And how do we measure these and relate them to traditional effect measures of human well-being?

The objective of this article is to give an introduction to research in the therapeutic use of animals and to present some ideas as to how we can identify and measure a potential causal relationship between animal contact in a therapeutic setting and the longer-term effects.

The Therapeutic Use of Animals

Based on historical and prehistoric evidence, it is believed that the social symbiotic relationship between man and companion animals developed without any coercion from the side of humans (Odendaal, 2000). During the 20th century, introduction of animals to institutional care settings increased. Today, animals may be used therapeutically as part of treatment protocols for humans with neurodevelopmental disorders like autism or ADHD or problems of a psychiatric or social nature. However, not all interactions with animals are considered therapy or have a thera-
pic goal. The following definition of animal-assisted therapy (AAT) from the organization Pet Partners (formerly Delta Society; www.petpar-
ters.org/) is the most commonly used:

“AAT is a goal-directed intervention in which an animal that meets specific criteria is an integral part of the treatment process. AAT is directed and/or delivered by a health/human service professional with specialized expertise and within the scope of practice of his/her profession. AAT is designed to promote improvement in human physical, social, emotional, and/or cognitive functioning. AAT is provided in a variety of settings and may be group or individual in nature. This process is documented and evaluated.”

One example of AAT is equine-facilitated psychotherapy with the aim to trigger a behavioral change and help solve emotional problems in the client (Lentini and Knox, 2008). Conversely, animals may also be employed for leisure activities such as dogs visiting nursing homes (Figure 1) or horseback riding in institutions for adolescents. The latter activities fit the term animal-assisted activities (AAA), which has the following definition by Pet Partners:
“AAA provides opportunities for motivational, educational, recreational, and/or therapeutic benefits to enhance quality of life. AAA are delivered in a variety of environments by specially trained professionals, paraprofessionals, and/or volunteers, in association with animals that meet specific criteria.”

In practice, however, it can be difficult to decide in which category a given intervention fits, and this is the reason for including the term animal-assisted interventions (AAI; Figure 2), which is defined as: “any intervention that intentionally includes or incorporates animals as a part of a therapeutic or ameliorative process or milieu” (Kruger and Serpell, 2010).

Theoretical Framework

Currently, there is no general or overall theory behind the available forms of animal therapy. Instead there are a number of theories that can be roughly divided into two main categories. The first is where the effect is ascribed to the idea that the animal has unique abilities in itself, and the second is that the interaction with the animal has therapeutic effects (Kruger and Serpell, 2010).

Regarding the first group of theories, which focuses on the ability of the animals, we find the biophilia theory (Wilson, 1984), which describes the affinity of humans to nature and animals and that there seems to be an innate interest to look at and to be in natural surroundings, preferably those that enable life and survival. Another aspect of this first category is the calming effects of being together with animals and the ability of animals to catalyze contact to other persons e.g., a therapist, or act as a transitional object in a therapy situation (Corson and Corson, 1980). This category of theories is supported to some extent by scientific studies showing physiological effects of physical contact to animals (Beetz et al., 2011; Handlin et al., 2011). Other studies find that the presence of an animal positively affects the perception of the treatment or therapist (Nagengast et al., 1997; Schneider and Harley, 2006). Involved, if not central for these effects, seems to be the activation of the oxytocin system. Oxytocin is a peptide hormone that is released in response to pleasant social interactions, particularly touch, in trusting human–human relationships (Uvnäs-Moberg, 2003). The study of Handlin et al. (2011) found that the level of oxytocin was correlated to the quality of the relationship between dog owner and dog.

To the second category of hypotheses, of whether therapeutic activities with animals are effective, we find psychological theories related to self-efficacy, self-esteem, and social support. Self-efficacy is associated with mastering a difficult task and creates a willingness to try again when faced with challenges because of the belief of success (Baumeister et al., 2007). Perceived social support may be regarded as a social resource in the terms of feedback, help, and information (Hjemdal et al., 2006). Mutual interaction with animals is found to provide a feeling of support because it creates an experience of connectedness (Brown, 2007). Social support is seen as an important factor in interactions with the horse among at-risk adolescents (Burgon, 2011) and even among a normal group of adolescents (Hauge et al., 2014). Overall, the theories connected to interaction with animals have been less subjected to scientific studies.

