From the Department for Biomedical Sciences
University of Veterinary Medicine Vienna,
Institute of Pathophysiology,
(Head: Univ.-Prof. Dr. med.vet. Reinhold Erben)

Animal welfare in animal-assisted interventions: Effects of human-animal interaction on dogs’ physiological measures and behaviour

Thesis submitted for the degree of
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Mag. rer.nat. Lisa Maria Glenk,
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Supervisor: Univ.-Prof. Dr. DI Halina Baran
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1 PREFACE

“The human-animal bond is a mutually beneficial and dynamic relationship between people and other animals that is influenced by behaviors that are essential to the health and well-being of both. This includes, but is not limited to, emotional, psychological, and physical interactions (of people, other animals, and the environment)... (JAVMA, 1998)”
2 INTRODUCTION

“It is a universal, natural and basic human right to benefit from the presence of animals (IAHAIO, 2007).”

The International Association of Human-Animal Interaction Organizations (IAHAIO) is a global interdisciplinary organization, striving for effective advancement of the understanding and appreciation of human-animal interaction. IAHAIO was established in 1990 as a not-for-profit entity in the United States of America to become a key influencer in education and practice in the field of human-animal interaction. However, IAHAIO has widened its activities to include dissemination of the latest research contributions and to provide a coordinating structure for worldwide networking and collaborations between all member organizations (IAHAIO, 2011).

2.1 Theoretical foundations of animal-assisted interventions (AAIs)

Animals are an integral component of our socioeconomic environment and have distinctly influenced human history. Analysing the ancient relationship between people and animals, a mutual influence on the psychological and physiological state of one another has been widely documented. Hence, it appears feasible that the application of animals as curative measures in the treatment of human diseases has a rich tradition. Historical reports range from the belief in guardian spirits in animism and shamanism, on to religious representatives in ancient Greece and Egypt (Schoen, 2001; Kruger & Serpell, 2006).
2.1.1 Historical foundations

Historical evidence on early animal-assisted therapy has been reported in ancient Greece where Hippotherapy was used for rehabilitating injured soldiers. The Grecian cult of Asklepios, also called the “god of medicine” was able to transform into a dog or snake, curing patients by licking their wounds. Animals were believed to be endowed with divine power to cure human illness with their saliva (Kruger & Serpell, 2006).

In early Christianity, animals were also assigned to participate in healing processes by contacting and licking ill people and as a new trend, especially dogs gained appreciation as guardian and working animals. The beneficial use of animals in curing diseases was however characterized as demonic by the Catholic Church and hence taken to court by the Inquisition (Brackert & Van Kleffens, 1989).

During the late 18th century, the positive effects of animal companionship were again used to enhance the treatment of human patients in a mental institution in England, giving rise to the hypothesis that companion animals could have socializing influences on mentally ill patients (Netting et al., 1987). These results were duplicated in the 19th century where animals received increasing attention, were commonly adopted as domestic pets and eventually introduced into therapeutic settings (Schoen, 2001; Kruger & Serpell, 2006).

The apparent achievement was however blurred by the subsequent success of medical science in the early 20th century and brought animals rather into context with zoonotic diseases than therapeutic success (Kruger & Serpell, 2006). Nevertheless, groundbreaking studies by Bossard (1944) and Levinson (1962, 1970) once again drew attention to the beneficial effects provided by animal companionship.
Another milestone in animal-assisted therapy research dealt with the effect pets had on the survival rate of cardiovascular patients one year after leaving a coronary care unit, reporting a five times higher probability of survival for pet owners (Friedmann et al., 1980). The first steps to deliberately embed the positive effects of animal contact into a theoretical framework were taken by McCulloch (1983) who, in analogy to the bio-psycho-social model of health, proposed biological, psychological and/or social comfort as a viable explanation.

These early investigations provided useful new insights and stimulated the establishment of the first organizations, institutions and communities that were dedicated to the promotion of the human-animal bond (Hines, 2003).

Well-being and longevity have been related to close social relationships (House et al., 1988; Berkman et al., 2000) and pet keeping (Siegel, 1990; Serpell, 1991). As a consequence, pets are highly integrated into our social life (Otterstedt, 2001).

### 2.1.2 Terminology and definition of animal-assisted interventions (AAI)

Over the past decades, a considerable body of research has been undertaken to connect human health to the properties of their social relationships with animals. Willis (1997) described the therapeutic use of animals for humans’ health benefit in three basic ways:

(i) animals are used as companions for individuals who are either living independently in their own home or in assisted living facilities

(ii) animals are used in institutions where they help to stimulate and/or be companions to the residents

(iii) animals visit institutions to help stimulate the residents’ interest and provide a topic of conversation
Along with the increasing number of research reports, there was a subsequent rise of terms and definitions (e.g. animal-assisted therapy, animal-assisted interventions, pet-facilitated therapy, pet-supported therapy). Hence, Beck and Katcher & Beck (1984) suggested that a clear distinction should be made between the term “therapy” in any scientific/medical sense and the non-medical, curative inclusion of animals for recreational use or as an emotional stimulus. There exist several explanations on what is considered therapy, animal-supported visitation or activity (LaJoie, 2003). One of the largest organizations responsible for the certification of therapy animals in the United States, the Delta Society has published the following widely cited definitions of animal-assisted therapy and animal-assisted activity (Delta Society, 2005; Fine, 2006):

- “Animal-assisted therapy (AAT) is a goal-directed intervention in which an animal that meets specific criteria is an integral part of the treatment process. These programs are usually 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 improve human physical, social, emotional, and cognitive (e.g., thinking and intellectual skills) function and animals may be formally included in activities such as physical, occupational, or speech therapy. Therapy programs are provided in a variety of settings and may involve individuals or groups. Key features include specified goals and objectives for each individual, evaluation and measured progress.

- Animal-assisted activities (AAA) provide 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. Key features include the absence of specific treatment goals; volunteers and treatment providers are not required to take detailed notes; visit content is spontaneous”

<table>
<thead>
<tr>
<th>AAA</th>
<th>AAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casual “meet and greet” activities that involve visiting people</td>
<td>Significant part of treatment for many people who are physically, socially, emotionally or cognitively challenged</td>
</tr>
<tr>
<td>No specific treatment goals planned</td>
<td>Stated goals for each session</td>
</tr>
<tr>
<td>Same activity can be used with many people</td>
<td>Individual treatment for each patient</td>
</tr>
<tr>
<td>Detailed notes unnecessary</td>
<td>Notes on patient progress taken at each session</td>
</tr>
<tr>
<td>Visit content is spontaneous</td>
<td>Visit scheduled, usually at set intervals</td>
</tr>
<tr>
<td>Visit can be long or short as desired</td>
<td>Length of visit is pre-determined to best fit needs of patient</td>
</tr>
</tbody>
</table>

Figure 1: Comparison of Animal-assisted activities (AAA) and animal-assisted therapy (AAT), modified from Delta Society (2012a).

To facilitate terminology and maintain coherence in this doctoral thesis, the above-stated terms (see Fig. 1) have been subsumed under the definition animal-assisted interventions (AAIs), representing any kind of inclusion of an animal into an intervention for human health purposes.

Although there is no legal definition for therapeutic animals as there is for service animals, a definition of a therapy animal has been given on the website of the Delta Society: “They1 provide people with contact to animals, but are not limited to working with people who have disabilities. They are usually the personal pets of their handlers, and work with their handlers to provide services to others. Federal laws have no provisions for people to be accompanied by therapy animals in places of

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1 Therapeutic animals (author’s comment)
public accommodation that have "no pets" policies. Therapy animals usually are not service animals (Delta Society, 2012b)."

2.1.3 Biophilia – an explanatory framework?
AAIs incorporate specially trained and certified animals as a part of a therapeutic purpose. There has been some speculation but little evidence of why AAIs may positively affect human health. Humans’ affectionate relationships with nature may have emerged out of an evolutionary based, innate interest to interact with the biotic environment. This theoretical concept of “biophilia” has been established by Wilson (1984) and has become a frequently cited model to explain aspects of human-animal interaction.

The idea of employing biophilia as a suitable explanatory framework to describe the underlying mechanisms of AAI-derived effects has been challenged by Joye (2011). Evolutionary important aspects of an affective orientation towards nature definitely include fear, threat and the predator-prey relationships; however, these principles are commonly neglected in most explanatory backgrounds found in AAI research.

Kruger & Serpell (2006) argue that science lacks evidence to link humans’ biologically grounded attraction towards nature with genetic inheritance. Kellert (2005), on the other hand, emphasizes that a genetic predisposition is likely to be complemented by subjective experience, learning and the cultural environment.

Moreover, it has remained unclear to what extent certain traits and attributes that are characteristic of animals, but not unique to them, contribute to AAI research results (Marino & Lilienfeld, 2007). Perhaps, interaction elements as perceived during human-animal contact can be easily mimicked in an experimental setting without actually interacting with an animal. Recent research indicates that the virtual
perception of a 3D-modeled dog and watching a real dog stimulate similar physiological responses in healthy adults (Stetina et al., 2011). Taking this idea further, Shibata & Wada (2011) suggest that animals can actually be replaced by pet robots that share animal-like traits (i.e. shape, size, fur) in robot therapy. Yielding results comparable to those derived during AAl, there is a considerable implementation potential for technology-aided intervention in health care institutions where no animals are allowed (Shibata & Wada, 2011).

In conclusion, AAI research obviously bears measureable components that, however, cannot be directly linked to an innate predisposition or species-specific characteristics (Joye, 2011).

2.2 The human-dog bond

Being the eldest domesticated animal, it has been suggested that dogs’ companionship has played a significant role since the beginning of human history (Benecke, 1994). However, sources of evidence on how and when the domestication process took place are rather indicative than substantial (Pennisi, 2002). Although intense effort has been spent on tracking the correct evolutionary age of the dog-human bond, a coherent and integrated explanation is still absent. Despite the fact that dogs share considerable similarities with coyotes, jackals and other canids, most researchers agree that dogs are derivatives of ancestral wolves (Coppinger & Coppinger, 2001).

Genetic analyses examining the mitochondrial DNA of dogs, wolves, coyotes and jackals provide evidence that dogs descended from several lineages of wolves 135,000 years ago (Vila et al., 1997). Considering the origin of genetic separation where morphological changes were unlikely to be visible, Vila et al. (1997) indicate
that the phenotypic divergence found in dogs occurred as a result of co-adapting with human populations to sedentary agriculture around 15,000-10,000 years ago.

Based on the results of Vila et al. (1997), Savolainen et al. (2002) conducted another study on mitochondrial genomes of modern dogs, European- and Asian wolves. Their data gave rise to the assumption that the dog originated in East Asia, 15,000 years ago (Savolainen et al., 2002). In contrast to the conclusions drawn by mitochondrial DNA analyses, vonHoldt et al. (2010) investigated single nucleotide polymorphisms in the genome sequence of dogs and grey wolves, highlighting that Middle East Wolves are more likely to be dogs’ ancestral relatives than Asian wolves. Consistent with the hypothesis that humans were accompanied by dogs when they crossed the Bering Strait 10,000-15,000 years ago (Pennisi, 2002), New World dogs exhibit DNA sequences similar to European dogs, suggesting a common ancestral bloodline (Leonard et al., 2002).

Archaeological findings associating canine fragmented bones with human burial sites have been dated between 14,000-11,000 years ago (Pennisi, 2002; Reitz & Wing, 2008). The unique position that dogs had occupied in ancient human societies was analyzed by Morey (2006), describing phenomena of dog burial, mummification, cremation and ritual sacrifice. Individual cases of dogs and wolves being buried in a formal cemetery, similar to humans, have been reported by Losey et al. (2011). Subsequent changes in behaviour, size and shape in early dogs may have emerged as a developmental response during the adaption to a new source of food: human waste (Coppinger & Coppinger, 2001).

2.2.1 Human-like social skills?

Notwithstanding the remarkable progress in human-canine evolution and genetics, a growing body of science aims to link humans’ affectionate interactions
with domestic dogs to special characteristics that distinctly discern the dog from any other domesticated species. Exploring pet ownership in a cross-cultural sample of 60 societies, dogs were among the most commonly kept pets (Gray & Young, 2011). In western societies, both yard and house dogs receive veterinary care, attention and physical proximity from their owners (Shore et al., 2006).

The ancient relationship between dogs and humans has been referred to as a mutualistic social system (Odendaal, 2000; Schleidt & Shalter, 2003). Co-existence of these two social species has been linked to similar brain structure and function, generating similar physiological and psychological responses in each species. It has been evidenced that the adaption of comparable socio-communicative abilities in dogs and humans has contributed to the development of special social skills that allow dogs to comprehend human social and communicative behaviour (Hare & Tomasello, 2005). It has been speculated that these skills have evolved during and as a result of the process of domestication (Hare & Tomasello, 2005; Hare et al. 2010). Dogs are not only well adapted to read and interpret human gestures but seem to facilitate pro-social human behaviour by increasing their owner’s social attractiveness, stimulating conversations and friendly behaviours from strangers (Gueguen & Ciccotti, 2008; Wells, 2004; McNicholas & Collins, 2000). These aspects are likely to contribute considerably to the dog’s unique position in the lives of humans.

2.3 Effects of human-animal interaction and AAIs on humans

AAIs in therapeutic settings aim to support human health and well-being. Contact is usually initiated by the therapeutic animal while intensity and duration of AAIs vary with the patient’s particular situation-specific needs (Jorgenson, 1997). Companion animals can add to the quality of human life, providing physiological,
psychological and social comfort that arises from interaction as evidenced by the research findings listed below.

2.3.1 Motivation

A higher percentage of attendance to attain voluntary therapy was observed by comparing an animal supported group therapy to regular group therapy in a psychiatric unit, suggesting that animals act as a motivational stimulus by increasing the patient’s attendance in participating in voluntary therapy programs (Halcomb & Meacham, 1990).

Animals can contribute to therapeutic purposes by facilitating and utilizing the patient’s attachment and attention during the establishment of a therapeutic relationship and bond, by decreasing the initial reservations that people may have about entering therapy (Hoelscher & Gafat, 1993; Mallon, 1994). The so-called "social lubricant" or "ice-breaking" effect of the animal on the patient ameliorates initial therapist-patient interaction by promoting a relaxed and friendly atmosphere (Corson & Corson, 1977; Fine, 2006).

Individuals suffering from severe psychophysical disabilities, if capable of verbal communication, can benefit from speaking to and about the dog; they learn new words that are related to the dog’s body parts, objects or obedience commands and thus, improve pronunciation and implement new vocabulary (Buttram et al., 2008).

2.3.2 Social interaction

An increase in social interaction was found over the course of a pre-post study in a psychiatric facility comparing an animal assisted therapy group to a traditional therapy group in patients undergoing substance abuse therapy (Marr et al., 2000). Brief exposures (10-30 min) of animal assisted therapy improved psychosocial and
emotional conditions in hospitalized psychiatric adult patients (Barker & Dawson, 1998; Barker et al., 2003) and adolescents (Bardill & Hutchinson, 1997).

Qualitative data (patient journals, interviews, and nursing notes) analyses furthermore indicated that AAI can serve as a facilitator for social interaction and communication among patients, especially in that they talked to one another about the dog or interacted while feeding or grooming the dog (Bardill & Hutchinson, 1997; Bernstein et al., 2000).

Significant improvements in social contact and interpersonal relationships were found in schizophrenic patients that received dog-supported intervention (Villalta-Gil et al., 2009).

2.3.3 Physiological effects
Studying the effects of companion animals on human physical health, pet owners visit healthcare providers less frequently than non-pet owners (Headey et al., 2002; Siegel 1990), exhibit lower blood pressure and heart rate (Allen et al., 2002). In the presence of their pets, pet owners seemed to recover faster from an exposition to a stressful event (Allen et al., 2002).

There is evidence that interaction with dogs can mediate stress reactivity in humans. Dog owners who gently groomed their dogs exhibited significantly lower levels of cortisol (Handlin et al., 2011). Pre-post assessment of cortisol in health care professionals revealed that interaction with a dog leads to significant decreases in the adrenal hormone (Barker et al., 2005).

Hospitalized heart failure patients and their reactions when visited by a human volunteer and dog team, a human volunteer only or no visit at all were tested for changes in cardiac function and neuroendocrine responses. Participants who received dog visitation therapy exhibited lower levels of anxiety, plasma
catecholamines, pulmonary capillary wedge, and systolic pulmonary artery pressure (Cole et al., 2007).

Decreases in physiological arousal are accompanied by vital signs (i.e. increased peripheral skin temperature) as evidenced by Nagengast et al. (1997) and Wu et al. (2002).

Sobo et al. (2006) tested the effectiveness of a dog-assisted intervention in reducing pain in hospitalized children that suffered from postoperative pain. Significant decreases in the perception of both physical pain and emotional distress were reported. In autistic children, subsequent interaction with a therapeutic dog significantly reduced the cortisol awakening response when compared to before and after the four-week-long intervention (Viau et al., 2010).

