Chapter 15
A Dog's Perspective on Animal-Assisted Interventions

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Abstract The practice of implementing dogs into therapeutic environments is an emerging field. Despite the increasingly growing scientific interest on human health outcomes, research efforts into the canine perspective of animal-assisted interventions (AAIs) have been scarce. The demands therapy dogs encounter during their performance in therapeutic environments however go beyond the challenge of accepting close social contact with strangers. Physiological and behavioral welfare indicators and dog handler surveys to identify stress related to AAIs have been used across the scientific literature. However, the current body of research presents a conflicting picture, making it difficult to generalize study results. Research indicates that frequency and duration of AAI sessions, novelty of the environment, controllability, age, and familiarity of recipients modulate animal welfare indicators. The biopsychosocial model of dog health in AAIs is proposed as a multidimensional framework of human–animal interaction effects on dogs. Moreover, training methods, attachment to handler, and inequity aversion in dogs are discussed as factors likely to affect welfare. This chapter highlights that clear conclusions on how the well-being of dogs is influenced by the performance in AAIs cannot be drawn due to the heterogeneity of programs, recipient and session characteristics, small dog sample sizes, and methodological limitations.

Keywords Dog · Animal welfare · Stress · Behavior · Cortisol · Animal-assisted intervention · Animal-assisted therapy · Animal-assisted activity

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M. R. Pastorinho, A. C. A. Sousa (eds.), *Pets as Sentinels, Forecasters and Promoters of Human Health*, https://doi.org/10.1007/978-3-030-30734-9_15

15.1 Introduction

Animal-assisted interventions (AAIs) are commonly referred to as complementary and adjunctive initiatives that aim to positively affect human health by utilizing animals. In general, AAI programs seek to enhance quality of life variables of patients, clients, or residents and facilitate therapeutic progress. Thus, animals are integrated as a central part of a therapeutic or ameliorative process (Kruger and Serpell 2006).

In the literature, two other terms have been variously used and defined. Basically, in animal-assisted therapy (AAT), professionals engage in preventive, curative, promotional, or rehabilitative healthcare services. These are animal-supported and goal-centered programs, in which documentation and evaluation of therapeutic progress and outcomes is inevitable. Animal-assisted activity (AAA) refers to programs without a therapeutic aim, in which professionals or volunteers deliver interventions with spontaneous content that are neither concisely documented nor evaluated (Kruger and Serpell 2006).

As previously claimed by Palley et al. (2010), the scientific literature is characterized by an inconsistent use of terminology. The term AAIs may be used as an umbrella term to overcome this dilemma, but does not provide any further information on therapeutic content, if not otherwise specified. In the media, AAIs are also often related to as pet therapy.

15.1.1 Biopsychosocial Effects of Animal-Assisted Interventions

The biopsychosocial model of health provides a structural framework of individual and interactive dimensions of biological, psychological, and social health, integrated dynamic aspects. It has been introduced as a suitable model in understanding human–animal interaction effects on human health outcomes (Friedmann et al. 2010). One dimension affects the other two, underlining how unidimensional improvement or impairment may exert effects on systemic health.

A growing body of research into the human–dog relationship has highlighted that interaction with dogs may result in positive effects on human health. Psychological benefits may be derived indirectly via enhanced therapy motivation and facilitated relationships with psychotherapists and healthcare staff (Schneider and Harley 2006; Wesley et al. 2009; Wohlfarth et al. 2013). Direct psychological effects of AAIs include the reduction of depressive symptoms, negative mood, and anxiety (Crowley-Robinson et al. 1996; Cole et al. 2007; Lang et al. 2010). In general, dogs have been attributed a social lubricant function. Interpersonal interactions seem to be facilitated by the mere presence of a friendly dog. For instance, dog companionship increases human social attractiveness, stimulating smiles, conversations, and prosocial behavior from strangers (Eddy et al. 1988; Gueguen and Ciccotti

2008; Wells 2004). Positive effects have also been described for human physiological health parameters. Animals can act as a source of social support during cognitive tasks, leading to reduced endocrine and cardiovascular stress responses (Beetz et al. 2011; Allen et al. 2001). In addition, decreased perceptions of pain have been reported (Braun et al. 2009; Marcus et al. 2012; Ichitani and Cunha 2016).