Different Types of Therapy and Target Groups

The type of treatment can take many different forms, and the inclusion of animals can range from the mere presence of an animal during a meeting with the doctor or psychologist for example, to stroking or brushing an animal, or further intense interactions, like horseback riding or even psychotherapy, where the animal has an integrated role. In all cases, the animal contact is offered in a much more standardized form compared with merely being with a pet.

Animal-assisted therapy is directed towards several target populations, with persons who have neurodevelopmental disorders, psychiatric diseases, or psychosocial problems as the predominant groups (Berget et al., 2013). An informal Danish questionnaire among 34 practitioners of AAI agreed with these findings (Thodberg and Christensen, 2010). In a Norwegian study of 1,100 practitioners (300 psychologists, 300 general practitioners, and 400 psychiatrists), the strongest degree of usefulness of AAI was reported for individuals with intellectual disability while the least significant one was for individuals with schizophrenia disorders. The practitioners that took part in the study believed that the treatment effects were greatest for improved physical capacity and least for improved ability to communicate with other people and increased attention to other humans (Berget and Grepperud, 2011).

It is our impression that few limitations exist as to which species can be used in therapy, but the predominant species are dogs and horses (Thodberg and Christensen, 2010), but also smaller animals and even reptiles have been found to have effects (e.g., Murry and Allen, 2012; O’Haire et al., 2013). It is likely that cultural differences between countries play a role in which animals are selected for therapeutic use.

Effectiveness and Measurement of Animal-Assisted Interventions

The effects of AAI have been studied in randomized and controlled studies, both with companion animals as well as traditional production animals in a farm setting.

Some studies have investigated the effect of AAI on the prevalence of psychiatric symptoms such as depression and anxiety and on physiological stress responses. Cole et al. (2007) found significantly greater decreases in blood pressure, adrenaline concentration, and anxiety measured with Spielberger State Inventory (STAI; Spielberger et al., 1972) among 76
hospitalized adults with severe heart failure that received a 12-minute dog visit compared with control groups. Hoffmann et al. (2009), in a smaller study, found a significant decrease in STAI in a pre- and post-treatment controlled crossover study among 12 depressed patients. The intervention was a 30-minute session with or without the presence of a dog. Similarly, Le Roux and Kemp (2009) demonstrated a significant reduction of scores for depression in elderly persons in long-term residential facilities, attending weekly 30-minute group sessions with a dog, compared with a control group attending sessions without a dog. In two studies of AAT with traditional farm animals (mainly dairy cows, beef cattle, and sheep), Berget et al. (2011) and Pedersen et al. (2012) showed a significant decrease in anxiety and depression, respectively, after a 3-month intervention (three hours, twice a week). Berget et al. (2011) also demonstrated a significant decrease in anxiety at a 6-month follow-up in the experimental group compared with the controls.

In meta-analysis of five studies measuring the effect of AAI with dogs or cats on individuals with depression, Souther and Miller (2007) found that AAA/AAT was associated with fewer depressive symptoms. More recently, a larger meta-analysis examining the effect of AAT, with any animal species, on elderly persons and patients with psychiatric disorders concluded that AAT improves social functioning, whereas moderate effects were found for depression and anxiety (Virués-Ortega et al., 2012).

Several experimental studies have shown that interaction with pet animals affects self-efficacy, self-esteem, and social support. Chu et al. (2009) demonstrated improvement in self-esteem and self-determination and a decrease in schizophrenic symptoms among 30 schizophrenic patients in an 8-month intervention with a therapy dog compared with treatment without a dog. Correspondingly, Berget et al. (2008) found significantly increased self-efficacy, measured with the Generalized Self-Efficacy Scale (Schwarzer, 1993), among a heterogeneous population of persons with psychiatric disorders during a 3-month intervention (3 hours, twice a week) with traditional farm animals. Additionally, at a 6-month follow-up, the intervention group showed significantly increased self-efficacy compared with the control group. The aforementioned AAI studies with farm animals (Berget et al., 2008, 2011; Pedersen et al., 2012) were designed in the context of green care, which is defined as the use of commercial farms and agricultural landscapes as a base for promoting human mental and physical health, social inclusion, and educational benefits through normal farm activity (Sempik, 2008). As far as we know, these are currently the only randomized controlled studies with traditional farm animals in an AAT setting.