2.3.4 Psychological effects

From a psychological point of view, pet ownership and animal attachment have been described to affect childhood development, particularly in the development of empathy, self-concept and self-esteem (Poresky & Hendrix, 1990; Ascione, 1992; Van Houtte & Jarvis, 1995). Interaction with animals furthermore reduced the symptoms of children with attention deficit disorder (Hayden, 2005). Beside the promotion of relaxation (Katcher & Beck, 1984), interaction with animals can decrease anxiety (Wu et al., 2002) and enhance perceived energy levels (Coakley & Mahoney, 2009).

Pet ownership seems to be especially supportive to adult individuals who are single, divorced, separated or widowed (Headey, 1999). In particular, unmarried females seem to benefit from pet ownership in that they have lower scores of depression than single women who do not own a pet (Tower & Nokota, 2006). Although women spent more time talking to their dogs in an experimental setting,
there was no difference between men and women regarding the amount of play and affiliate behaviours towards their dogs (Prato-Previde et al., 2006).

Among pet keepers, a great majority considers their personal animal as a family member, becomes attached to the animal and experiences severe stages of grief when the animal dies (Adams et al., 2000; Cohen, 2002, Carlisle-Frank & Frank, 2006).

2.3.5 **Dogs in prison and substance abuse**

The prevalence of mental health problems including anxiety disorders, substance abuse and neurodegenerative disorders has increased in recent years, posing a serious threat to future public health (Olesen et al., 2012). Consequently, the need for suitable treatment and rehabilitation programs has caused socio-economic challenges to society.

A considerable body of complementary therapies and interventions has emerged out of the growing need for supporting psychosocially vulnerable people (Hart, 2010). Hence, a variety of AAIs have been developed for prison inmates with the aim of providing offenders a way to get in touch with another species (Strimple, 2003). The term “prison animal program” was first introduced by Furst (2006), highlighting the curative potential of animal inclusion into correctional facilities. Correctional staff perceptions indicate that human-animal contact can significantly contribute to enhance the social climate, shaping the behaviour of the inmates (Furst, 2006). Especially programs in which assistance dogs are trained by the incarcerated residents or in which kennel dogs are prepared for adoption have gained popularity; it has been demonstrated that interaction with a therapy dog during these programs can improve self-esteem and reduce depression as well as anxiety during stressful situations (Strimple, 2003; Britton & Button, 2005).
Dog-assisted interventions with adult substance abuse patients improved the patient-therapist alliance, suggesting that the dog can increase therapy motivation and success (Wesley et al., 2009). Moreover, it has been suggested that in some populations, an animal may provide more comfort and trust than a human therapist (Chandler, 2005; Beetz et al., 2011).

2.3.6 *Multiprofessional animal-assisted intervention (MTI)*

The MTI (multiprofessional animal-assisted intervention) program was initiated by pedagogue U. Handlos and psychologist B.U. Stetina, at the Teaching and Research Facility of the University of Vienna in co-operation with the Town School Council of Vienna (Special Education Center for Integrative Support, City School Board Mittelgasse, Vienna) and supported by the Fund Healthy Austria (Stetina et al., 2008).

MTI is a dog-assisted group intervention program, based on pedagogic, psychological and psychotherapeutic findings and aims to improve communication, social and emotional competences. The underlying concept meets the criteria of AAT as defined by the Delta Society (2012a) and builds up on the bio-psycho-social understanding of health (McCulloch, 1983).

MTI incorporates aspects of cognitive-behavioural treatment including individual-centered changes in thinking, reasoning, empathy and coping into a goal focused dog-assisted therapy. Based on the premise that changes in cognition and perception will result in adaptive behavioural modifications (MacKenzie, 2006), MTI aims at developing and enhancing socio-emotional competencies in healthy and clinical populations (Stetina et al., 2011). An evaluation of MTI in correctional facilities revealed substantial increases in social and emotional competences with relevant differences when compared to a control group (basic training) and another
investigation group (work integration training). A pilot study with dangerously disturbed offenders led to improvements in communication skills, social and emotional competences. Beside its therapeutic value, the dog-assisted intervention was highly appreciated by the participants (Stetina et al., 2008).

Emotional competences are predictors of life satisfaction that affect health and human behaviour in relationships and professional life (Ciarrochi et al., 2000). Stetina et al. (2011) tested whether an AAI focusing on dogs’ emotional expressions can improve the human ability to recognize emotions, a prerequisite of interpersonal communication. A computerized test (VERT-K: Vienna Emotion Recognition tasks) was used to identify the participants’ emotion recognition abilities before and after 12 weeks of AAI. Significant improvements in the recognition of the emotions ‘anger’, ‘fear’, ‘disgust’ and the number of total correctly rated facial expressions were found in children and adults when compared to control groups. Children furthermore managed to recognize a ‘neutral’ face after receiving the AAI and decreased their latency to respond. During the intervention, the participants were encouraged to enhance their emotion recognition skills by identifying emotional expressions in dogs. The results of the study suggest that these newly acquired skills can be transferred to stimulate significant improvements in human-human interaction (Stetina et al., 2011).

MTI has been standardized and evaluated with research outcomes that underpin the effectiveness of the intervention for different populations including healthy children and adults, offenders and in-patient drug-addicts (Burger et al., 2009; Burger et al., 2011; Turner et al., 2011; Stetina et al., 2011).

2.4 Effects of human-animal interaction and AAIs on dogs

Vock (2008) conducted a survey with 92 institutions that offer AAIs in german-speaking countries and revealed that 70% of all documented interventions
incorporate dogs. Moreover, Gatterer (2002) showed that humans attribute dogs more positive behavioural traits than other animals. However, is the performance in AAs inevitably associated with a certain amount of stress imposed by the working environment and conditions? In comparison to research on human welfare associated with the benefits of AAs, only few studies explored possible effects of AAs on therapeutic animals.

Despite their positive qualities, one must not overlook that dogs have been primarily bred for assisting humans in hunting, herding and guarding; hence, they were supposed to recognize family members and be suspicious of unfamiliar individuals and/or intruders (Butler, 2004). Accordingly, being approached, petted and hugged by strangers in unfamiliar environments, which is commonly featured in AAs, may elicit comprehensible discomfort in dogs (Serpell et al., 2010).

2.4.1 Ethical considerations - the LIEBI model
James O’Heare (2009) proposes a model for trainings and interventions that incorporate animals, namely the “Least Intrusive Effective Behaviour Intervention (LIEBI)” model. According to the authors view, there exists an ethical responsibility to design interventions that are not only effective but also minimally intrusive for the individuals involved.

Adapting the framework of the LIEBI model to the fundamental concept of AAs, professionals need to be aware that the more side effects an intervention is likely to elicit in the respective animal (e.g., injury, generalized problematic emotional behaviour including fear or anxiety, increased aggressive behaviours, apathy or generalized behavioural suppression, countercontrol), the more intrusive the intervention will have to be considered. O’Heare (2009) claims that the effectiveness
of interventions should not only be based on how they fulfil their purpose, but be embedded into a broader ethical context.

2.4.2 The animal handler/therapy dog relationship
Perception of an interaction as negative, neutral or positive is affected by the existing relationship with humans, which, in turn, is based on previous interactions; responses to certain interactions are furthermore considerably influenced by human and animal underlying personality traits, e.g., fearfulness/emotionality (Waiblinger et al., 2006). Working with their personal animals enables animal-assisted therapists to emphasize the importance of a strong emotional bond in the human-animal interaction, reinforcing a positive relationship (Chandler, 2005).

2.4.3 Training the therapeutic dog
"Working with therapy dogs is not about training, it is about building and maintaining a relationship with another species (Butler, 2004)."

To become an AAI working team, therapeutic dogs are usually required to complete special training and a temperament test to meet the criteria established by the institutions that certify animal handlers and dogs (Haubenhofer & Kirchengast, 2006b; Serpell et al., 2010). Among these conditions is the ability to cope with strange situations, to remain calm and confident under stressful situations and to be reliable with visual or vocal commands (Piva et al., 2008; Viau et al., 2010; King et al., 2011). Butler (2004) emphasizes that during an AAI, humans usually enter the dog’s intimate zone and vice versa. Hence, inappropriate training methods and/or forced positions in which animals cannot avoid invasive social intrusions and do not have the opportunity to refuge may impair the dogs’ welfare (Hatch, 2007, Piva et al., 2008, Serpell et al., 2010, Glenk et al., 2011). Another issue that may have been underestimated in previous investigations is the use of the lead in AAIs. Being off/on
the lead has been proposed to affect aggressive behaviour in dogs (Roll & Unshelm, 1997).

2.4.4 Preliminary findings

Initial reports of strain in companion animals associated with AAIs were primarily anecdotal or case reports. In 1991, Iannuzzi & Rowan focused on ethical concerns for animals used in therapy and underlined that animal-assisted programs can be problematic if interventions take too long, environmental temperature is inappropriate, and/or no water is supplied.

Ethical issues on therapeutic animal health gave rise to the idea that AAIs could be harmful for individuals under certain circumstances as documented in a case study by Heimlich (2001). AAIs with disabled children had to be terminated due to the deteriorating behavioural and physiological conditions of the therapeutic dog that had developed canine hypercortisolism or Cushing’s syndrome. In this disease, subsequent and prolonged exposure to glucocorticoid hormones leads to the development of clinical signs that vary with severity and duration of glucocorticoid excess (Kooistra & Galac, 2010). The dog was immediately removed from the program but had to stay on lifelong medication (Heimlich, 2001).

There is further evidence that the inclusion of dogs in AAT causes physiological arousal. Haubenhofer & Kirchengast (2006a) measured salivary cortisol in dogs used for AAT and AAA, and found significantly higher levels during therapy days than on control days. Cortisol levels derived from short therapy sessions (1 to 3 hours) were higher than those from longer ones (up to 8 hours) and increased relative to the number of therapeutic sessions done during the sampling period. According to Haubenhofer & Kirchengast (2006a), it could be possible that (more) shorter sessions could be more exhausting than (less) longer sessions.
When dogs and dog owners participating in AAs were tested for their cortisol profiles, Haubenhofer & Kirchengast (2007) found that humans exhibited significantly higher concentrations before therapeutic sessions. Also, concentrations increased along with the duration of the therapeutic sessions. However in dogs, the number of therapeutic sessions per week led to significant increases in secretion of the adrenal hormone.

Another study assessing welfare of dogs in AAA reported no significant changes in salivary cortisol over the course of a seven-week-long AAA program in a retirement home, nor did behavioural observation give evidence for signs of acute stress (Marinelli et al., 2009a).

Along with another investigation of three year period observation of AAs in an experimental specialized service center, the clients’ age was found to significantly influence the expression of stress-related behaviours in dogs (Marinelli et al., 2009b). But not only human age seems to affect dogs’ behavioural responses to therapeutic work. Examining the effects of time-out sequences between working sessions in therapy dogs, King et al. (2011) recently showed that dogs aged 6 years and older exhibit significantly less behavioural signs of work-induced strain than younger dogs. King et al. (2011) also measured that salivary cortisol in dogs elevated from baseline to after one hour of therapeutic work. The experimental introduction of a short time-out session with quiet play did not cause differences in salivary when compared to the “no time-out” control group.

Hennessy et al. (2006) tested whether training in a prison-socialization program can positively affect shelter dogs’ behaviour. Each shelter dog was trained by and lived with a prison inmate with to become socialized with unfamiliar dogs and people. After two weeks, experimental dogs were more obedient to a stranger’s
commands and exhibited less stress-associated behaviours than the control group. Increased secretion of the adrenal glucocorticoid hormone cortisol has been linked to cascading levels of physiological arousal.

Simply put, it remains difficult, if not impossible, to justify any broad conclusions from such a limited number of studies that exhibit controversial results.

2.4.5 Quality assurance

Literature based on substantial scientific evidence is scarce in the field of animal welfare in AAI s. Thus, more attention should be devoted to conducting targeted investigations to identify key aspects that affect animals involved in therapeutic interventions (Marinelli et al., 2009b; Grandgeorge & Hausberger, 2011).

Pinpointing at potential implications for animals in AAI s, Serpell et al. (2010) offered recommendations to ensure high quality of life in therapeutic animals:

“1. Those involved in preparing or using animals for service and therapy need to educate themselves regarding the particular social and behavioral needs of these animals, both to avoid the consequences of social and behavioral deprivation, as well as to permit animals a degree of control over the levels of social and environmental stimulation they receive.

2. AAI practitioners need to understand that close physical contact with strangers may be inherently stressful for many animals, and recognize the signs of stress when they appear. Ideally, visitation and therapy sessions should be terminated before, rather than after, such symptoms are manifested (Serpell et al., 2010).”

2.4.6 Can dogs benefit?

It has been questioned if animal-supported programs can actually benefit the animals as well as the humans involved (Hatch, 2007). Exploring the positive effects
of human-animal interaction on shelter dogs, Coppola et al. (2006) demonstrated that human-animal contact can decrease cortisol levels, while research by Hennessy et al., (2002) has shown that behavioural indicators of anxiety can be reduced. Both studies incorporated shelter dogs that were deprived of human interaction.

Apparently, it has remained unclear if and to what extent therapeutic dogs undergo work-related strain. Beck & Katcher (2003) suggested that highly social species (i.e. dogs) may have similar health benefits from AAls as humans. However, to date, there are no investigations of whether therapeutic dogs, that could possibly be overloaded with human interaction, may be positively affected by human-animal interaction and whether these are manifest in physiological and behavioural measures.

2.5 Animal welfare

In 1986, Broom introduced a widely cited definition of the animal welfare concept by referring to an animal’s attempts to cope with the environment. Similarly, the welfare state of an individual relates to its abilities to deal with the stress imposed on it by the environment (Wechsler, 1995). More recent research indicates that animal welfare is strongly affected by predictability and controllability of the environment (Veissier & Boissy, 2007). When studying animal welfare, measurements should reliably reflect and translate the actual state (i.e. physical, emotional) of an individual into an objective description that can be delivered and agreed upon by different observers. Moreover, statements about animal welfare are usually based on measurements that include physiological and/or behavioural parameters (Mills et al., 2010).
2.5.1 *Physiological indication of stress*

Studying underlying physiological phenomena most relevant to welfare, two main aspects need to be considered (Mills et al., 2010):

(i) the indication of physical health and

(ii) measures that are indicative of stress

While physical health monitoring is crucial for the prevention of disease (that, in turn, will directly affect welfare), the development of disease itself may as well occur as an outcome of chronic stress. However, chronic stress is commonly preceded by subsequent and prolonged exposure to stressful conditions. Hence, in welfare research, it is essential to capture short-time effects and changes that, in sum and/or over time may pose a severe challenge to animal’s health (Mills et al., 2010).

In the original concept of stress by Selye (1946), different forms of stressors elicit a more or less similar physiological response in mammals. As a result, an organism may alter its behaviour and physiology with the aim of maintaining homeostasis (Selye, 1946). An increase in cardiovascular tone, respiration rate and the release of adrenal catecholamines is associated with sympathetic nervous system arousal and the subsequent release of glucocorticoids (Cortisol, Corticosterone) is delayed for several minutes (Chrousos, 2009).

2.5.1.1 Cortisol

In mammals, the adrenal hormone cortisol is regulated through the hypothalamic-pituitary-adrenal (HPA) axis and plays a major role in the response to altered internal or external stimuli (Papadimitriou & Priftis, 2009). Regarding its primary function, cortisol requires modulation of bodily functions to maintain homeostasis by adapting the individual to novel conditions (Fries et al., 2009).
Elevation in the cortisol levels supplies energy for survival, heightens memory function, lowers sensitivity to pain and alters immune functions (Ebrecht et al., 2004; Chrousos, 2009). However, prolonged exposure and/or excessive secretion of cortisol may lead to clinical symptoms and stress-adaptive disorders. In dogs, dysfunction of the HPA favors the development of hypercortisolism or Cushing's disease (Kooistra & Galac, 2010). Humans exhibit a circadian pattern of cortisol secretion (Kirschbaum, 2000), while no circadian rhythm was detected for salivary cortisol levels in dogs during a 24-hour period (Koyama et al., 2003).

2.5.1.2 Salivary sampling of cortisol

A number of specialized glands discharge in the oral cavity of mammalian vertebrates and produce saliva (Vining & McGinley, 1982). Saliva has recently attracted much attention, in particular among researchers studying stress phenomena in both humans and animals. There are several reasons why salivary sampling has become a state of the art procedure over the past years.

Most importantly, immediate reactions to invasive collection of samples may bias real stress responses and lead to misinterpretation of data. However, non-invasive sampling of saliva offers additional advantages over the use of plasma as the collection can be carried out easily and thus may minimally disturb the welfare of the studied subjects (Carter, 2007).