15.1.2 Limitations in Research on Animal-Assisted Interventions

Research into the effects of AAIs on human health outcomes has been justifiably challenged because of methodological shortcomings that include lacking numbers of studied subjects, suitable control (non-treatment, alternative treatment) groups, randomization, or blinding (Stern and Chur-Hansen 2013). Accordingly, the majority of studies do not meet evidence-based medicine criteria. Especially for clinical populations, it has remained largely unclear whether the AAI treatment itself affects desirable patient outcomes or whether the results were modulated by other nonspecific factors (Anestis et al. 2014; Chur-Hansen et al. 2014). Another issue is that to date, the role of the animal as the outcome mediating factor in AAIs has remained intangible. Thus, it becomes apparent that there exists a discrepancy between the scientific justification of AAIs and lay public perceptions that are also manifest in the broad offer of AAI-related services. Accounting for the emerging popularity of AAI programs, animal welfare aspects need to be considered. Preliminary research has pointed out that dog welfare may be threatened by participation in AAIs, either via inappropriate handling by recipients or staff members (Hatch 2004), which warrants a closer look onto the dog perspective of AAIs.

15.1.3 Animal Welfare Recommendations

A comprehensive guideline for animal well-being in AAIs has been published by the International Association of Human-Animal Interaction Organizations (IAHAIO). According to the "IAHAIO White Paper," AAIs should only be performed with the support of animals that are in immaculate health, both physically and emotionally. Prior to their involvement in AAIs, individuals considered appropriate should be carefully evaluated via veterinary screening and temperament assessment by an expert in animal behavior. Such pre-selection procedures aim to identify animals with the proper disposition that most likely enjoy this type of human–animal interaction. Handlers and professionals working with animals are required to understand the fundamental, species-related, and individual needs of the animal so that its safety and comfort are guaranteed. Thus, any interactions involving inappropriate treatment of the animal, thereby putting recipients and the animal

at risk, are unacceptable. Animals must be cared for properly prior to, during, and after the sessions. Also overload associated with participation in AAIs must be avoided, and session durations should be time limited (IAHAIO 2014).

15.1.4 Dogs and Humans

Given the biological and psychological evidence for the extraordinary affinity of humans to companion dogs and vice versa, a strong interrelation between bio-psycho-social variables according to Fig. 15.1 across species is plausible.

Across the process of domestication, dogs have developed distinctive relationships with humans that facilitate integration into human societies. The fact that domestic dogs are highly sensitive to human communicative cues seems to have contributed to the wide distribution of the species that we see nowadays. Human gestures such as pointing and gazing are easily recognized already at puppy age (Ittyerah and Gaunet 2009; Zaine et al. 2015; Bhattacharjee et al. 2017). Dogs evidently outperform their wild ancestor, the wolf, and even chimpanzees with their rigorous capacity to understand human gestures (Udell et al. 2009).

In AAIs, dogs are commonly confronted with strangers in unfamiliar environments, which is a challenge per se because during the major part of the ongoing process of dog domestication and breeding, hunting and guarding have been desired skills. AAIs encompass a relatively novel area of working dog performance and have evolved only during a few decades, where the appreciation of close intimate contact with strangers became a desirable behavioral trait (Butler 2004).

Previous research on pet dogs has shown that dogs' social behavior strategies toward strangers were affected by the way the dogs were approached. For example, if family dogs were confronted with positive cues from unfamiliar humans including a friendly voice and face while being approached at a normal pace, the dogs exhibited high levels of contact seeking. In contrast, if approached by a stranger in a threatening manner including slow movements, staring eye contact, and a slightly bent upper body, the dogs avoided gaze, vocalized more often, and backed away (Vas et al. 2005; Györi et al. 2010).