While AAT has been practiced for many years and a handful of studies performed have been presented here, it becomes obvious while reviewing the literature that huge gaps exist in our knowledge and that more research is needed before we have fully exposed the effects of AAI (Nimer and Lundahl, 2007; Souther and Miller, 2007; Virués-Ortega et al., 2012; Bernabei et al., 2013).

### Methods Used to Measure the Effects of Animal-Assisted Interventions

In the majority of the AAI studies, the effect measures are collected after the actual therapy has ended, not during the therapy. If a documented effect is found, it is therefore not always possible to determine the causal relationship or direct pathway between the different elements in the therapy situation and the measures of effect. To be able to refine and target AAI, it would be useful to add objective measures of the immediate response effect, so that effective elements can be identified and optimized. As exemplified in the previous section, the gain of the AAI is often measured by qualitative psychiatric instruments (or scales) measuring the prevalence of psychiatric symptoms like anxiety and depression. While these methods are well established and validated, they are based, to some extent, on the subjective evaluation of either a professional, a caretaker, or by self-evaluation; therefore, we suggest that future studies combine such traditional instruments with objective measures of the immediate response. This approach will enable us to link traditional effect measures with measures of the immediate response and pinpoint the factors that are especially important for different target groups and should be optimized in future interventions (Figure 3). Measures of immediate response should include physiological measures such as heart rate, blood pressure, and endocrinological parameters as well as the observation of behavior, which is our main focus. Often a combination of behavioral and physiological variables will give the optimal description of the response during the human–animal interaction.

### A Relatively New Approach: Ethology

Ethology is the science of animal behavior and the causation of behavior. In ethology, questions are asked about evolution and function (ultimate questions) or causes and development of behavior (proximate questions; Tinbergen, 1951). The methods used to answer these questions about behavior can be used also to quantify the human–animal interactions and to evaluate the welfare of the animals used in AAI. To obtain good quality behavioral data, it is optimal to video record the interventions. The videos can then be analyzed afterward based on an ethogram or predefined list of relevant and thoroughly described behaviors. Use of this technique makes it possible to quantify the frequencies and durations of the movements and behaviors of the animal round the human as well as the movements, body posture, orientation, and vocal response of the human and where the human looks during the interaction (Martin and Bateson, 2007). More research is needed to delineate the chain of interactions
between an animal and human (e.g., looking at what happens when a dog performs one behavior, the response of the human to this behavior, and what happens next). By using behavior as a quantitative and objective measure, as done in the study of Hauge et al. (2014) who registered the behaviors of horses in interaction with adolescents, we can get a better picture of which behavioral interactions stimulate humans the most. This could then be used in developing and refining the types of interactions used during intervention.

**Is There a Risk for Reduced Animal Welfare during Animal-Assisted Interventions?**

There is a potential risk that the welfare of the therapy animals could be threatened during the AAI sessions. The risk will depend on the treatment type and the diagnosis of the patients, as the handling of the animals during AAI session is not always on the terms of the animal. The welfare of the animal was the focus of a smaller (17 handlers with 18 educated therapy dogs) online Swedish survey (Ehrén, 2014) investigating the work of dogs with elderly as well as disabled persons. The handlers were asked whether they had observed incidents of the dogs being petted too hard or even hit by the patients. Forty percent answered once, and 5% answered several times.

A necessary question and an important area of research is therefore whether it can be recommended, from an animal welfare perspective, to include animals in the treatment of humans? Most studies on the welfare of therapy animals have been done with dogs. King et al. (2011) found that AAI dogs with increased salivary cortisol concentrations also had more behavioral signs of stress and that dogs over 6 years of age and experienced dogs showed fewer behavioral signs of stress during AAI. Haubenhofer and Kirchengast (2007) found that dogs had increased salivary cortisol concentrations on days with AAI sessions compared with control days, and when dogs had more than 25 sessions within a sampling period, they showed a steady increase in cortisol concentration (above 3 nmol/L). The 18 dogs used in the study were both male and female and of different breeds. Glenk et al. (2013) did not find that dogs (male and female dogs of different breeds) were stressed by being used in AAI but found variation in the reaction of the dog according to whether they were on- or off-lead, with a greater cortisol concentration in the dogs on-lead.