Salivary sampling is a valid method because measurements have been successfully correlated with plasma concentrations. Furthermore, in comparison to plasma, where cortisol is bound to proteins, the amount of free and hence, biologically active cortisol is represented in saliva (Kirschbaum & Hellhammer, 2000).
2.5.1.3 *Salivary cortisol in dogs*

Salivary cortisol indicates physiological stress and is a frequently used marker for non-invasive welfare assessment in dogs (e.g. Coppola et al., 2006; Dreschel & Granger, 2009; Bergamasco et al., 2010; King et al., 2011). Salivary cortisol collection in dogs does not alter the activity of the hypothalamic–pituitary–adrenal system itself but is a potent marker for detecting physiological responses to a stressful stimulus (Dreschel & Granger, 2005). Time of day and the location of sample collection had no effect on salivary cortisol in healthy dogs (Wenger-Riggenbach et al., 2010), nor had age or sex (Haubenhofer et al., 2005). According to Beerda (1998, 1999), both acute and chronic stress levels can be determined using salivary samples. In addition, Kobelt et al. (2003) found that there was no handling effect bias when sampling was carried out within four minutes.

Although salivary sampling is a suitable method for non-invasive assessment of cortisol, food consumption in dogs prior to sampling might not only affect salivation itself but also dilute hormone concentration or impair assay efficacy. In a pilot study, Ligout et al. (2009) tested the effects of sausage, chicken and cheese on cortisol measures by comparing them to control samples. While chicken and sausage intake resulted in lower cortisol levels, cheese samples were highly correlated with their controls (Ligout et al., 2009).

2.5.2 *Oxytocin*

The secretion of the neuropeptide oxytocin has been related to stress responsiveness in that it affects positive social interaction supported by increased trust, enhanced affiliation and decreased amounts of anxiety (Neumann, 2008). Blood pressure in dogs and humans significantly decreased during positive social interactions while levels of oxytocin increased (Odendaal & Meintjes, 2003).
By reduction of the parasympathetic nervous system tone, i.e. heart rate and blood pressure, oxytocin enhances relaxation and coordination of emotional states and feelings (Uvnas-Moberg, 1998).

In a recent study by Handlin et al. (2011), dogs and their owners also showed significant increases in oxytocin during affiliate interactions and grooming. Although analysis of oxytocin would have been desirable due to its key role in regulation of social behaviour and stress responsiveness, measurements were not included in the present study due to the invasive nature of plasma sample collection.

However, here is evidence that changes in salivary oxytocin cannot be captured by immunoassay as saliva does not seem to contain measurable amounts of the hormone (Horvat-Gordon et al., 2005). To gain a deeper understanding of the interrelations in human-animal contact during AAlS, analyses of oxytocin in humans and therapeutic dogs could provide further insight.

2.5.3 Stress-related behaviour in dogs

In dogs, observation and interpretation of body language and posture have been widely used to analyse human-animal relationships (Hatch, 2007). Perhaps no aspect of the dog’s behavioural repertoire elicits more controversy than stress-related behaviours or the so-called “calming signals” that have been described in the non-scientific dog literature (Nagel and v. Reinhardt, 2003). Although it has been widely accepted that these subtle cues (e.g. yawning, lip licking, body shake, paw lifting, panting, tail wagging) are correlates of intra- and interspecies communication, one of the most recently debated issues is whether these behaviours actually represent stressful conditions in dogs and how it can be scientifically evidenced.

Behavioural concomitants of stress-related physiological conditions can be commonly observed and have been previously described in dogs after exposure to
noise and fearful stimuli (Beerda et al., 1999; Hydbring-Sandberg et al., 2004; Dreschel & Granger, 2005). In addition, dogs subjected to social and spatial restriction showed enhanced frequencies of locomotion, yawning, paw-lifting and body shaking (Beerda et al., 2000). Lip licking and yawning have been suspected to precede situations of social conflict in dogs (Voith & Borchelt, 1996). Behavioural indices like motion activity, lip licking, panting and yawning were used to determine the effects of dextroamphetamine on dogs (Stiles et al., 2011). Bellaio et al. (2009) have identified lip licking, yawning and body shaking as concomitants of stress in rescue dogs during training sessions. Schilder & van der Borg (2004) linked paw-lifting in dogs to a state of conflict, confusion and fear of punishment.

On the other hand, when dogs were reunited with their owners after being left alone at home, they showed increased lip licking and body shaking, suggesting that these cues rather correspond to greeting and affiliate behaviour (Rehn & Keeling, 2011). Hoff (2001) proposed that yawning in dogs may be a frequently displayed behavioural prerequisite associated with social interaction.

2.5.4 Measuring behaviour in dog welfare assessment

Systematic observation of an animal’s actions to reliably reflect animal welfare has become a common method in the scientific assessment of behaviour (Martin & Bateson, 2007). To quantify animal behaviour, a detailed ethogram is an essential component and consists of a catalog of behaviours of single or socially interacting individuals (Banks, 1982). Behavioural responses in dogs are commonly assessed by objective recordings of frequencies and durations and are reliable indicators if variables are accurately described (Svartberg & Forkman, 2002).

A great body of research was dedicated to working dogs that are subjected to kenneling (Hiby et al., 2006; Taylor & Mills, 2007). Behavioural studies targeting dog
welfare and performance have been predominantly conducted with shelter dogs (Coppola et al., 2006; Hennessy et al., 2006), working dogs (Haverbeke et al., 2008; Horváth et al., 2007, 2008; Rooney et al., 2007; Fallani et al., 2007, Bellaio et al., 2009; Tomkins et al., 2011) and companion dogs (Kotrschal et al., 2009; Pastore et al., 2011). During welfare assessment, it has been demonstrated that stressed working dogs were more likely to be poor performers than dogs that did not show behavioural and physiological signs of stress (Diederich & Giffroy, 2006). Accordingly, the majority of authors suggest that a combination of behavioural assessment and physiological data is likely to yield the most reliable results in reflecting an animal’s state of welfare. However, if both physiological and behavioural data are sampled, a standardized testing procedure is inevitable (Diederich & Giffroy, 2006).

2.6 Therapy dog certification

At present, scientific focus on animals in AAI s is limited and does not provide representative evidence to highlight which standards should be issued regarding therapeutic animals (Beck & Katcher, 2003). In dog-assisted therapy, substantial differences exist between different programs with regard to (1) the methods in dog training, (2) the AAI working schedule, (3) prearrangement of the therapeutic session (i.e. timespan between arrival at a facility and the begin of the AAI) and (4) quality assessment and quality assurance (Stetina & Glenk, 2011).

To date, there are no legal regulations on how therapeutic should be most effectively educated, trained and looked-after. Some initial suggestions for standardisation have been proposed by renowned organizations.
2.6.1 IAHAIO Standards

To become a therapeutic team for the professional purpose of AAIs, animal handlers and dogs need to be awarded a certificate by a recognized program. A first major step in broadening a quality agenda for programs offering AAIs is the regulation of basic standards that ought to be regularly monitored and carried out by appropriately trained staff. Moreover, those who train animals and deliver the service to others must ensure the quality of life of the animals involved. In September 1998, IAHAIO members have adopted four fundamental guidelines at their General Assembly (IAHAIO, 1998):

"IAHAIO urges all persons and organizations involved in animal-assisted activities and/or animal-assisted therapy, and all bodies governing the presence of such programs in their facilities to consider and abide by the following points:

1. Only domestic animals which have been trained using techniques of positive reinforcement, and which have been, and will continue to be, properly housed and cared for, are involved.

2. Safeguards are in place to prevent adverse effects on the animals involved.

3. The involvement of assistance and/or therapy animals is potentially beneficial in each case.

4. Basic standards are in place to ensure safety, risk management, physical and emotional security, health, basic trust and freedom of choice, personal space, appropriate allocation of programme resources, appropriate workload clearly defined roles, confidentiality, communication systems and training provision for all persons involved (http://iahaio.org/html/prague.htm)."
2.6.2 ISAAT Standards

The International Society for Animal-Assisted Therapy (ISAAT) was founded in Zürich in 2006 by representatives from universities and private institutions in Japan, Germany, Luxembourg and Switzerland. Amongst other goals, ISAAT strives to ensure the quality control of public and private institutions which offer continuing education/training in AAT, animal-assisted pedagogy and AAA to benefit people. An independent approval procedure has been established and published in 2008. In “The Standards for Institutions with Programs of Continuing Education in Animal-Assisted Activities, Animal-Assisted Pedagogy and/or Animal-Assisted Therapy (ISAAT, 2008)”, aspects of animal ethics, welfare, care and ethology need to be addressed for any applying institution. Examination, approval and hence, adoption as a full ISAAT member is carried out by the independent ISAAT Accreditation board (ISAAT, 2008).

2.6.3 ESAAT Standards

The European Society for Animal Assisted Therapy (ESAAT), a European umbrella organization for AAT, was founded in Vienna in 2004. The society’s endeavor is dedicated to the advancement of animal-assisted therapy, especially in the promotion of health-related effects gained by the relationship between man and animal. Furthermore ESAAT strives to establish basic guidelines for education and training in the area of AAT and for standardization of these conceptual and practical foundations within the EU (http://www.en.esaat.org).

ESAAT has proposed guidelines to determine quality assurance in AAT (2012):

“Structural quality: Particular attention must be paid to protecting the animal during animal-assisted work. The animal used must not be instrumentalised [sic],
exploited or overworked. Species-appropriate care of the animals used in animal-assisted interventions is not solely ensured by animal protection legislation or by satisfying basic needs. Species-appropriate care also includes feeding that imitates the animal’s natural forms of nutrition, freedom of movement in nature, and appropriate activities (ESAAT 2012)’.

“Animals in animal-assisted interventions:

● Documentation of veterinary\(^2\) [sic] inspections of animals and their health (illness, accident and infection risks faced by the animals, etc.).

● Training of animals; an examination as a therapy dog (ESAAT basic training) is a prerequisite for dogs.

● The animals’ behaviour during interventions must be observed.

● Written instructions to prevent overexertion.

● The monitoring and follow-up inspection of therapy animals must be documented.

● The handling and use of young animals should be specially regulated (ESAAT, 2012)”.

2.6.4 AVMA Standards

The American Veterinary Medical Association (AVMA) was established in New York in 1863 with the objective to improve animal and human health and to advance veterinary medicine as a scientific field and a profession (AVMA, 2012a). As a medical authority for the health and welfare of animals, AVMA (2012b) has published guidelines for AAA, AAT and resident animal (RA) programs.

- Staff and administrative supervision of AAA, AAT, and RA programs are required to protect the welfare of human and animal participant. Animals

\(^2\) veterinary (author’s comment)
should be monitored closely for clinical signs of stress and should have ample opportunity and space for solitude (AVMA 2012b)."

2.6.5 Animals as therapy - Tiere als Therapie (TAT)
Animals as therapy “Tiere als Therapie” (TAT) is Austria’s largest organization offering educational programs for AAI professionals, volunteers and therapeutic animals. The biologist Dr. Gerda Wittmann founded TAT in 1991 (Haubenhofer & Kirchengast, 2006b) and aims at qualifying volunteers and graduates for the professional use of animals for the care and therapy of humans of all age groups, for the benefit of health promotion and for an increase in quality of life and well-being (www.tierealstherapie.org). TAT is a recognized member of the European Society for Animal-Assisted Therapy (ESAAT).

2.6.5.1 TAT certification
In order to be eligible for the certification process, human handlers have to be at least 18 years of age and must attend a first-aid training course. Applying dogs must be at least 18 months of age and pass the evaluation of suitability to become a potential therapy dog. Approximately 40 hours of theoretical (psychology, pedagogy, physiotherapy, geriatrics and animal behaviour, training, husbandry and first aid) and practical content are taught over the course of three training modules (Haubenhofer & Kirchengast, 2006b). In the final exam, conditions that may be encountered during therapeutic work are simulated (see Tab. 1).
Table 1: The dog-human team applying for TAT certification must perform the following tasks on the lead, where the dog has to... (Haubenhofer & Kirchengast, 2006b; Widder & Wittmann, 2002):

<table>
<thead>
<tr>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>…accept a friendly stranger (talking, overall petting)</td>
</tr>
<tr>
<td>…sit politely during petting</td>
</tr>
<tr>
<td>…tolerate bodily contact with increasing intensity (being stroked gently and intensely; being hugged and lifted)</td>
</tr>
<tr>
<td>…tolerate being crowded and petted by several persons who gesture and talk loudly</td>
</tr>
<tr>
<td>…walk on a loose lead</td>
</tr>
<tr>
<td>…obey commands (come, sit, down)</td>
</tr>
<tr>
<td>…be separated from the animal handler (at least two minutes) under supervision of a stranger</td>
</tr>
<tr>
<td>…tolerate unexpected and loud noise from behind</td>
</tr>
<tr>
<td>…be confronted with another dog (of the same and opposite sex)</td>
</tr>
<tr>
<td>…obey during social behaviour in a group of dogs</td>
</tr>
<tr>
<td>…confronted with wheelchairs, crutches and loud people</td>
</tr>
<tr>
<td>…eat treats out of a stranger’s hand and have a treat taken out of the mouth</td>
</tr>
<tr>
<td>…lay on the floor while someone unexpectedly bumps into the dog from behind</td>
</tr>
<tr>
<td>…walk through a crowd</td>
</tr>
<tr>
<td>…undergo an overall examination of personality</td>
</tr>
</tbody>
</table>

Aggressive behaviour including snarling, baring the teeth, aggressive barking, snapping and biting will result in immediate termination of the exam and the dog may not be tested again. After successful final examination, five assistance-visits under supervision in geriatrics and other institutions have to be accomplished by the human-dog team. Then, they are granted a certificate and may start to work individually in AAI programs. However, if dogs are supposed to perform therapeutic work off the lead, additional qualifications are required (Haubenhofer & Kirchengast, 2006b; Widder & Wittmann, 2002).

In addition to the successful completion of a practical and theoretical exam, therapeutic dogs need to meet the TAT health requirements. Regular veterinary monitoring is obligatory; the dogs must be healthy (last veterinary screening not older than six months), free from internal and external parasites, free from pain, and
completely immunized (Haubenhofer & Kirchengast, 2006b; Widder & Wittmann, 2002).

2.6.6 **Multiprofessional animal-assisted intervention (MTI)**

MTI is carried out by two human trainers from different professions, providing wide-ranging expertise in their subject, and a specially trained dog. The training is based on positive reinforcement, respectful interaction and species-appropriate dog handling. The psycho-educational effect of the intervention is applied by implicit learning, thus, participants reflect their knowledge and acquired skills by focusing on the dog. The acquirement of new skills is granted by gradually increasing complexity of tasks and exercises. MTI supports client groups of 10 to 14 members, providing 10-12 working sessions. Quality assurance is promoted by an evaluation of each intervention, using pre-post questionnaires, systematic participating observations, video analysis and feedback interviews with all persons involved. The following seven main basic principles are prerequisites for human-animal contact during MTI (Stetina et al., 2008):

1. Willingness to form a bond (i.e. relationship) with the therapeutic dog
2. Voluntary participation based on informed consent
3. Resource orientation and empowerment
4. Communication of values
5. Respectful interaction with human and animal participants
6. Verbal and nonverbal communication and
7. Socialization

2.6.6.1 **MTI certification**

In order to be eligible for the certification process, animal handlers are required to have a solid knowledge of canine psychology, behaviour and basic dog
training. An academic background in psychology, pedagogy, biology, (veterinary) medicine, and/or social science is desirable.

Applying dogs must be at least 18 months of age and pass the evaluation of suitability to become a potential therapy dog (held by the committee). 64 hours of theoretical content (psychology, psychotherapy, pedagogy, canine behaviour, dog training) and a variable amount of practical training courses (depending on the dog’s training status) are taught over the course of eight modules (Stetina et al., 2008). In the final exam, conditions that may be encountered during therapeutic work are simulated (see Tab. 2).

Table 2: The dog-human team applying for MTI certification must perform the following tasks off the lead, where the dog has to... (Stetina et al., 2008):

<table>
<thead>
<tr>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>...accept a friendly stranger (talking, overall petting)</td>
</tr>
<tr>
<td>... tolerate bodily contact (gentle petting)</td>
</tr>
<tr>
<td>....obey commands (come, sit, down, stay)</td>
</tr>
<tr>
<td>...behave naturally and without fear in a crowd of people</td>
</tr>
<tr>
<td>... tolerate unexpected noise</td>
</tr>
<tr>
<td>...be confronted with another dog (of the same and opposite sex)</td>
</tr>
<tr>
<td>...eat treats out of a stranger’s hand and have a treat taken out of the mouth</td>
</tr>
<tr>
<td>...stay calm while brushing</td>
</tr>
<tr>
<td>...stay calm and stand steady while a stranger points at the dog’s body parts</td>
</tr>
<tr>
<td>...obey commands of higher complexity (e.g. Come-&gt;Sit-&gt;Stay-&gt;Come-&gt;Turn-&gt;Lay)</td>
</tr>
</tbody>
</table>

Similar to TAT veterinary guidelines, MTI dogs are required to undergo regular veterinary screening; the dogs must be healthy, free from pain, internal and external parasites, and completely immunized. In addition, MTI recommends monthly supervision of dog behaviour by a veterinarian with ethological expertise.
2.7 Personality and attitudes in pet owners

Hemsworth et al. (2009) and Waiblinger et al. (2006) suggest that underlying attitudes and personality traits in humans predict their behaviour towards animals and hence, are important determinants of the quality of human-animal interaction.