Coordination of nonverbal behaviors between interactive partners takes place during the process of social synchronization in many mammalian species. The experience of synchrony roots in the mother–child relationship, and high levels of synchrony have been related to efficient bonding (Atzil et al. 2014; Leclère et al. 2014). Interestingly, dogs tend to automatically imitate their owners' behavior in a performance task (Range et al. 2011) and adjust their behavior to their owners' reactions toward an unfamiliar stimulus (Merola et al. 2012a, b). It has been suggested that referential communication may enhance behavioral organization during shared activities (Csányi 2000), but it may possibly also account for synchronization patterns during AAIs.

Previous research has examined whether dog owners recognize behavioral cues of discomfort in their pets. In a survey by Mariti et al. (2012), 60% of respondents

were able to provide a correct definition of stress and its impact on their dog's well-being. While intense behaviors like trembling, panting, and vocalizing were easily attributed to stress by more than half of the respondents, study participants failed to identify the more subtle behavioral signs of unease. These included behaviors like nose licking, yawning, paw lifting, and excessive food or water intake, which were only related to stress by less than 10% of the respondents.

These findings stress the importance of a broad dog handler education on dog ethology prior to participation in AAIs. This is particularly important in programs where volunteers with little or no previous experience with dogs may engage in AAIs.

15.1.5 Ethical Aspects

In 1991, Iannuzzi and Rowan conducted questionnaires and phone interviews to identify under which circumstances AAIs may raise ethical concerns for the animals involved. Study participants responded that particularly resident animals should be closely monitored for stress and fatigue and must have opportunities to withdraw and rest. In visitation programs, environmental conditions including high room temperatures in institutions and restricted access to water were the most frequently mentioned concerns. Working schedules should be limited to three sessions per week with an individual duration of no more than 60 minutes (Iannuzzi and Rowan 1991). According to Fejsáková et al. (2009), each animal should be provided a safe place within the working environment into which it can refuge when exhausted or stressed from overwhelming interactions. Zamir (2006) claims that the integration of animals into AAIs can be ethically justifiable only if also animals benefit from the interactions. Thus, this may refer to species that can establish close social relationships with humans like dogs, while non-domesticated species that generally exhibit a lower tolerance for stressful situations and stimuli should not be considered. Taylor et al. (2016) suggest that animals may benefit if people's attitudes and behaviors toward animals change for the better. Such changes in attitude are based on the acknowledgment of animal sentience and their role as a partner rather than tool during AAIs.

15.2 A Dog's Perspective: Review of the Literature

This chapter seeks to systematically review the current literature on the dog experience of AAIs (Sects. 15.2.1, 15.2.2, and 15.2.3). Moreover, factors that are likely to modulate therapy dog performance are discussed (Sects. 15.3.1, 15.3.2, and 15.3.3).

Scientific literature was identified from database keyword search and article reference sections. Inclusion criterion for reviewed literature was the publication of original research in a peer-reviewed scientific journal. Keyword search terms were

therapy dog, animal welfare, stress, arousal, behavior, AAI, AAT, and AAA. The literature search resulted in 13 relevant papers, further extending the body of knowledge presented in a recent review (Glenk 2017). The majority of studies in the present literature review focused on dogs in visitation programs where animals accompanied either their owners or handlers during visits in healthcare and educational settings (Parenti et al. 2013). Across studies, the dog experience of AAIs builds primarily on the assessment of behavioral (i.e., general activity and stress-related behaviors) and physiological variables (i.e., salivary cortisol or heart rate) and/or questionnaires designed to examine animal handlers' interpretations of their dogs' behavior. An overview on AAI program definitions, recipients, number of dogs, and welfare indicators is shown in Table 15.1. In addition, Table 15.2 exhibits AAI session characteristics including duration, arrangement of recipients (single or group intervention), between session intervals, and significant findings across the studies.

Two of the reviewed studies were case reports ($N = 1$) that followed one dog over time. In the other studies, the number of dogs varied between 4 and 47 (18.1 ± 12; Mn ± SD), indicating that existing research builds on a relatively small number of studied subjects. As previously reported, studies were carried out in multiple therapy sites including in-patient and out-patient facilities, schools, and university (Glenk 2017). The most common human–animal interactions during AAI sessions included verbal praise, petting, gentle scratching, brushing the dog's fur, walking the dog on- or off-lead, obedience commands, throwing or hiding dog toys, and mild exercise.