These studies emphasized the ability of the dog handler to monitor the behavior of the dog and to intervene if necessary. In a small study by Brisk et al. (2013), 11 dogs were video filmed during the first 10 minutes of an AAA visit to nursing homes, and the owners made observations of the behavior and emotions of their dogs. It was found that there was a positive relationship between the evaluation of the dog behavior by the owners and the behavior analyzed from the video recordings for the behaviors yawning, panting, tail wagging, standing, sitting, and lying down. The behaviors panting, tail wagging and standing were associated with positive emotional state, whereas sitting was associated with a negative emotional state (Brisk et al., 2013).

In order for the welfare of the therapy animals to be taken care of, there is a need to develop standardized protocols that the handlers of these animals can use to assess their welfare. Knowledge exists about body postures and behaviors of dogs that can indicate they do not want to have contact with specific persons. We need to document these behaviors for more therapy animal species and make it readily available to handlers so that they are aware of when they should interrupt an intervention for the welfare of the animal. This should be taught when educating handlers and therapy animals but also be available to people who use animals without having formal education. In general, handlers who want to use animals in AAI should have appropriate education to ensure the animals used are safe and healthy for the persons receiving AAI and that the welfare of the animals is not put at risk.

**Cooperation with Experts from Other Disciplines Needed**

A Norwegian questionnaire among psychiatrists, general practitioners, and psychologists found that while most professionals had no former experience with using animals as part of their work, more than two-thirds of the respondents were motivated to learn more about AAI and thought that it should be used more in their field of work (Berget et al., 2013). These findings demonstrate that within the established health care system in Norway, there is interest and a positive attitude towards the implementation of AAI. This is important because to move forward and enhance the quality of future studies by combining measures of immediate effects and longer-term outcomes of AAI, we need to cooperate with professionals from many disciplines, including those already in contact with potential target groups. Obvious collaborators are psychiatrists and psychologists that have the expertise to measure and evaluate the effects on the mental well-being of the patients. Another aspect that must be considered is that if you want to incorporate physiological parameters from human participants in a project, you should include a medical doctor in your research team who is able to collect this type of data. Pedagogues are another group of professionals that have a tradition of incorporating AAI in their work and should be considered as project partners, especially if the work is with a young target group.

The obvious advantages of cross disciplinary cooperation are that it forces one to attack scientific questions from all possible angles, thereby attaining a more holistic approach and including a wider range of variables. The challenges of interdisciplinary cooperation are to acknowledge and respect that other fields use different techniques and approaches and to recognize that as a strength and not as an obstacle.
What is the Way Forward in Research on Animal-Assisted Interventions?

To develop this collaborative field of research, we need to focus even more on the quality and the quantity of our data. We should make an effort to include proper control groups and, if possible, record the situation of the study subjects before the start of the intervention (to get control data on the individual), at the beginning of the intervention, during the intervention, and at certain intervals after the intervention has stopped to follow-up and check for how long the intervention has an effect. It is necessary to get a broad picture of how AAI affect the persons during the intervention, which would include physiological measures such as blood pressure, heart rate, body temperature, and different hormones (e.g., cortisol, oxytocin, and insulin) as well as behavioral measures such as body posture and orientation, movements, where the human is looking, and what the human is talking about during the intervention. The measures of immediate effect should be related to traditional effect measures to enable the identification of possible causal pathways of the effects of animal contact.

Another future focus area is the importance of the species, breed, gender, sex, and age of the intervention animal for the response and the long-time effects of the human. Finally, we need to further investigate how the animals used in the intervention are affected by the interaction, especially since many of the patients in question may not behave normally due to their disorder. The theoretical explanations for the benefits of interacting with animals need to be further explored and the plausible mechanisms be confirmed by scientific data. In conclusion, abundant research opportunities exist in the field of AAI.

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