Personality has been referred to as an individually characteristic, persistent pattern of attitudes, behaviours and thoughts that remain constant over a period of time (Phares, 1991; Fisseni, 1998; Pervin et al., 2005). It has been suggested that individual personality emerges from biological predisposition, learnt behaviours and social environment (Ryckman, 1982). Substantial changes in personality are usually preceded by major and critical life events, however, research over the past decades identified five basal dimensions and associated character traits (Costa & McCrae, 1992). These five dimensions are shown and described in Tab. 3.

Table 3: Personality dimensions and associated individual traits (adapted from Costa & McCrae, 1992):

<table>
<thead>
<tr>
<th>Personality dimension</th>
<th>High scores</th>
<th>Low scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism</td>
<td>tense, nervous</td>
<td>secure, confident</td>
</tr>
<tr>
<td>Extraversion</td>
<td>outgoing, energetic</td>
<td>shy, withdrawn</td>
</tr>
<tr>
<td>Openness to experience</td>
<td>inventive, curious</td>
<td>cautious, conservative</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>friendly, compassionate</td>
<td>competitive, outspoken</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>efficient, organized</td>
<td>easy-going, careless</td>
</tr>
</tbody>
</table>

Podberscek & Gosling (2000) provide a summary of previous studies on personality in pet owners that were compared to non-pet owners based on predefined traits of the Big Five factor model of personality. Some of the differences that were reported include neuroticism (Paden-Levy, 1985) and agreeableness (Cameron & Mattson, 1972; Kidd & Feldman, 1981). However, a clear picture cannot be drawn from the preliminary insights from cross-sectional studies focusing on adult
participants, mostly because of different methodology, the lack of information on pet ownership histories and contact to animals (Podberscek & Gosling, 2000).

Szatowski (2008) reported no differences between pet owners and non-pet owners regarding their personality traits according to the Big Five factor model. Personality traits in dog owners affected stress coping and the success as a human-dog dyad during a performance task; dog owners with a high score on neuroticism were closer attached to their dogs but less successful as performers in shared activities with their dogs (Kotrschal et al., 2009). Excerpts of the study design of Kotrschal et al. (2009) were replicated by Aliabadi (2008) where dog owners that engaged in leisure activities (i.e. agility competition) and scored high on the neuroticism and agreeableness axis were found to talk more to their dogs and were less likely to use a lead during the competition.

2.7.1 The effects of pets on psychological prerequisites

Previous research has demonstrated that people can become attached to their pets similarly to humans (Holcomb et al., 1985; Voith, 1985). Attachment has primarily been defined as the bond that develops between caregivers and children, resulting in emotionally-driven behaviours to stay in close proximity to the attachment figure (Ainsworth & Bell, 1974).

Effects of pet ownership are suspected to be evident already at a very young age; 6-month-old infants with pets at home reacted differently to pictures of dogs and cats than the non-pet owning infants (Hurley et al., 2010). Scores of empathy and interpersonal trust were higher in college-age pet owners than in non-pet owners (Hyde et al., 1983). Young adults who owned a pet during childhood exhibited higher levels of empathy, pro-social behaviours and were more likely to engage in social professions (Vizek-Vidovic et al., 2001).
2.7.2 AAI professionals

To be qualified for therapeutic work, regardless of their initial profession, animal handlers have to be trained in communication, social and emotional competences. High social and emotional competences contribute to the quality of interpersonal interaction (Ekman, 1988; Izard, 1994; Schulze et al., 2006).

The self-esteem concept has been described by Rosenberg (1965) as a favourable or unfavourable attitude towards the self. Rosenberg’s definition has been widely cited and complemented in the reflection of an individual's feeling of his/her value or worth (Blascovich & Tomaka, 1991) and is causally connected to interpersonal relations and job performance (Baumeister et al., 2003).
3 RESEARCH QUESTIONS

Despite the absence of legal regulations regarding quality assurance in AAl's, perceived standards are notably high. Deaton (2005) claims that similarly to other novel disciplines, AAl's are carried out in numerous settings with different populations and lack standardized manuals. Due to these variations, animal welfare science in AAl's faces difficulties. Marinelli et al. (2009b) argue that studies need to be designed that specifically focus on aspects that may influence the welfare of dogs involved in AAl's. Methodologies to evaluate dog welfare in individual types of AAl's are urgently needed because the variability in the way these interventions are conducted has not been taken into consideration in many of the earlier studies.

To be qualified for therapeutic work, regardless of their initial profession, animal handlers have to be trained in communication, social and emotional competences (Butler, 2004). It is generally accepted that these parameters contribute to the quality of interpersonal interaction. With regard to the growing field of AAl's and the diversity of health service provision, AAI professionals work in an increasingly complex area. Previous research has not been able to provide support whether academic education and training in AAl's affect humans' personality, attitude towards animals and AAl's and measures that enhance social competence (i.e. self-esteem). To address this gap in knowledge, we identified three individual research questions that emerged from the literature review.

3.1 Salivary cortisol in certified therapeutic dogs and therapeutic dogs in training during AAl's

Starting our research on dogs' physiological measures, we aimed to investigate short-term effects of human-animal interaction during two types of group-AAl's on salivary cortisol levels in therapeutic dogs. In our first analysis, we compared
two programs that incorporate certified dogs into AAIs that are carried out in mental health care. In one program (P1), the dog was permanently on the lead and not able to have voluntary contact with people while in the other program (P2), the dog was off the lead the entire intervention and able to voluntarily contact people and leave the room. Baseline salivary cortisol levels before work and on non-working days served as control values for the working data. In the second analysis, we compared salivary cortisol levels before and during an AAI in certified dogs and therapeutic dogs in training (T) that participated in their first AAI working session. We expected to find differences in the marker salivary cortisol between experienced (P1, P2) and unexperienced (T) therapeutic dogs and proposed that the way dogs are handled (use of a lead) during therapy may also affect cortisol secretion.

3.2 Behavioural monitoring and salivary cortisol in therapeutic dogs during MTI

Looking at physiology and behaviour in therapeutic dogs, another purpose of the study was to document therapeutic dogs’ salivary cortisol levels, motion activity, specific behaviour, avoidance behaviour and human-initiated contact during MTI, a standardized AAI program, where dogs are constantly off the lead. Moreover, we strive to investigate whether behavioural variables that have previously been related to stress in dogs can be correlated with the hormonal marker cortisol during therapeutic sessions. We hypothesized that eventually there might be a habituation effect as dogs get accustomed to the participants over the course of five subsequent MTI sessions that are measurable in the dogs’ cortisol levels and behavioural variables.
3.3 Pet attitude, personality and self-esteem AAI professionals, dog owners and non-dog owners

The third aspect of the present investigation is highly innovative because AAI professionals have not been previously compared to dog owners and non-dog owners in self-report assessments. Since AAI experts have to deal with humans and animals in their profession, we employed self-report instruments to assess pet attitude, personality and self-esteem. The objective of the psychological assessment was to investigate important determinants for successful interspecies and interpersonal relations. We suggested that the attitude towards pets and AAI professionals be higher than dog owners and non-dog owners. Since differences between pet owners and non-pet owners have been reported, we also expected differences in personality and self-esteem between the groups.
4 MATERIAL & METHODS

Ethical note

The procedures of the research proposal have been approved by the Ethics Committee of the University of Veterinary Medicine Vienna. Research was based on voluntary participation and oral and/or written informed consent with the institution, patients and animal handlers.

4.1 Salivary cortisol in certified therapeutic dogs and therapeutic dogs in training during AAI

4.1.1 Animal subjects

Animal handlers who regularly work with their personal dog/s in dog-assisted group therapy were recruited via email or telephone invitation or through contact with local colleagues. All participating dogs were privately-owned and led by their animal handlers who took also part in the AAI. All animal handlers have completed an academic training in AAI and exhibited working experience from a minimum of one year. To lessen experimenter-biased effects, the experimenter attended therapeutic sessions prior to data collection so that the dogs and patients were familiar with her presence.

The 21 dogs of different breeds ranged in age from 1.5 to 14 years (5.7 ± 4.1; Mean ± SD) and weighed from 1.50 kg to 35 kg (18.7 ± 10.5, Mean ± SD). 9 dogs (all female) were spayed. Each dog was either already a therapeutic dog certified through a recognized AAI program (P1, P2) or an assistant therapy dog in training (T), about to complete its certification (see Tab. 4).
Table 4: Age, status of certification and working experience in therapeutic dogs (N=21)

<table>
<thead>
<tr>
<th></th>
<th>P1 dogs</th>
<th>P2 dogs</th>
<th>T dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Age (Mean±SD)</td>
<td>6.4 ± 1.5</td>
<td>4.8 ± 1.1</td>
<td>4.9 ± 1.5</td>
</tr>
<tr>
<td>Temperament screening carried out by veterinarian</td>
<td>Yes</td>
<td>Yes</td>
<td>yes</td>
</tr>
<tr>
<td>Certification through a recognized AAI institution</td>
<td>Yes</td>
<td>Yes</td>
<td>no</td>
</tr>
<tr>
<td>&gt; 1 year working experience in AAI's</td>
<td>Yes</td>
<td>Yes</td>
<td>no</td>
</tr>
</tbody>
</table>

To be eligible for participation in the study, the dogs were required to be in good clinical health (i.e. free from pain, external and internal parasites and immunized). Both AAI programs P1 and P2 stipulate in their contract that therapeutic dogs have to undergo regular veterinarian screening. None of the female dog was in estrus or pregnant by the time of the experiments.

In the group of P1 dogs, three animal handlers were associated with two therapeutic dogs. In the group of P2 dogs, two animal handlers worked with two dogs while all T dogs were guided by one individual person.

4.1.2 Study design

Quasi-experimental testing was carried out during weekly AAI's in in-patient mental health care in Austria. AAI's were 50 - 60 minutes in length and carried out in groups of 8 - 10 participants.

In the first comparison, we monitored salivary cortisol in experienced and certified dogs (P1, P2) before and during two AAI working sessions with familiar patients and baseline levels on a non-working day at home. The number of individual therapy participants remained constant over the sampling time.

In comparison two, we assessed salivary cortisol levels of P1 and P2 dogs before and during a regular AAI working session with dogs that completed their first AAI working session in order to receive an AAI certificate (T). T dogs were not yet allocated to an AAI working program and participated as “assistance” dogs. An
experienced dog of P1 was regularly working, while T dogs were first introduced to a therapeutic environment and merely observing the intervention process. Cortisol levels of T dogs were compared with Cortisol levels of P1 and P2 dogs during AAI session one from the above described comparison one. Interaction schedule and behaviours towards the dogs of P1, P2 and T are categorized in Tab. 5.

Table 5: Interaction schedule and description of behaviours displayed by animal handlers and patients towards the dogs of P1, P2 and T:

<table>
<thead>
<tr>
<th>Human-animal interaction behaviour</th>
<th>P1</th>
<th>P2</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal contact: People talk softly to the dog</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Praising: People speak in high-pitched/fluctuating voice</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Tactile contact: People touch/stroke/groom the dog</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Gesturing: People gesture with hands, arms, fingers</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Treat reward: Dog receives food treats</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>On the lead: People hold/pull the lead</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Playing: Gestures, Laughing, Use of dog toys</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Obedience commands: Dogs respond to visual/verbal cues with a change in behaviour</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

4.1.3 Sample collection

To absorb the saliva, we used a cotton roll (Salivette®, Sarstedt) in large dogs (> 15 kg) or an arrow-shaped cotton piece attached to a plastic shaft (Sorbette, Salimetrics) in small dogs (< 10 kg). The saliva collection device was gently placed into the cheek pouch or under the tongue of the dog until it was saturated with saliva (approximately 40 - 70 seconds). For ethical reasons, neither of the dogs was restraint during the sampling procedure. To stimulate salivation, animal handlers presented commercial food to their dogs. In order to avoid sample contamination and hence, reduced reliability of the enzyme immunoassay, the dogs were only allowed to sniff at the food treats in the experimenter’s closed hand and not to chew on it (Ligout et al., 2010; Bennet & Hayssen, 2010). The time latency between the last
food treat and sampling was 10 minutes, respectively. Moreover, the sampling devices contained no food-based additives that may interfere with the enzyme immunoassay (Dreschel & Granger, 2009).

After the cotton roll was soaked with saliva, it was re-placed in the device container and closed with a plastic stopper to avoid evaporation. The collected material was stored in an ice box, so that the salivary devices were immediately cooled before they were finally stored at -20°C. Prior to analysis, samples were thawed on ice and centrifuged at room temperature at 3000g for 15 minutes to obtain the clear saliva. Samples with a lesser volume of 0.02 ml were dismissed.

4.1.4 Sampling schedule

To lessen the effect of potential circadian deviation on salivary cortisol, only AAIIs starting in the morning from 9.30 a.m. – 11.00 a.m. were considered in the analysis. Salivary samples were collected within 4 minutes (Kobelt et al., 2003). The experimental sampling schedule was adjusted considering that salivary cortisol levels reflect plasma cortisol with a 20 - 30 minute delay (Salimetrics, 2009). Session baseline (T1a, T1b) sampling was carried out prior to each AAI. After each 50-60 minute-long interventions, an additional 5 minutes were scheduled where the dogs received no more food treats before the dogs were sampled to capture levels that correspond to the time during therapeutic work. Animal handlers were given a demonstration how to collect a sample and provided with written instructions to sample baseline levels on days without AAIIs; for investigating the daily pattern, three salivary samples on two control days at 9 - 10 am, 1 - 2 pm and 6 - 7 pm. One sample was collected on another day between 9 am – 12 am (T0) to serve as baseline value. These samples were taken in the dogs’ homes.
4.1.5 Sample analysis

On average, 50 μl of clear saliva were used for the analysis. Analyses were carried out at the Institute for Biochemistry at the University of Veterinary Medicine in Vienna with a highly sensitive enzyme immunoassay kit for salivary cortisol that has been previously used in dogs (Haubenhofer & Kirchengast, 2006a). Samples were assayed in duplicates and cortisol concentrations were assessed by double-antibody biotin-linked enzyme immunoassay. Other than standard immunoassays, this assay can also be used for samples containing low concentrations of hormones (Palme & Möstl, 1997). Duplicate samples with a coefficient of variance > 10% were replicated and considered in the analysis when a coefficient of variance < 10% was achieved. If the sample volume fell below the limit needed to run duplicates or ran out before reaching a coefficient of variance < 10 %, the sample was dismissed from the analysis. The average intra- and inter-assay coefficients of variance were less than 10% and 15%, respectively.

4.1.6 Statistics

Calculations were carried out using the statistical package SPSS 15.0 for Windows (SPSS, Inc, Chicago, USA). We considered that $p \leq 0.05$ denotes statistical significance. Friedman Two-way ANOVA was conducted to evaluate the subjects’ daytime salivary cortisol levels at home. Repeated measures ANOVA with two groups were used in analyses of salivary cortisol measures, with intervention type as between-group factor and time as repeated factor in first comparison, and with animal subjects’ educational status as between-group factor and time as repeated factor in the second comparison.
4.2 Behavioural monitoring and salivary cortisol in therapeutic dogs during MTI

4.2.1 Animal subjects

Animal handlers who regularly work with their personal dog/s in the dog-assisted group therapy MTI were recruited via email or telephone invitation. All participating dogs were privately-owned and led by their animal handlers (three individual people) who took also part in the AAlIs. To lessen experimenter-biased effects, the experimenter attended three therapeutic sessions prior to data collection so that the dogs and patients were familiar with her presence. The 5 adult dogs (4 Crossbreeds, 1 Labrador Retriever) ranged in age from 3 to 10 years (5.4 ± 2.8; Mean ± SD) and weighed from 20 kg to 35 kg (27.8 ± 2.9; Mean ± SD). 1 dog was male, 3 dogs (all female) were spayed.

To be eligible for participation in the study, the dogs were required to be in good clinical health (i.e. free from pain, external and internal parasites and immunized) and subjected to regular health screening and behavioural monitoring by a veterinarian or an ethologist. In order to choose a representative sample of therapeutic dogs, each participating dog had been awarded an AAI certificate and exhibited a minimum of 2 years working experience. Moreover, only dogs who regularly (at least once a month) participated in AAlIs over the past two years were considered.