15.2.1 Case Studies

In a case study by Piva (2008), a shelter dog that was adopted and integrated as a resident dog in a nursing home for the elderly was observed over the course of 6 months. After being rehomed in, the dog was regularly enrolled in AAA group sessions. Welfare measures included clinical indicators, behavior, and cortisol levels. Behavioral disorders in shelter dogs are not uncommon, and also this particular dog exhibited a previous history of stereotypic autogrooming that had developed into an acral lick granuloma. Observations of the dog across three time points during the AAA program led to the conclusion that over time, the dog seemed to be more healthy, playful, and engaged in social interaction and exploration. Stress indicators such as hair cortisol, tachycardia, tachypnea, nose and lip licking, hypervigilance, walking-pacing, and the granuloma tended to decrease progressively over time, suggesting that the dog was successfully integrated in the new environment and participation in AAA did not impair its overall health and welfare.

The other case study by Palestrini et al. (2017) was carried out in a pediatric hospital where a dog-handler team was paired with a child during postoperative awakening, 2 hours after surgery. The dog was enrolled in 20 subsequent AAT sessions. Study outcomes were heart rate and analyses of the stress-related behavior,

Table 15.1 Overview on program definitions, therapeutic environment, recipients, sample of dogs, and welfare indicators

Reference	AAI type	Program type	Environment	Recipients	Dogs (*N*)	Welfare indicators
Haubenhofer and Kirchengast (2006, 2007)	AAA, AAT	Visitation	Hospitals, schools, rehabilitation centers, nursing homes	Adults, children	18	Salivary cortisol, emotions according to handler
Piva (2008)	AAA	Resident	Nursing home	Adults	1	Clinical protocol, behavior, fecal and hair cortisol
Marinelli et al. (2009)	AAA, AAT	Resident, visitation	Hospitals, clinics or rehabilitation centers, schools, nursing homes	Adults, children	18	Behavior, handler questionnaire
King et al. (2011)	AAT	Visitation	Hospital	Adults, children	21	Salivary cortisol, behavior, handler questionnaire
Glenk et al. (2013)	AAT	Visitation	In-patient mental Healthcare	Adults	21	Salivary cortisol
Glenk et al. (2014)	AAT	Visitation	In-patient substance abuse treatment	Adults	5	Salivary cortisol, behavior
Ng et al. (2014)	AAA	Visitation	University	Adults	15	Salivary cortisol, behavior
Koda et al. (2015)	AAT	Visitation	Prison	Adults	47	Salivary cortisol, handler questionnaire
Palestrini et al. (2017)	AAT	Visitation	Pediatric hospital	Children	1	Heart rate, behavior
Pirrone et al. (2017)	AAA	Visitation	Healthcare facility	Adults	4	Heart rate, behavior
McCullough et al. (2018)	AAT	Visitation	Pediatric hospital	Children	26	Salivary cortisol, behavior, handler questionnaire
Colussi et al. (2018)	AAA	Visitation	Kindergarten	Children	6	Salivary cortisol

Modified and extended from Glenk (2017)

exploration, passive behavior, environmental orientation, and interaction with children, animal handler, and other people (i.e., staff, parents). Heart rates did not vary whether or not children interacted with the dog during the sessions; neither did behavioral variables differ across the sessions. There were no incidences of the dog trying to withdraw from the intervention, and the high occurrence of panting was attributed to the relatively high room temperature. No acute concerns for the dog's welfare emerged during investigation of the program (Palestrini et al. 2017).

15.2.2 Original Research (N > 1)

Research by Haubenhofer and Kirchengast (2006, 2007) and Marinelli et al. (2009) exhibits a high variability of AAI settings referring to therapeutic environments and contents, the number and age of recipients, and session arrangements was found. Dogs' salivary cortisol concentrations were higher on days with AAIs if compared to a resting day according to Haubenhofer and Kirchengast (2006, 2007). In addition, the duration of sessions and the number of visits per week affected secretion of the glucocorticoid hormone. In their study, animal handlers reported that fewer breaks occurred during sessions between 1 and 3 hours and these were perceived to be more intense than longer sessions (up to 8 hours). Higher cortisol concentrations were also measured during shorter sessions. However, these results should be interpreted with caution as more recent recommendations demand a limitation of session duration (30 to 45 minutes) with respect to animal welfare (IAHAIO 2014). Handlers perceived their dogs to be more likely to be physically strained from therapeutic performance than they considered themselves (Haubenhofer and Kirchengast 2007). The results of higher cortisol levels associated with AAIs were confirmed by King et al. (2011) who measured enhanced salivary cortisol levels 1 hour after session begin in dogs that were involved in AAT in hospital environments. Stress-related behaviors observed during 1 minute after 2 hours of AAT included panting, pupillary dilation, yawning, whining, and air licking. Interestingly, the occurrence of these behaviors did not vary if dogs were subjected to 2 minutes of a quiet time-out after 60 minutes. Still, a correlation of stress behaviors and increases in salivary cortisol levels was found, and less behavioral signs of stress were observed if dogs had 2 years of experience in AAT or more and/or were older than 6 years (King et al. 2011).

The only study that evaluated data over a period of 3 years was by Marinelli et al. (2009) and analyzed handler reports on stress-related behaviors in dogs performing AAA/AAT and handlers' opinions on working conditions. According to animal handlers, both the frequency of sessions and the number of recipients increased for each dog with an overall lower perception of the quality of the intervention. An effect of recipient age was discovered to modulate the expression of stress-related behaviors, which were more frequently expressed when children under the age of 12 years participated in AAA/AAT sessions. Moreover, interferences, high temperatures, and lack of space were considered inappropriate for the maintenance of dog well-being (Marinelli et al. 2009).

Table 15.2 AAI session characteristics including duration, single or group intervention, between session intervals, and significant findings

Reference	Duration	Single/ group	Intervals	Significant findings
Haubenhofer and Kirchengast (2006, 2007)	1–8 hours	Not available	Differed from 9–50 sessions/3 months	↑ Salivary cortisol: on working days, during short sessions with high intensity, high frequency of sessions
Piva (2008)	20 min	Group	3–4 sessions/ week	↓ Stereotypic autogrooming; ↑play behavior, socialization; ↓ hair cortisol
Marinelli et al. (2009)	10–105 min	Single, group	Daily	↑ stress-related behavior if recipients were children <12 years; increase in the frequency of sessions and number of recipients across 3 years
King et al. (2011)	2 hours	Single	Biweekly	No effect of a short time-out session; ↑salivary cortisol after 60 minutes; ↑behavioral signs of stress in dogs <6 years and/or < 2 years of AAI experience
Glenk et al. (2013)	50–60 min	Group	Weekly	No difference in salivary cortisol between working and resting days; ↓ salivary cortisol in therapy dogs off-lead
Glenk et al. (2014)	55–60 min	Group	Weekly	↓ Salivary cortisol in sessions 4 and 5; no changes in behavior
Ng et al. (2014)	60 min	Group	Not available	No difference in salivary cortisol between working and resting days; ↑ salivary cortisol in novel environment
Koda et al. (2015)	70 min	Group	Weekly	No change in salivary cortisol from pre- to post-session in dogs rated as severely stressed by handlers; cortisol levels were significantly lower post session in dogs rated as minimally stressed
Palestrini et al. (2017)	20 min	Single	Not available	No changes in heart rate or behavior across 20 sessions
Pirrone et al. (2017)	55 min	Group	Weekly	No difference in salivary cortisol between working and resting days; ↑ joint attention and gaze synchrony during AAA; ↑ heart rate on working days
McCullough et al. (2018)	20 min	Single	Weekly	No difference in salivary cortisol between working and resting days; ↑ salivary cortisol levels related to ↑ stress behaviors and ↓ affiliative behaviors; ↓ affiliative behaviors in dogs with higher scores on stranger-directed fear
Colussi et al. (2018)	90 min	Group	Not available	↓ Salivary cortisol after AAA compared to before session and home levels

Modified and extended from Glenk (2017)