4.2.2 Study design

Sampling was carried out during five subsequent MTI sessions per dog, i.e. 25 MTI sessions in total, with offenders in an in-patient substance abuse treatment facility in Austria. In the specialized facility, MTI was first launched in 2008 and has been established as an adjunct socialization therapy to re-habilitate offenders whose crimes have been associated with substance abuse. The adult human participants of
the MTI sessions that were analysed over the course of this study all (1) enrolled in residential substance abuse treatment, (2) participated voluntarily, (3) agreed to be video-recorded for scientific purpose, (3) underwent clinical-psychological screening and (4) appeared physically and mentally stable so that they posed no risk to themselves, the human handlers and the therapeutic dog.

A primary endeavour of MTI in residential substance abuse treatment is the training of social skills that shall ease re-integration into working life and society. Each therapeutic session was 50 - 60 minutes in length and carried out in groups of 8 - 10 participants who interacted with one therapeutic dog and two animal handlers (see Fig. 2). During intervention, the participants were seated in wooden chairs and only allowed to stand up, move around and call or touch the dog in accordance with the animal handlers.

Figure 2: Dog-assisted group intervention (MTI) recorded with a multi-camera-setup (a, b), MTI professionals (c), participants (d) and intervention dog (e).

The individual participants remained constant over the sampling time. The MTI concept primarily builds on respectful human-animal interaction with a naturally
behaving dog. Accordingly, the participants are instructed how to interact in an appropriate way with the therapeutic dog before the dog is introduced to the group. Human-animal contact is initiated by the freely moving dog, except for obedience commands and giving food treats (see Tab. 6).

<table>
<thead>
<tr>
<th>Behavioural code</th>
<th>Description of behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal contact</td>
<td>People talk softly to the dog</td>
</tr>
<tr>
<td>Praising</td>
<td>People speak in high-pitched/fluctuating voice</td>
</tr>
<tr>
<td>Tactile contact</td>
<td>People touch/stroke/groom the dog</td>
</tr>
<tr>
<td>Gesturing</td>
<td>People gesture with hands, arms, fingers</td>
</tr>
<tr>
<td>Treat reward</td>
<td>Dog receives food treats</td>
</tr>
<tr>
<td>Playing</td>
<td>Gestures, Laughing, Use of dog toys</td>
</tr>
<tr>
<td>Obedience command</td>
<td>Dog responds to visual/verbal cue with a change in behaviour</td>
</tr>
</tbody>
</table>

4.2.3 Dog behaviour

Behavioural observations were carried out via video-analysis using a multi-camera setup (Canon XM2, Canon MV960; see Fig. 2). To guarantee the anonymity of the participants, the video material was stored in a closed facility at the Department of Clinical, Biological and Differential Psychology at the University of Vienna until analysis. Analysis of behaviour was carried out using the Observer software package (Noldus Information Technology, 6702 EA Wageningen, The Netherlands).

In the pre-study phase (monitoring of three individual therapeutic sessions), we identified behavioural variables that could be reliably recognized and agreed upon by different observers. We chose to code 50 minutes of therapeutic progress of each of the recorded sessions. Gestures and behaviours were evaluated due to their relative frequency and/or duration of occurrence during the observation period (see Tab. 6). Behavioural taxonomy was chosen in accordance with previous studies (see
Tab. 6 and Tab. 7) (Clark et al., 1997; Beerda et al., 1999; Haverbeke et al., 2008; Piva et al., 2008; Bellaio et al., 2009; Ley et al., 2007; Pastore et al., 2011; Tomkins et al., 2011).

Table 7: Behavioural variables shown by the therapeutic dogs towards their animal handlers and patients. Recorded in duration (D) or frequency (F) of occurrence:

<table>
<thead>
<tr>
<th>Category-</th>
<th>Code -</th>
<th>D/F</th>
<th>Description of behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motion activity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lay</td>
<td>D</td>
<td></td>
<td>Resting position with trunk in contact with the ground</td>
</tr>
<tr>
<td>Sit</td>
<td>D</td>
<td></td>
<td>Hindquarters and front paws only in contact with the ground</td>
</tr>
<tr>
<td>Stand</td>
<td>D</td>
<td></td>
<td>Upright position with at least three paws in contact with the ground</td>
</tr>
<tr>
<td>Walk</td>
<td>D</td>
<td></td>
<td>Taking at least one step, shifting body position</td>
</tr>
<tr>
<td>Run</td>
<td>D</td>
<td></td>
<td>Any motion faster than a walk including trotting</td>
</tr>
<tr>
<td><strong>Specific behaviour</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lip licking</td>
<td>F</td>
<td></td>
<td>Part of the tongue is shown and moved to the upper lip</td>
</tr>
<tr>
<td>Yawning</td>
<td>F</td>
<td></td>
<td>Mouth is open to apparent fullest extent while eyes are closed</td>
</tr>
<tr>
<td>Panting</td>
<td>D</td>
<td></td>
<td>Mouth is open with the tongue protruding</td>
</tr>
<tr>
<td>Paw lifting</td>
<td>F</td>
<td></td>
<td>Fore paw is lifted into a position of approximately 45°</td>
</tr>
<tr>
<td>Body shake</td>
<td>F</td>
<td></td>
<td>Rotation of the body, starting at the head and moving caudally</td>
</tr>
<tr>
<td>Tail wagging</td>
<td>D</td>
<td></td>
<td>Repetitive wagging movements of the tail</td>
</tr>
<tr>
<td><strong>Human-initiated contact</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treat reward</td>
<td>F</td>
<td></td>
<td>Dog receives a food treat</td>
</tr>
<tr>
<td>Obedience command</td>
<td>F</td>
<td></td>
<td>Dog responds to a visual/verbal cue with a change in behaviour</td>
</tr>
<tr>
<td><strong>Human avoidance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave</td>
<td>F</td>
<td></td>
<td>Dog leaves the setting</td>
</tr>
<tr>
<td>Turn away</td>
<td>F</td>
<td></td>
<td>Dog turns head or body away from people</td>
</tr>
</tbody>
</table>

Intra-observer reliability calculations refer to the rating consistency in a single observer who records behavioural sequences and is usually assessed by comparing the same observer’s reports from a recording of the same sequence viewed on two
or more separate occasions (Taylor & Mills, 2006; Martin & Bateson, 2007). We assessed intra-observer reliability by repeated coding of three independent samples (each 15 minutes) of videotaped sessions and calculated the percentage of agreement, which was > 93%.

4.2.4 Salivary sampling

To absorb dog saliva, we used a cotton roll (Salivette®, Sarstedt). The saliva collection device was gently placed into the cheek pouch or under the tongue of the dog until it was saturated with saliva (approximately 40-70 seconds). For ethical reasons, neither of the dogs was restraint during the sampling procedure. To stimulate salivation, animal handlers presented commercial food to their dogs. In order to avoid sample contamination and hence, reduced reliability of the enzyme immunoassay, the dogs were only allowed to sniff at the food treats in the experimenter’s closed hand and not to chew on it (Ligout et al., 2010; Bennet & Hayssen, 2010). The time latency between the last food treat and sampling was 10 minutes, respectively. Moreover, the sampling devices contained no food-based additives that may interfere with the enzyme immunoassay (Dreschel & Granger, 2009).

After the cotton roll was soaked with saliva, it was re-placed in the device container and closed with a plastic stopper to avoid evaporation. The collected material was stored in an ice box, so that the salivary devices were immediately cooled before they were finally stored at -20°C. Prior to analysis, samples were thawed on ice and centrifuged at room temperature at 3000g for 15 minutes to obtain the clear saliva.
4.2.5 Sampling schedule

To lessen potential circadian effects on salivary cortisol, only AAIs starting in the morning from 9.30 a.m. – 11.00 a.m. were considered in the analysis. Salivary samples were collected in a timeframe < 4 minutes (Kobelt et al., 2003). As seen in Fig. 3, baseline sampling was carried out prior to each of the MTI sessions. The working sampling schedule was adjusted considering that salivary cortisol levels reflect plasma cortisol with a 20 - 30 minute delay (Salimetrics, 2009). After each 50 - 60 minute-long interventions, an additional 5 minutes were scheduled where the dogs received no more food treats before the dogs were sampled to capture levels that correspond to the time during therapeutic work.

Figure 3: Saliva sampling and video-recording schedule during an MTI session.

4.2.6 Sample analysis

On average, 50 μl of clear saliva were used for the analysis. Analyses were carried out at the Institute for Biochemistry at the University of Veterinary Medicine in Vienna with a highly sensitive enzyme immunoassay kit for salivary cortisol that has been previously used in dogs (Haubenhofer & Kirchengast, 2006). Samples were assayed in duplicates and cortisol concentrations were assessed by double-antibody biotin-linked enzyme immunoassay. Other than standard immunoassays, this assay can also be used for samples containing low concentrations of hormones (Palme & Möstl, 1997). Duplicate samples with a coefficient of variance > 10% were replicated and considered in the analysis when a coefficient of variance < 10% was achieved.
The average intra- and inter-assay coefficients of variance were always less than 10% and 15%, respectively.

4.2.7 Statistics
Calculations were carried out using the statistical package SPSS 15.0 for Windows (SPSS, Inc, Chicago, USA). Shapiro-Wilks tests were used to examine normal distribution of each data set. Statistical analyses were the Wilcoxon signed rank test on the cortisol data and Friedman's two way ANOVA to detect differences in behavioural variables across multiple testing. Spearman’s rank correlation was used to search for relationships between behavioural variables and the difference between baseline and working cortisol (T0 – T1). All data represent group means plus standard error. We considered that $p \leq 0.05$ denotes statistical significance.

4.3 Pet attitude, personality and self-esteem in AAI professionals, dog owners and non-dog owners

4.3.1 Sample
Group 1: AAI professionals who have completed an education on AAI and who work or have previously worked with dog/s in AAI were recruited on AAI meetings, via email or telephone invitation, at the University of Veterinary Medicine Vienna and at the University of Vienna. Since all participants of group 1 are female, the control requirements for control group participants have been adjusted. Hence, only female participants were recruited to join the control groups.

Group 2: Participants of the control group (dog owners) were recruited in off-lead dog zones, where owners can take their dogs and let them run freely, dog schools and at the University of Veterinary Medicine Vienna and at the University of Vienna.
Group 3: Participants of the control group (non-owners) were recruited at the University of Veterinary Medicine Vienna, the University of Vienna and public places near the two Universities.

A total of 101 study participants (31 AAI professionals, 36 dog owners and 34 non-dog owners) were recruited during the call from September 2010 – April 2011. As indicated in Tab.8, 72 participants in each group returned their questionnaires on time so that the responses of 23 AAI professionals, 25 dog owners and 24 non-dog owners were included in the analysis.

Table 8: AAI professionals (group 1), dog-owners (group 2) and non-dog owners (group 3):

<table>
<thead>
<tr>
<th>Groups</th>
<th>Humans</th>
<th>Participate in AAI?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n = 23)</td>
<td>AAI professional</td>
<td>Yes</td>
</tr>
<tr>
<td>2 (n = 25)</td>
<td>Dog owner</td>
<td>No</td>
</tr>
<tr>
<td>3 (n = 24)</td>
<td>Non-dog owner</td>
<td>No</td>
</tr>
</tbody>
</table>

4.3.2 Procedure
The first section of the instrument included demographic data. The participants were asked about their age, student and employment status, marital status, number of people living in the home, dog ownership and whether they lived in an urban or rural area.

4.3.2.1 Pet attitude
The pet attitude scale (Templer et al., 1981) is an 18-item inventory that measures the general attitude towards pets on a rating scale from a seven point scale (strongly disagree to strongly agree). Higher scores reflect a more positive attitude towards pets.

To investigate parameters most relevant for our research purpose, the original scale has been expanded to include four additional items regarding the attitude
towards dogs in AAl's. Higher scores reflect a more positive attitude towards dogs in AAl's. The newly constructed variables were:

- Dogs should not be used in AAI
- Dogs have fun doing AAI
- AAI with dogs is not species-appropriate
- AAl's with dogs have beneficial effects on humans

4.3.2.2 Personality

Personality was measured by the corresponding self-report inventory NEO-FFI (Costa & McCrae, 1992; German adaptation by Borkenau & Ostendorf, 1993), in which individuals are characterised by differences in neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. The NEO-FFI is a short version of the NEO-Pi-R and consists of 60 items that are rated on a five point scale (strongly disagree to strongly agree).

4.3.2.3 Self-esteem

The Rosenberg Self-Esteem Scale (SES; Rosenberg, 1965) has been developed to explore the feelings of a person about his/her self. The instrument consists of ten items that are rated on a four point scale (strongly agree to strongly disagree) and in which higher scores reflect greater self-esteem.

4.3.3 Statistics

Calculations were carried out using the statistical package SPSS 15.0 for Windows (SPSS, Inc, Chicago, USA). We considered that $p \leq 0.05$ denotes statistical significance. Homogeneity of variances was tested using the Levene Test. One-way ANOVA was applied to test for the equality of means (General Linear Model procedure). The Welch ANOVA with Games-Howell post-hoc test was employed to identify statistical difference while accounting for heterogeneity in variance. For more
than 20 years, it has been argued (e.g. Cohen, 1988) whether significance testing on its own can provide valuable information in behavioural science, since it depends on variables such as sample size. In addition, significance of differences hardly offers all the information that would be needed to draw conclusions about differences between people. To gain a deeper insight, effect sizes are calculated using eta squared ($\eta^2$) as a valuable additional information on the relevance of differences. In the present study, $\eta^2$ values were calculated manually using the formula $\eta^2 = \frac{SS_{between}}{SS_{total}}$. An effect size of 0.01 is considered as small, 0.06 as medium and 0.13 as large for that parameter after Cohen (1988), who points out that already a medium effect is visible “for the naked eye”.
5 Results

5.1 Salivary cortisol in certified therapeutic dogs and therapeutic dogs in training during AAs

A total number of 171 salivary samples were collected from 7 certified therapeutic dogs on-lead (P1), 7 certified therapeutic dogs off-lead (P2) and 7 therapeutic dogs in training (T).

5.1.1 Home baseline

20 home baseline samples (12% of all samples) were not included in the analysis because the samples yielded an insufficient volume of saliva to run duplicates or did not reach a CV < 10%. Hence, home baseline salivary sampling was carried out on a day without therapeutic work at 3 different time points, resulting in 39 home baseline samples (23% of all samples) that were available in 13 of the 14 experienced dogs of P1 and P2 (Fig. 4). There was no significant difference between concentrations at the different time points ($\chi^2 = 2.923; p = 0.232$).
5.1.2 Baseline and working salivary cortisol levels in certified therapeutic dogs

For our quasi-experimental study, we assayed salivary cortisol levels in 70 samples (41% of all samples) to produce data for comparison one and 42 samples (24% of all samples) for comparison two. Repeated measures ANOVA for two groups were used to analyse salivary cortisol measures in the first comparison. Levene's Test for homogeneity was appropriate at T1a, the cortisol baseline of session one \((F(1, 12) = 1.481; \ p = 0.247)\); T1b, the cortisol response during the working session one \((F(1, 12) = 2.600; \ p = 0.133)\), T2a, the cortisol baseline of session two \((F(1, 12) = 2.769; \ p = 0.122)\), and T2b, the cortisol response during the working session two \((F(1, 12) = 0.323; \ p = 0.581)\). Mauchly's test indicated that the assumption of sphericity has not been violated \((\chi^2 = 4.286, \ p = 0.511)\). Testing for homogeneity of
covariance matrices, Box-M-Test showed no significant results ($F = 0.902; p = 0.531$). Cortisol levels did not differ between the dogs of the two programs (P1: 5.7 ± 2.4; P2: 5.0 ± 2.0; \textit{Mean} ± \textit{SD} ng/ml) at the baseline measurement at home ($T0 = -0.587, p = 0.568$). ANOVA results indicate a significant main effect of time ($F(3, 10) = 5.555, p = 0.017, \eta^2 = 0.625$).

In response to working sessions, dogs in the second program (P2) showed a decrease in salivary cortisol levels during both working sessions, yielding a significant group effect ($F(1, 12) = 5.060, p = 0.044, \eta^2 = 0.297$) and a significant interaction effect time by group ($F(1, 10) = 4.399, p = 0.032, \eta^2 = 0.569$). Specific program differences in cortisol levels emerged during both working sessions ($p = 0.010$). However, the mean absolute decreases in cortisol were at T1b -2.45 ng/ml and at T2b -2.34 ng/ml, respectively, in group P2. Group P1 showed a decrease in cortisol at T1b of -0.59 ng/ml and an increase in cortisol at T2b of +0.28 ng/ml with respect to the session’s baseline (Fig. 5).
Figure 5: Salivary cortisol (ng/ml) levels in P1 (N = 7) and P2 (N = 7) dogs at home (T0), before (T1a, T2a) and during therapeutic work (T1b, T2b). Except T0, data were analysed with ANOVA for repeated measure; respective group means ± SEM are shown in the graph. * indicates a significant group difference with \( p \leq 0.05 \).

5.1.3 Baseline and working salivary cortisol in certified and to-be-certified therapeutic dogs

ANOVA for three groups with repeated measurements was used to analyse salivary cortisol data in the second comparison. Levene’s test for homogeneity was appropriate at T1a (cortisol baseline referring to the time before the session, \( F(2, 18) = 1.659; p = 0.218 \)); T1b (reflecting the cortisol response during the working session, \( F(2, 18) = 1.708; p = 0.209 \)), respectively. Box-M-Test showed no significant results (\( F = 1.587; p = 0.146 \)). Again, there was no difference between the three groups (P1: 4.0 ± 1.8; P2: 4.7 ± 1.3; T: 5.0 ± 0.9; Mean ± SD ng/ml) according to the baseline measurements (\( F(2, 18) = 0.888; p = 0.429 \)). Results from the repeated measurements ANOVA point at a significant main effect of time (\( F(1, 18) = 6.670, p = 0.019, \eta^2 = 0.270 \)) and group (\( F(2, 18) = 6.316, p = 0.008, \eta^2 = 0.412 \)), as well as a significant interaction effect time by group (\( F(2, 18) = 8.726, p = 0.002, \eta^2 = 0.492 \)).
Bonferroni post hoc analysis for multiple comparisons indicated significant differences between the groups P1 and P2 ($p = 0.034$). In addition, group P2 differed significantly from group T ($p = 0.002$), but there was no significant effect between P1 and T ($p = 0.674$). As indicated in Fig. 6, both groups of experienced dogs in therapeutic programs showed decreases in their work-related cortisol response (P1 and P2 levels were taken from the first session of comparison one). However, the third group that included therapeutic dogs in training exhibited a non-significant increase in cortisol (T: $+0.43$ ng/ml) during their first working session.

Figure 6: Salivary cortisol (ng/ml) levels in P1 ($N = 7$), P2 ($N = 7$) and T ($N = 7$) dogs before (T1a) and during therapeutic work (T1b). Data were analysed with ANOVA for repeated measures; respective group means ± SEM are shown in the graph. * indicates a significant group difference with $p \leq 0.05$. 
5.2 Behavioural monitoring and salivary cortisol in therapeutic dogs during MTI

A total of 25 MTI sessions were included in the analysis. Since data were not normally distributed and the dog sample was considerably small, we used non-parametric statistics. Each statistical unit represents an N of 5.

5.2.1 Cortisol

We looked at baseline salivary cortisol levels that were sampled before the start of an MTI session (baseline levels, T0) and working levels (T1) that were assessed by saliva sampling after completion of the therapeutic session. As demonstrated in Fig. 7, Wilcoxon signed rank test showed no significant differences in session one and two ($Z = -1.214, p = 0.225$). Session three was marked with a marginal significance ($Z = -1.753, p = 0.080$), while in session four and five, baseline and working levels of salivary cortisol differed significantly ($Z = -2.023, p = 0.043$).
Figure 7: Salivary cortisol (ng/ml) levels in therapeutic dogs \((N = 5)\) before (T1) and during (T2) five subsequent MTI working sessions (S1 - S5). Data were analysed with Wilcoxon; respective box plots are shown in the graph. * indicates a significant difference with \(p \leq 0.05\). Circles represent outliers and the white line represents the median.

5.2.2 Motion activity

The behavioural variables lay, sit, stand, walk, run and invisible were subsumed in the category motion activity. Data were analyzed as total duration (s) of occurrence during the observation period across five subsequent MTI sessions. As shown in Fig. 8, analyses of the results using Friedman’s two way ANOVA \((N = 5)\) did not reveal any significance in the observed parameters “lay” \(\chi^2 = 1.120, p = 0.891\), or, as indicated in Fig. 9, “sit” \(\chi^2 = 4.160, p = 0.385\).
Figure 8: Behavioural variable “lay” of the category motion activity over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman's two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

Figure 9: Behavioural variable “sit” of the category motion activity over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman's two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.
As seen in Fig. 10, behavioural variable “stand” only reached a level or marginal significance ($\chi^2 = 8.960, p = 0.062$).

Figure 10: Behavioural variable “stand” of the category motion activity over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

Again, no significant time course was found in “walk” ($\chi^2 = 4.320, p = 0.364$; see Fig. 11) or “run” ($\chi^2 = 2.400, p = 0.663$; see Fig. 12).
Figure 11: Behavioural variable “walk” of the category motion activity over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA (N = 5, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

In looking at relationships between the hormonal marker cortisol and motion activity, we found in session one, the greater the decline in cortisol from baseline to working levels was, the longer the duration of “stand” ($r_s = 0.921, p = 0.026$) and the shorter the duration of “sit” ($r_s = 0.926, p = 0.024$) behaviours.
5.2.3 Specific behaviours

In addition to motion activity, we measured behavioural variables that have been previously linked to arousal in dogs. The results of our statistical analysis (Friedman’s two way ANOVA; \( N = 5 \)) comparing specific behaviours (measured in frequency of occurrence) demonstrate that there was no significant effect regarding the five subsequent MTI sessions for specific behaviours “lip licking” (\( \chi^2 = 4.638, p = 0.326 \); see Fig. 13), “yawning” (\( \chi^2 = 0.857, p = 0.931 \); see Fig. 14), “paw lifting” (\( \chi^2 =
1.395, \( p = 0.845 \), see Fig. 15) and “body shake” (\( \chi^2 = 4.790, \ p = 0.310 \), see Fig. 16).

![Box plot showing lip licking frequency across MTI sessions](image)

**Figure 13:** Behavioural variable “lip licking” of the category specific behaviours over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA (\( N = 5 \), n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

Decreasing cortisol in session five (see Fig. 7) was accompanied by more “lip licking” (\( r_s = 0.899, \ p = 0.038 \)) and “body shake” (\( r_s = 0.931, \ p = 0.021 \)).
Figure 14: Behavioural variable “yawning” of the category specific behaviours over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

Figure 15: Behavioural variable “paw lifting” of the category specific behaviours over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.
Figure 16: Behavioural variable “body shake” of the category specific behaviours over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

In session one, longer durations of “run” were found with higher frequencies of “paw lifting” ($r_s = 0.897$, $p = 0.039$), “body shake” ($r_s = 0.943$, $p = 0.016$), “lip licking” and “paw lifting” ($r_s = 0.960$, $p = 0.010$). In session two, less “lip licking” was observed with the motion variable “lay” ($r_s = -0.943$, $p = 0.016$). “Yawning” and “body shake” were more often recorded along with higher durations of “sit” ($r_s = 0.936$, $p = 0.019$ and $r_s = 0.907$, $p = 0.034$, respectively) during session four. Moreover, “body shake” was significantly linked with “paw lifting” ($r_s = 0.879$, $p = 0.049$).
Figure 17: Behavioural variable “panting” of the category specific behaviours over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

Specific behaviours “panting” (see Fig. 17) and “tail wagging” (see Fig. 18) that were measured in duration of occurrence (s) revealed no significant effect over the five MTI sessions when analysed with Friedman’s two way ANOVA ($\chi^2 = 0.800$, $p = 0.938$ and $\chi^2 = 1.120$, $p = 0.891$, respectively).
Figure 18: Behavioural variable “tail wagging” of the category specific behaviours over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman's two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

Spearman correlations revealed significant relations between motion activity and the duration of specific behaviours. Dogs that showed longer durations of “panting” tended to “sit” longer in session one ($r_s = 0.928$, $p = 0.023$) and session five ($r_s = 0.906$, $p = 0.034$). The duration of “panting” was positively related with the frequency of “yawning” ($r_s = 0.881$ and $p = 0.048$) in session three. We recorded less durations of “tail wagging” on the other hand along with “lay” in session one ($r_s = 0.979$, $p = 0.004$), two ($r_s = -0.955$, $p = 0.011$) and three ($r_s = -0.901$, $p = 0.037$), while it showed a positive association with “run” in session two ($r_s = 0.071$, $p = 0.006$), three ($r_s = 0.926$, $p = 0.024$) and four ($r_s = 0.944$, $p = 0.016$). Moreover, “tail wagging” was also related to “walk” in session three ($r_s = 0.910$, $p = 0.032$) and four ($r_s = 0.937$, $p = 0.019$) and “stand” ($r_s = 0.930$, $p = 0.022$) in session three.
5.2.4 Human-initiated contact

Not all human-animal contact during the MTI sessions was initiated by the dog. We also recorded the number of food treats and obedience commands given by participants or human handlers. Again, as indicated in Fig. 19 and Fig. 20, no significant differences over the course of the five sessions were found for the number of food treats ($\chi^2 = 4.404, p = 0.354$) and obedience commands ($\chi^2 = 2.735, p = 0.603$), respectively. The more “Food treat” was recorded, the longer durations of “panting” in session three ($r_s = 0.899, p = 0.038$) occurred, as well as more “obedience command” and longer periods of “stand” ($r_s = 0.906, p = 0.034$) and “walk” ($r_s = 0.933, p = 0.021$). In session four, “obedience command” was positively related to the frequency of “lip licking” ($r_s = 0.905, p = 0.035$) and in session five to the duration of “tail wagging” ($r_s = 0.990, p = 0.001$).

Figure 19: Human-initiated contact variable “food treat” over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman's two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.
Figure 20: Human-initiated contact variable “obedience command” over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA (N = 5, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

5.2.5 **Human avoidance**

At last, we strived to assess the frequency of human avoidance behaviours. Our results demonstrate that there was no significant time pattern over the five sessions in “turn away” ($\chi^2 = 3.221, p = 0.522$; see Fig. 21) or “leave” ($\chi^2 = 3.048, p = 0.550$, see Fig. 22). Higher frequencies of the variable “turn away” were positively related to “leave” in session three ($r_s = 0.930, p = 0.022$) and session four ($r_s = 0.979, p = 0.004$).
Figure 21: Human avoidance behavioural variable “turn away” over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA (N = 5, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.

Figure 22: Human avoidance behavioural variable “leave” over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA (N = 5, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers.
5.3 Pet attitude, personality and self-esteem in AAI professionals, dog owners and non-dog owners

5.3.1 Demographics

The participants were aged between 20 and 65 years with a mean age of 34 years (33.95 ± 11.91, Mean ± SD). Between the three groups, no significant differences were found regarding age. AAI professionals were aged 32.77 ± 10.48 (Mean ± SD) years, dog owners 36.19 ± 14.18 (Mean ± SD) years and non-dog owners 32.88 ± 10.86 (Mean ± SD) years. Three quarters (75.6 %) of the volunteers lived in an urban area at the testing point and 24.4 % in a rural neighborhood with Chi-Square test showing a significant difference between the three groups (Chi-Square (N=72) = 6.237, p = 0.043) with dog owners living significantly more frequently in rural areas as the other two groups. Most of the volunteer participants stated their “marital status” as “in a relationship” (52.6%). Regarding their living arrangements, half of the participants (50.0%) stated that they live with their partner. In these two aspects, there was no difference between the groups.

5.3.2 Personality

Levene’s Test for homogeneity showed homogeneous variances for “Neuroticism” F(2, 69) = 0.630; p = 0.536), “Extraversion” F(2, 69 = 0.196; p = 0.822), “Openness to experience” F(2, 69) = 0.781; p = 0.462), Agreeableness F(2, 69) = 1.723; p = 0.186) and “Conscientiousness” F(2, 69) = 0.236; p = 0.791). The results of the following One-way ANOVA indicated significant differences between the three groups for “Openness to experience” F(2, 69) = 5.46; p = 0.006, η²= 0.130) and “Conscientiousness” F(2, 69) = 3.482; p = 0.036, η²= 0.098).

Regarding the dimensions “Neuroticism” F(2, 69) = 2.176; p = 0.121, η² = 0.056), “Extraversion” F(2, 69) = 1.772; p = 0.178, η² = 0.047) and “Agreeableness” F(2, 69) = 1.805; p = 0.172, η² = 0.048), no significant effects were found but small to
medium effect sizes that give a hint regarding relevant differences in the other scales as well.

Table 9: Personality dimensions of the NEO-Five Factor Inventory in AAI professionals (N = 23), dog owners (N = 25) and non-dog owners (N = 24). Mean ± SD are shown; * indicates a significant group difference with \( p \leq 0.05 \); ** indicates a significant group difference with \( p \leq 0.01 \):

<table>
<thead>
<tr>
<th>Personality dimension</th>
<th>1 - AAI professionals</th>
<th>2 - Dog owners</th>
<th>3 - Non-dog owners</th>
<th>Level of significance</th>
</tr>
</thead>
</table>
| Neuroticism            | 29.17 ± 7.87          | 31.04 ± 6.41  | 27.00 ± 5.99       | 1 vs 2, \( p = \text{n.s.} \)  
2 vs 3, \( p = \text{n.s.} \) |
| Extraversion           | 14.78 ± 7.53          | 18.04 ± 6.97  | 18.17 ± 6.42       | 1 vs 2, \( p = \text{n.s.} \)  
2 vs 3, \( p = \text{n.s.} \) |
| Openness               | 10.39 ± 4.86          | 15.64 ± 6.45  | 11.33 ± 6.225      | 1 vs 2, \( p = 0.009^{**} \)  
2 vs 3, \( p = 0.039^{*} \) |
| Agreeableness          | 11.00 ± 6.04          | 14.20 ± 6.70  | 13.17 ± 4.85       | 1 vs 2, \( p = \text{n.s.} \)  
2 vs 3, \( p = \text{n.s.} \) |
| Conscientiousness      | 10.57 ± 5.80          | 15.08 ± 7.31  | 14.75 ± 6.36       | 1 vs 2, \( p = 0.059 \)  
2 vs 3, \( p = \text{n.s.} \) |

Group means ± SD are listed in Tab.9. Post post-hoc comparison of means using a Bonferroni correction revealed that there were significant differences in “Openness to experience”, where dog owners differed significantly from AAI professionals (\( p = 0.009 \)) and non-dog owners (\( p = 0.039 \)) with dog owners showing significantly higher values in the scale and stating that they are more open to experiences. The large effect size shows a high relevance of the difference between the groups. A clear trend (\( p = 0.059 \)) was found for the personality dimension “Conscientiousness” comparing AAI professionals with dog owners. Although no significance was found according to the medium effect size a relevant difference may be possible. No other significant differences observed between the three groups, but
the presented effect sizes show that the three groups are also different in the three other scales (as it can be seen in Fig. 23).

![Figure 23: Personality dimensions of the NEO-Five Factor Inventory in AAI professionals (N = 23), dog owners (N = 25) and non-dog owners (N = 24). Data were analyzed with One-Way ANOVA and Bonferroni post hoc corrections, Mean and SD are shown; * indicates a significant group difference with $p \leq 0.05$; ** indicates a significant group difference with $p \leq 0.01$.](image)

5.3.3 Pet attitude

Levene's Test for homogeneity was significant for the pet attitude original scores $F(2, 69 = 6.420; p = 0.003)$ and the AAI-specific scores $F(2, 69 = 8.853; p = 0.000)$ showing that the null hypothesis of homogeneous variances can be rejected. Accordingly, Welch's tests to explore the main effect regarding the original PAS scores ($F(2, 43.566) = 15.502, p < 0.001, \eta^2=0.302$) and the AAI-specific scores ($F(2, 39.599) = 0.161, p = 0.852, \eta^2=0.002$) were calculated. In addition to the significant result for the PAS original scale, the huge effect size underlines the relevance of that
clearly testable and observable difference. Comparing the three groups, post-hoc Games Howell revealed that all groups differ significantly from each other; AAI professionals from dog owners ($p = 0.004$), AAI professionals from non-dog owners ($p < 0.001$) and between dog owners from non-dog owners ($p = 0.028$); see Tab. 10.

Table 10: Pet attitude (Original and AAI) in AAI professionals ($N = 23$), dog owners ($N = 25$) and non-dog owners ($N = 24$). Mean ± SD are shown; * indicates a significant group difference with $p \leq 0.05$; ** indicates a significant group difference with $p \leq 0.01$:

<table>
<thead>
<tr>
<th>Pet Attitude Scale</th>
<th>1 - AAI professionals</th>
<th>2 - Dog owners</th>
<th>3 - Non-dog owners</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original</td>
<td>83.78 ± 4.29</td>
<td>78.92 ± 5.69</td>
<td>73.17 ± 8.91</td>
<td>1 vs 2, $p = 0.004^{**}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 vs 3, $p &lt; 0.001^{**}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 vs 3, $p = 0.028^{*}$</td>
</tr>
<tr>
<td>AAI</td>
<td>15.65 ± 2.57</td>
<td>15.76 ± 1.69</td>
<td>15.54 ± 0.93</td>
<td>1 vs 2, $p = n.s.$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 vs 3, $p = n.s.$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 vs 3, $p = n.s.$</td>
</tr>
</tbody>
</table>

Figure 24: Pet attitude scores (original and AAI scales) in AAI professionals ($N = 23$), dog owners ($N = 25$) and non-dog owners ($N = 24$). Data were analyzed with One-Way ANOVA and Games Howell post hoc corrections; Mean and SD are shown; * indicates a significant group difference with $p \leq 0.05$; ** indicates a significant group difference with $p \leq 0.01$. 

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Fig. 24 clearly demonstrates that AAI professionals exhibit the highest values in their attitudes towards animals.

5.3.4 Self-esteem

Levene’s test for homogeneity showed that the prerequisite of homogenous variances were fulfilled ($F(2, 69 = 0.337; p = 0.715)$). As seen in Fig. 25, the following One-Way ANOVA ($F(2, 69) = 1.179; p = 0.174, \eta^2 = 0.047$) showed that there were no significant differences regarding self-esteem between AAI professionals (41.74 ± 4.79, Mean ± SD), dog owners (41.20 ± 4.92, Mean ± SD) and non-dog owners (39.29 ± 4.31, Mean ± SD) but that the differences are of certain relevance taking the small to medium effect size into consideration.

![Graph showing self-esteem scores](image)

**Figure 25**: Self-esteem scores in AAI professionals ($N = 23$), dog owners ($N = 25$) and non-dog owners ($N = 24$). Data were analyzed with One-Way ANOVA (n.s.). Respective Mean ± SD are shown.
6 Discussion

Animal-assisted programs have attracted considerable attention over the past decades and have become widely accepted in numerous therapeutic settings. During an intervention, the inclusion of a therapeutic dog has proven successful in enhancing human responsiveness and motivation to participate. However therapists, institutions and patients need to be aware that interactions with unfamiliar people in strange environments may create a challenge for the working dogs. If not recognised by the animal handlers, these challenges may result in recurring difficulties to cope with arising stress.

In sum, a comprehensive discussion about AAI must pursue animal welfare. We must decipher how to assess physiological and psychological health in therapeutic dogs for those who offer AAI within the scope of their expertise and those who carry out certification of animal handler/therapeutic dog teams. In the present analysis, non-invasive measurements were selected to reveal behavioural variables and physiological concomitants (i.e. salivary cortisol) associated with therapeutic work in dogs. In addition, we conducted a first attempt to investigate whether AAI professionals vary significantly from dog owners and non-dog owners regarding their attitudes towards pets and AAIIs, personality and self-esteem.

6.1 Salivary cortisol in certified therapeutic dogs and therapeutic dogs in training during AAIIs

The first research approach was designed to investigate effects of human-animal interaction during AAIIs on salivary cortisol levels in therapeutic working dogs (P1 and P2) and therapeutic dogs in training (T).
6.1.1 Are AAIs a source of acute stress?

Prima facie, our study results demonstrate that performance in AAIs in adult mental health care did not cause significant increases in salivary cortisol in therapeutic dogs when working levels were compared to baseline levels. In dogs, elevation in cortisol has been associated with stressful conditions resulting from fear (Beerda et al., 1999; Hydbring-Sandberg et al., 2004; Dreschel & Granger, 2005), controlled/authoritarian play (Horváth et al., 2008) and human threat (Horváth et al., 2007). Moreover, Jones & Josephs (2006) found that punitive behaviours (including pushing and yelling) towards dogs can be positively correlated with increases in dogs’ cortisol concentrations in human-dog teams performing agility.

In contrast, positive human-contact, quiet play and affiliate behaviours stimulated decreases in dogs’ cortisol levels (Coppola et al., 2006; Horváth et al., 2008) and increases in oxytocin (Odendaal & Meintjes, 2003). The role of altered cortisol in response to fluctuating environmental condition has an adaptive function in mammals; enhanced levels of cortisol supply energy for survival, heighten memory, lower sensitivity to pain and boost the immune system (Ebrecht et al., 2004; Chrousos, 2009). However, exposition to high levels of cortisol for extended periods of time may lead to harmful physiological consequences, which, in turn, frequently favour the development of stress-associated adaptive diseases (Kooistra & Galac, 2010).

Taken the functions and effects of cortisol into account for discussing our comparisons, we assume that human-animal-contact did not elicit symptoms of acute physiological stress in the therapeutic dogs in our setting. Our results correspond to both comparisons including P1, P2 and T dogs and corroborate the findings of Marinelli et al. (2009a) and Piva et al. (2008) but stand in contrast to the reports of Haubenhofer & Kirchengast (2006a; 2007) and King et al. (2011). Considering the
controversy in these data, it is possible that the AAIs investigated by the different authors are not directly comparable because of their different conceptual context (e.g. therapeutic content; single versus group interventions; familiar versus unfamiliar participants), environment (e.g. institution such as hospital, school, prison, geriatrics) and arrangement (e.g. frequency, intensity and duration of human-animal contact; dog on/off the lead; refuge for the dog; familiarity of patients).

6.1.2 Does off-lead make a difference?

In the first comparison of our study, we chose to examine two dog-assisted group interventions with a similar agenda regarding the number of participants and the elements of human-animal interaction incorporated. Moreover, both programs focused on adult participants in in-patient mental health care. The major difference was that in P2, the dog was off the lead and hence, able to move freely and naturally, initiate or terminate human contact voluntarily or even leave the therapeutic setting. In contrast, P1 dogs were on the lead during the entire intervention and there was no possibility to move freely, have voluntary contact or leave the setting.

Our data reveal a significant difference in salivary cortisol between P1 and P2 dogs during both AAI sessions. Being pulled on the lead can increase cortisol levels (Beerda et al., 1998), hence, decreasing levels of cortisol in P2 dogs that were off-lead during AAIs indicate that these dogs might be more relaxed. The absence of a lead may furthermore increase the perceived controllability as described in the review by Veissier & Boissy (2007).

To prove that the decrease in cortisol was solely caused by the use of the lead, an experimental testing procedure putting P2 dogs on the lead and P1 dogs off the lead would have provided us with useful insights. However, since both groups of dogs have been intensively trained for their respective working condition, such an
approach probably would have caused a bias. Experimentally altered and unfamiliar working procedures may elicit confusion and discomfort in the dogs, hence, this idea has been considered inappropriate.

Another factor that could not be controlled for in this investigation is the role of the animal handler in mediating the dogs’ cortisol and the individual human-animal relationship in each animal handler-dog dyad. Focusing on human-dog dyads, it has been reported that the personality of the dog owner, the level of attachment and the quality of the relationship can affect cortisol secretion in dogs (Schöberl et al., 2012)

Previous research has documented that plasma concentrations of cortisol in aggressive dogs were significantly higher than in non-aggressive dogs which, in turn, were linked to the dogs’ high stress levels (Rosado et al., 2010). According to the strong correlation between plasma and saliva cortisol levels (Kirschbaum & Hellhammer, 1994), low salivary cortisol levels along with low levels of stress and aggression would be desirable in therapeutic dogs during interaction with humans.

In working baseline levels, no significant differences between P1 and P2 dogs were found. Relatively high baseline cortisol values in both groups may have been caused by the transportation, relocation from home and arriving at the facility. Compared to working levels, we do not know what may have caused the relatively high levels that were measured during home baseline assessment. In addition to possible effects of activity on cortisol, it is likely that the dogs’ daily lives are also characterized by moderate exposures to stress.

6.1.3 The aspect of experience

King et al. (2011) investigated the effects of age on work-related stress in therapeutic dogs and concluded that older and more experienced dogs exhibit less signs of stress. The authors hypothesized that dogs may undergo subsequent
habituation to therapeutic work and may seem less aroused during AAIs. Haubenhofer et al. (2005) found no significant variations in salivary cortisol in dogs that attended a 5-day-long training course in order to become a therapeutic dog. However, to finally earn a certificate in AAI, therapeutic dogs in training are required to get subsequently used to the therapeutic environments of their future workplaces. In this stage of training, they are supervised and accompanied by an experienced AAI-team doing during regular AAI work (Haubenhofer & Kirchengast, 2006b).

Objective assessment of stress in therapeutic dogs in training has not yet been carried out during the stage in the certification process, where the dogs first attend real working sessions. Hence, in our second comparison, we analysed salivary cortisol in dogs that are still in training (T), participating in an AAI session of P1 and P2. Baseline and working levels of P1, P2 and T dogs were compared. Although baseline levels did not differ among the groups, we found a significant difference in working levels of cortisol in experienced P2 dogs while there was no difference between experienced dogs from P1 and T dogs. Regarding their cortisol levels, also T dogs do not seem to be strained by their first exposure to strange patients and the participation in AAIs as “assistance” dogs, as there was no significant rise in cortisol. These findings corroborate the results reported by Haubenhofer et al. (2005). However, if subsequent habituation to therapeutic work is manifest in decreasing stress levels, P2 dogs that move freely during intervention might be better adapted to work-related challenges than P1 dogs. Consequently, the freedom to express natural behaviour not only depicts an essential aspect of dog welfare (Houpt et al., 2007) but seems to be a confounding factor in cortisol meditation during therapeutic work.
6.1.4 Limitations

Generalization of the results is however limited due to the small sample of dogs. Furthermore, an animal may react to environmental stress differently than a conspecific because stress perceptions vary with individual histories and experiences of the animal (Wolfle, 2000). To dismiss anecdotal evidence, representative investigations with a bigger sample size and individual control values are required.

We have suggested that the significant decrease in salivary cortisol during AAs in P2 dogs may be related to higher levels of relaxation. Here, the absence of a lead, the role of voluntary motion activity and contact with humans and the controllability of human-interaction appear to be crucial. Nevertheless, as animal handlers were different individuals for P1, P2, and T dogs, the potential cortisol-modulating effect of human personality and human-dog relationship has to be mentioned.

Although the conclusion seems appropriate that declining levels of cortisol mediate physiological de-arousal, it remains unsure whether cortisol can actually parallel stress and how individual variability in stress susceptibility can be confounded for (Moberg, 1987).

A limitation of our study is that although considerable effort was dedicated to the construction of an ideal sampling schedule, we only managed to assess home (no AAI work) baseline, session baseline (AAI work) and working cortisol levels. In looking at markers of stress, it would have been interesting to include another objective measure like heart rate or heart rate variability and monitor changes over time, that is, after completion of AAs. Measuring the time how long parameters need to return to baseline would provide additional insights.

Due to the organizational structure and institutional dependence of AAs tested, this kind of assessment was not possible within the concerted time of data
collection. Moreover, we aimed at minimally affecting and biasing the AAIs and strived to collect experimental data without manipulating the intervention settings. Therefore, future studies should consider follow-up measurements in their conceptual design to investigate long-term effects.

6.1.5 Baseline sampling

Our findings on the circadian pattern of baseline salivary cortisol corroborate the research results of Hydbring-Sandberg et al. (2004), Kobelt et al., (2003) and Haubenhofer & Kirchengast (2006a). It has been suggested that the collection of salivary cortisol can be carried out easily and by non-professionals (Dreschel & Granger, 2009). However, King et al. (2011) found that dog handlers experienced severe difficulties in dog saliva sampling, even if they were trained and instructed by scientific staff. Also in this study, a considerable amount of home baseline samples that were collected by animal handlers (dog owners) did not contain sufficient saliva to run an enzyme immunoassay. To prevent data loss, dog salivary samples should preferably be collected by a previously trained experimenter.

6.1.6 Outlook

Future research may advance our understanding of the role of interaction quality by assessing affiliate behaviours between dogs and humans during AAIs. It would be interesting if the significant decrease in cortisol in P2 dogs is accompanied by increases in oxytocin. In companion dogs, interaction with humans leads to significant increases in oxytocin (Odendaal & Meintjes, 2003; Handlin et al., 2011). There is further evidence that contact with humans can actually benefit dogs by decreasing their heart rate (McGreevy et al., 2005) and cortisol secretion (Coppola et al., 2006; Bergamasco et al., 2010). The results of our study indicate that therapeutic dogs too are able to relax during human-animal interaction in AAIs, however the
context matters. To draw broader conclusions, cortisol data need to be complemented by other objective measures of stress and arousal such as recordings of heart rate, heart rate variability and behaviour.

6.2 Behavioural monitoring and salivary cortisol in therapeutic dogs during MTI

6.2.1 Animal welfare standards in AAlS

Since humans benefit from the interaction with therapeutic dogs, behavioural and physiological health of the therapeutic animal should be a critical concern (Stetina & Glenk, 2011). Although “dog users have a legal and moral duty of care to maximize their dogs’ welfare (Rooney et al., 2009, p. 128)”, the incorporation of relevant guidelines into standardized manuals for in AAlS has been neglected. In the absence of legal regulations, some initial steps have been made and some organizations (e.g. AVMA, IAHAIO, ISAAT, ESAAT) have provided a framework of the minimum requirements to protect animal welfare during therapeutic work.

However, there is an essential need to gain a deeper understanding of which measureable variables reflect (aspects of) animal welfare and what standards are achievable. Clinical health and the absence of pain do not necessarily indicate good welfare because the freedom from fear and distress and the freedom to express natural behaviour are crucial (Houpt et al., 2007).

6.2.2 Welfare implications for dogs in AAlS

Preliminary investigations (Haubenhofer & Kirchengast, 2006a; 2007; Marinelli et al., 2009a; King et al., 2011) and anecdotal reports of case studies (Heimlich, 2001; Piva et al., 2008) present a conflicting picture regarding the potential welfare implications in dogs in therapeutic settings.
Wilson & Barker (2003) emphasized that results which were derived from experimental sampling in one particular facility are doubtfully generalizable to other facilities. The present investigation has been designed to monitor parameters that have been suggested to be indicative of dog welfare over five subsequent AAI sessions in a specialized facility. In our pilot study on dog behaviour and salivary cortisol in AAls, we provided a detailed description of the AAI, research site and the site population from which the study samples were drawn. Each of these parameters remained constant over the observation period for each therapeutic dog. Furthermore, all dogs regularly worked with their handlers in the program MTI, were awarded a recognized certificate and had a minimum of two years working experience. Still, precaution needs to be undertaken when interpreting behavioural and physiological data in the context of animal welfare (McEwen & Stellar, 1993). Our behavioural data reflect an observation time of 50 minutes, although the individual time span of MTI sessions varied slightly.

6.2.3 Motion activity

Although observation of activity can give rise to hypotheses on dog welfare states, individual coping styles have to be considered (Rooney et al., 2009). Previous research has revealed that stressed dogs may either engage in motion activity (Hiby et al., 2006) or appear quiet and inactive (Rooney et al., 2009). In addition, changes in posture can also affect the heart rate in dogs. Regarding our data from healthy dogs participating in the dog-assisted intervention program MTI, no differences in motion activities (lay, sit, stand, walk and run) were found over the observation period of five subsequent working sessions.

Relating motion activity to cortisol, there was only a connection in session one, where sitting was negatively and standing positively correlated to the decrease in
cortisol. It seems though that motion activity can mediate physiological responses in dogs. In a study by Maros et al. (2008), a change in body postures altered heart rates in dogs when they were lying or walking but not when they were sitting or standing, however, heart rate variability remained unaffected. Examining the effects of exercise on dogs’ cortisol levels, no associations were found (Clark et al., 1997). Taken our findings into consideration, it is unlikely that the significant decreases in cortisol we faced during session four and five should be attributed to changes in motion activity. After five subsequent sessions, dogs may get accustomed to human participants and as human-animal relationships develop, be more relaxed during interaction as there is evidence that cortisol in dogs is regulated by contact with humans (Coppola et al., 2006; Kotrschal et al., 2009).

6.2.4 Specific behaviours

Apart from motion activity, we also recorded specific behaviours (lip licking, yawning, paw lifting and body shake) that have been controversially associated with impaired welfare and found no significant temporal patterns over the five sessions tested. Lip licking occurred more often than the other behavioural variables and was positively correlated with body shake and the significant decrease in cortisol during session five.

Similarly to the conclusions drawn by Rehn & Keeling (2011), we suggest that lip licking and body shake may be a communicative cue in dogs that does not necessarily need to be linked to stress. Interpreting their non-significant data on salivary cortisol in dogs over a 7-week-long AAI program, Marinelli et al. (2009b) also proposed that the differences in behaviour they found are unlikely to be concomitants of stress. Our data both on salivary cortisol and behaviour support these findings as there were no signs of acute stress in therapeutic dogs linked to their performance in
AAs. Tail wagging and panting were recorded by Beerda et al. (1998, 2000) in connection to chronic stress and cortisol elevation in dogs. In our investigation, these parameters showed no relationship to cortisol but were correlated with motion activities.

6.2.5 Human-initiated contact

Dogs have evolved remarkable skills to interpret human gestures (Ittyerah & Gaunet, 2009). MTI participants use obedience commands and food treats to guide dogs through tasks of increasing complexity over the course of the intervention. With regard to these human-initiated behaviours, our analyses indicate that there were positive correlations between motion activities, oral behaviours and tail wagging which could be a prerequisite of attentive behaviour in the dogs.

6.2.6 Human avoidance

It has been suggested that animals use their freedom to move and interact (Martin & Bateson, 2007). During MTI, the dogs may voluntarily leave the setting at any time of the intervention. The results of our analyses reveal that this rarely happened during the five subsequent sessions. However, correlations between the behavioural variables leave and turn away were found in two of five sessions. Perhaps, dogs are more likely to leave the setting after they previously turned away from an unpleasant intrusion. Investigation of human behaviour towards the dog that eventually causes the dog to turn away or leave would be particularly interesting. Recognizing and using behavioural cues could help AAI professionals to predict what kind of situations they should avoid in order to protect the dog.

6.2.7 Limitations

Timeframe and available resources were a limiting factor in the study. The number of sessions where sampling was possible was limited by the substance
abuse treatment facility and only a sample of five MTI dogs met the requirements (participation in the program, certification and working experience) to be included in the study. With this small sample size, it has to be stated that generalizations are problematic, especially for correlations. A replication with a bigger dog sample would be necessary for further conclusions.

Nevertheless, since therapeutic dogs in general undergo careful selection and have to meet specific criteria to be awarded an AAI certificate (Serpell et al., 2010), the recruited sample accurately represents the target dog population.

6.2.8 Outlook

It has been suggested that the intervention context and the behaviours of humans involved influence the outcomes of AAIs (Wilson & Barker, 2003). It is likely that this assumption not only refers to the human side but also to the animal perspective. Categorization of positive, neutral or negative human behaviours towards animals has been previously used to assess human-animal relationships (Waiblinger et al., 2004; Waiblinger et al., 2006) and may as well yield additional insights into the biobehavioural responses in therapeutic dogs. Accordingly, in follow-up studies, it would be interesting to monitor each participant’s behaviour towards the dog over the sampling time.

In conclusion, the results of our study suggest an adaption of the dogs’ cortisol levels to subsequent participation in MTI while with regard to motion activity and behaviour, it is unsure whether there is an habituation effect. The development of a practitioner’s guide on dog welfare for AAI professionals and, maybe even more importantly, AAI volunteers shall be a forthcoming endeavour. Profound future research needs to identify the populations or situations where contact with
therapeutic animals may be potentially problematic or inappropriate for either the animals or the people involved (Beck & Katcher, 2003).

6.3 Pet attitude, personality, self-esteem and self-efficacy in AAI professionals, dog owners and non-dog owners

The present era is an opportune time for studying psychological prerequisites in AAI experts. A growing number of investigations suggest that humans can benefit in diverse ways from interactions with animals (Friedmann et al., 2011). Growing research, the upcoming scientific field of Anthrozoology and the history of AAI research demonstrate the relevance of these findings for public concerns.

Prior to evaluation of the results, the level of participant nonresponse should be taken into consideration. Of the 101 eligible participants who agreed upon participation in the study, 8 AAI professionals, 11 dog owners and 10 non-dog owners did not return the questionnaires on time and had to be dropped from the analysis. It is unsure whether the people not represented may impose a bias on result generalizability because the reasons for not responding are unknown. Perhaps, a negative attitude towards AAI's, animals or dogs may have encouraged people, who in the first place decided to participate, to withdraw from the study. Furthermore, it cannot be concluded that non-dog owners have never owned a dog or may be less likely to acquire a dog in the future (Podberscek & Gosling, 2000).

6.3.1 Pet attitude

The most striking finding was probably that there appeared to be clear differences regarding the attitudes toward pets in the three groups. The most positive attitude towards pets that we found in AAI professionals may account for their willingness to participate in AAI's. Furthermore, it seems evident that people who keep dogs would also score higher on pet attitude than non-dog owners. However, it
is particularly interesting, that there were no differences regarding the AAI-specific scores. Hence, it seems that although AAI professionals, dog owners and non-dog owners differ in their overall attitude towards pets, they scored similarly in their attitudes towards dogs in AAI. It has been suggested that pet attitude also refers to pet attachment; staff members in an AAI facility were more concerned about a missing therapeutic dog when they scored highly on the PAS (Crowley-Robinson & Blackshaw, 1998).

6.3.2 Personality
Interestingly, no significant differences were found in the personality dimensions of the NEO-Five Factory Inventory, except for “openness to experiences”, in which dog owners scored higher than AAI professionals. A clear trend indicated that dog owners also have higher values for the dimension “conscientiousness” when compared to AAI professionals. By highlighting these variables, it should be recognized that dog owners seem to possess traits that are probably desirable for professional mediation of interspecies communication. If that truly is the case, then dog owners may be excellent candidates for enrolling in AAI programs. Alas, it seems difficult to draw preliminary conclusion from these data. However, given the relevance of effect sizes for interpreting variables important for human behaviour, it can be assumed that a bigger sample size may have yielded significant results also in the four other dimensions.

6.3.3 Self-esteem
High scores in self-esteem are negatively correlated with emotional and behaviour disorders (Bagley et al., 1997). Although owning a dog has been subjected to higher self-esteem (Hart, 1995), we found no differences between AAI professionals, dog-owners and non-dog owners. Our findings, however, corroborate
the results of Johnson & Rule (1991). It should be recognized that the results on the small to medium effect sizes indicate that a bigger sample size might have yielded significant differences. Replication of the study with a larger or more diverse sample could give additional insights.

6.3.4 Limitations

Many research on human-animal interactions predominantly relies on self-reports of pet owners which may not be sufficiently objective measures, making it difficult to draw reliable conclusions (Herzog, 2011; Wells, 2009). Accordingly, new methods should be explored that may include objective observation of trained personnel during experimental settings and specific tasks.

Since gender differences in the attitude towards animals have been reported (Herzog, 2007) and women tend to be more critical than men regarding their self-esteem (McDonald & McKinney, 1994), our conclusions may be more evident from having evaluated female participant responses to reduce gender biases. On the other hand, a replication of the survey incorporating male participants would provide a more holistic interpretation of pet attitude, personality and self-esteem in animal-assisted therapists, dog owners and non-dog owners.

6.3.5 Outlook

Clearly, the results of our study suggest that there exist differences with regard to pet attitude. Every person who already lived with a four-legged family member of the canine species is aware what we learn about ourselves on a daily basis if we are capable of introspection. Further in-depth research that focuses on socio-emotional competences in dog owner and non-dog owner populations is urgently needed.
7 DISCLOSURE

The study design and preliminary results of the investigation were presented in poster sessions and published in the proceedings of the 19th and 20th Annual Conference of the International Society of Anthrozoology and the 45th Congress of the International Society for Applied Ethology. An abstract on the preliminary methodological design was published in the Journal of Veterinary Behavior: Clinical Applications and Research 6:1, pp. 81-82.
## Abbreviations

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<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>AAA</td>
<td>Animal-assisted activities</td>
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<tr>
<td>AAI(s)</td>
<td>Animal-assisted intervention(s)</td>
</tr>
<tr>
<td>AAT</td>
<td>Animal-assisted therapy</td>
</tr>
<tr>
<td>AVMA</td>
<td>American Veterinary Medical Association</td>
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<tr>
<td>ESAAT</td>
<td>European society for animal-assisted therapy</td>
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<tr>
<td>IAHAIO</td>
<td>International Association of Human-Animal Interaction Organizations</td>
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<td>ISAAT</td>
<td>International society for animal-assisted therapy</td>
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<tr>
<td>MTI</td>
<td>Multiprofessional animal-assisted intervention</td>
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<tr>
<td>NEO-FFI</td>
<td>NEO-Five Factor Inventory</td>
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<tr>
<td>PAS</td>
<td>Pet Attitude Scale</td>
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<tr>
<td>P1</td>
<td>Program One (certified therapeutic dogs on-lead)</td>
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<td>P2</td>
<td>Program Two (certified therapeutic dogs off-lead)</td>
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<td>RA</td>
<td>Resident animal</td>
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<tr>
<td>SES</td>
<td>Self-esteem scale</td>
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<td>T</td>
<td>Therapeutic dogs in training</td>
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<td>T0</td>
<td>Home baseline (salivary cortisol)</td>
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<td>T1a</td>
<td>Session baseline 1 (salivary cortisol)</td>
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<td>T1b</td>
<td>Working session 1 (salivary cortisol)</td>
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<td>T2a</td>
<td>Session baseline 2 (salivary cortisol)</td>
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<tr>
<td>T2b</td>
<td>Working session 2 (salivary cortisol)</td>
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<tr>
<td>TAT</td>
<td>Tiere als Therapie</td>
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<tr>
<td>TGI</td>
<td>Tiergestützte Intervention</td>
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10 List of Tables and Figures

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Figure 20: Human-initiated contact variable “obedience command” over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers. .................................................................................. 75

Figure 21: Human avoidance behavioural variable “turn away” over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers. .................................................................................. 76

Figure 22: Human avoidance behavioural variable “leave” over the course of five subsequent MTI sessions (S1 – S5). Data were analysed with Friedman’s two way ANOVA ($N = 5$, n.s.). Respective box plots are shown: circles represent outliers, the white line represents the median and stars represent extreme outliers. .................................................................................. 77
Figure 23: Personality dimensions of the NEO-Five Factor Inventory in AAI professionals \((N = 23)\), dog owners \((N = 25)\) and non-dog owners \((N = 24)\). Data were analyzed with One-Way ANOVA and Bonferroni post hoc corrections, Mean and SD are shown; * indicates a significant group difference with \(p \leq 0.05\); ** indicates a significant group difference with \(p \leq 0.01\). 

Figure 24: Pet attitude scores (original and AAI scales) in AAI professionals \((N = 23)\), dog owners \((N = 25)\) and non-dog owners \((N = 24)\). Data were analyzed with One-Way ANOVA and Games Howell post hoc corrections; Mean and SD are shown; * indicates a significant group difference with \(p \leq 0.05\); ** indicates a significant group difference with \(p \leq 0.01\). 

Figure 25: Self-esteem scores in AAI professionals \((N = 23)\), dog owners \((N = 25)\) and non-dog owners \((N = 24)\). Data were analyzed with One-Way ANOVA (n.s.). Respective Mean ± SD are shown.
“Animal welfare in animal-assisted interventions: Effects of human-animal interaction on dogs’ physiological measures and behaviour”

Animal-assisted therapy involves a goal-directed intervention in which an animal is an integral part of the treatment process. The fact that human-animal contact can influence psychological and physiological parameters important to health and welfare has contributed to the wide distribution of animal-assisted interventions (AAIs). Accordingly, the inclusion of animals as a therapeutic adjunct is becoming increasingly popular in mental health institutions. However, in comparison to research on human welfare associated with the benefits of AAIs, only few studies examined effects on therapeutic animals. Thus, the main aim of this study was to evaluate the physiological and behavioural effects of dog-assisted group interventions on therapeutic dogs. Over the course of this thesis, therapeutic dogs (n=21) participated in AAIs in adult mental health care. Using salivary collection devices, pre-post salivary samples were collected to measure levels of cortisol, a hormonal indicator known to vary with physiological arousal. Moreover, in addition to cortisol assessment, video recordings were analysed to monitor dogs’ motion activity, specific behaviours and human-initiated contact. In addition, questionnaires examining the AAI professionals’ attitude towards pets, personality and self-esteem were employed and compared to dog owners and non-dog owners. We found that salivary cortisol does not increase during AAIs in certified, experienced therapeutic dogs and therapeutic dogs in training. However, in dogs that are off the lead, working cortisol levels significantly decreased in comparison to dogs on the lead. Examining
five subsequent sessions of the multi-professional dog-assisted intervention (MTI), where dogs are constantly off the lead, they revealed a temporal pattern of decreasing cortisol levels. Motion activity, specific behaviours and human-initiated contact did not differ across the five MTI sessions, however, some correlations with cortisol were detected. Furthermore, we found that AAI professionals have significantly higher scores on the pet attitude scale than dog owners and non-dog owners. Regarding their attitude towards dogs in AAlS, the three groups scored similarly. Dog owners scored significantly higher than AAI professionals on the NEO-FFI personality dimension ‘openness to experiences’. With regard to self-esteem, no significant differences were found across the groups, although effect sizes indicate a marginal tendency for AAI professionals to have a higher self-esteem. The results of the investigations shall provide insights into the physiological and behavioural welfare of dogs in AAlS and furthermore contribute to increase the standards of education, certification and, most importantly, the quality of life in therapeutic dogs.
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Lisa Maria Glenk, Vienna in May 2012
14 Ad Personam

Mag. Lisa Maria Glenk
lisa.molecular@gmail.com
+43 664 88460159

Adresse: Hormayrgasse 46
A - 1170 Wien

University of Veterinary Medicine
Department of Physiology
Veterinärplatz 1
A - 1210 Wien

Karl Landsteiner Institut für
Schmerztherapie und Neurorehabilitation
Landesklinikum Amstetten-Mauer
A - 3362 Amstetten/Mauer

Akademischer Werdegang
- 05/2009 – jetzt: PhD Student, University of Veterinary Medicine, Vienna
  Thesis: Effects of human-dog interactions on dog physiology and behaviour during animal-assisted interventions in neuropsychiatry. Supervisor: Univ.-Prof. Dr. DI Halina Baran
- 10/2008 – 11/2011: University course animal-assisted therapy and animal-assisted measures, University of Veterinary Medicine, Vienna
- 10/2007 – 10/2008: Diploma Student, University of Vienna
  Thesis: Agonistic behaviour in female guinea pigs and its relationship to vaginal oestrus. Supervisor: Univ.-Prof. Dr. John Dittami
- 2001-2009: Undergraduate Studies: (molecular) Biology, University of Vienna; Veterinary Medicine, University of Veterinary Medicine, Vienna

Akademische Spezialisierung
Verhaltensendokrinologie, EntwicklungsbioLOGie, Tiergestützte Interventionen

Wissenschaftliche Methodik
Enzymimmunoassay, Ethogramme, Biofeedback Messungen, Analytical Profile Index, HPLC, FISH, Basisfertigkeiten der Molekulargenetik

Arbeitserfahrung
- 2010 – jetzt: Trainerin (Multiprofessionelle tiergestützte Intervention, Hundesicherheitstraining) in Hort, Schule, Justizanstalt Favoriten und Schweizerhaus Hadersdorf
- 2009 – jetzt: Tutorin (Vienna Open Lab)
- 2005 – jetzt: Kinder- und Schulgruppenbetreuung, Landgut Wien Cobenzl
- 2003-2010: Internships (Baxter, diverse tiergestützte Aktivitäten)
STIPENDIEN, AUSZEICHNUNGEN UND PREISE

- 09/2011: WISP 2011 Award, 1. Preis
- 12/2010: Doktoratsstipendium, University of Veterinary Medicine
- 01/2010: Leistungsstipendium, University of Vienna
- 09/2009: Publikumspreis, European Researchers’ Night

SEMINARE UND WEITERBILDUNG

- 03/2012: Doktorandenkolloquium, Bündnis Mensch-Tier
- 03/2012: PhD Crane Seminar, Swedish University of Agricultural Sciences
- 10/2011: Science, Media & Making Your Point - an introduction to effective communications, IMP-IMBA Communications Department
- 03/2011: Doktorandenkolloquium, Bündnis Mensch-Tier
- 2009 – 2011: Scientific Writing and Presentation Skills, diverse Seminare und Workshops (Universität Wien, DoktorandInnenzentrum)
- 05/2009: Business Crash-Kurs, Life-science Karriere Services
- 10/2008 – 10/2010: Trainerin, Multiprofessionelle tiergestützte Intervention
- 02/2008: FISH (Fluorescence In Situ Hybridization) Kurs

SPRACHKENNTNISSE

Deutsch: Muttersprache
Englisch: Zweisprachige Erziehung, 2001 - Cambridge University Certificate
Französisch: fließend, 2001 - Diplômes d´études en langue française (1-4)
Spanisch, Italienisch: Grundkenntnisse, Berlitz Diplom

KONFERENZBESUCHE

10/2011: 5th Vienna Games Conference "Future and Reality of Gaming" (FROG)
08/2011: 20th Annual Conference of the International Society of Anthrozoology (ISAZ)
07/2011: 45th Congress of the International Society for Applied Ethology (ISAE)
10/2010: 5th TAT (Tiere als Therapie) Symposium
08/2010: 2nd Canine Science Forum
07/2010: 12th IAHAIO Conference People & Animals: For Life
06/2010: 19th Annual Conference of the International Society of Anthrozoology (ISAZ)
11/2009: Fachtagung: Die Mensch-Tier Beziehung im interdisziplinären Dialog
10/2008: 4th TAT (Tiere als Therapie) Symposium
07/2008: 12th SBN (Society for Behavioral Neuroendocrinology) Conference
**JOURNAL ARTICLES (PEER-REVIEWED)**


**JOURNAL ARTICLES (NON-PEER-REVIEWED)**


**CHAPTERS IN EDITIONS AND COLLECTIONS**


**PRESENTATIONS AT SCIENTIFIC CONFERENCES**


the International Society for Applied Ethology, July 31st - August 4th, 2011. Indianapolis, Indiana, USA


REVIEWS AND MEMBERSHIPS
2010: Member of the International Society of Anthrozoology
2011: Reviewer for the Journal of Animal Science and Husbandry