The results by Haubenhofer and Kirchengast (2006, 2007) and King et al. (2011) have been contrasted by Glenk et al. (2013, 2014) and Ng et al. (2014) who reported no differences in salivary cortisol concentrations when working days with AAI settings and resting days at home were compared. Research by Glenk et al. (2013, 2014) was conducted in in-patient healthcare facilities and used salivary cortisol and behavior to determine dog welfare. In the study published in 2013, experienced dogs that were kept off-lead and allowed to move freely during AAIs exhibited lower cortisol levels than experienced dogs on-lead and dogs in training that had not earned an AAI certificate at that time. The second study reported no significant changes in behavior over a period of 5 weeks, where the dogs were enrolled in AAIs weekly for approximately an hour. Salivary cortisol decreased significantly during the last two sessions, possibly due to habituation. These studies suggest decreasing levels of arousal in dogs that modulate closeness and distance themselves during human–animal interaction by moving freely in sessions with increasingly familiar recipients. A different setting was focused on in research by Ng et al. (2014) who monitored salivary cortisol and behavior during on-campus AAAs with university students as recipients. Salivary cortisol concentrations increased if dogs rested quietly with their handlers in an unfamiliar environment compared to when they were at home or involved in an AAA setting. No differences in the occurrence of stress-related behaviors were found between the three study conditions. Behavioral differences were only found for postural state, resulting in more standing and ambulating if stimulated by interaction with strangers during the AAA setting. Koda et al. (2015) used salivary cortisol and handler reports to assess dog welfare during an AAI program with prisoners. Dogs that were evaluated as showing severe stress did not exhibit significant changes in salivary cortisol from pre- to post-session. Dogs that were rated as minimally stressed had significantly lower cortisol levels post session. There was an effect of novelty, as a higher tendency in handlers to rate their dog as severely stressed was found in the first session of the 12-week program. Behavioral indicators of stress in animal handler protocols were however only based on occurrence, and therefore, information on frequency, duration, and intensity of behavior is lacking. A discrepancy between handler evaluation and dogs' salivary cortisol concentrations existed in 11% of cases, where dogs were rated as severely stressed in the absence of relevant changes in the glucocorticoid hormone (Koda et al. 2015).

Social synchronization patterns that have been previously measured between caregivers and children were studied in handlers and dogs in an exploratory study by Pirrone et al. (2017). Moreover, assessment of heart rate and salivary cortisol was carried out over the course of five subsequent AAA sessions with psychologically or physiologically disabled adults. Gaze synchrony, joint attention, and touch synchrony were registered before, during, and after the sessions. Social synchrony occurred prior to and during AAAs with joint attention being the most prevalent behavior. However, more gaze synchrony and joint attention were found during AAA performances than before. No differences in salivary cortisol levels were found except for individual differences between the dogs. Although heart rate was higher in dogs on working days with AAA sessions compared to control days, values remained within the common physiologic range, suggesting only minor

increased arousal. Individual preferences for physical contact with recipients were described with some dogs being more willingly to initiate contact with the patients than others.

McCullough et al. (2018) recently published their findings on salivary cortisol and behavior in dogs performing AAIs in pediatric oncology. Sessions were arranged in a manner that a dog-handler team was paired with a child, his or her parents, and hospital staff. No significant differences in dogs' salivary cortisol were detected when working concentrations were compared to pre-working levels at the hospital site or at home, paralleling previous data of Glenk et al. (2013, 2014), Ng et al. (2014), and Koda et al. (2015). However, during AAI sessions, higher salivary cortisol was associated with an increased frequency of stress behaviors and a reduced frequency of affiliative behaviors. In dogs that exhibited higher scores of stranger-directed fear in a behavior-centered questionnaire (i.e., C-BARQ), fewer affiliative behaviors were displayed in AAI sessions. The findings suggest that only mild expressions of distress in dogs were observed, but it is interesting that incidences of stress and affiliative behaviors were linked with certain activities. For instance, more stress-related behaviors were seen if the child put a bandanna on the dog, and fewer affiliative behaviors were found if the child used a stethoscope to listen to the dog's heartbeat, and the child played a game on the dog's vest or drew a picture of the dog (McCullough et al. 2018).

Colussi et al. (2018) carried out an exploratory study on dogs' salivary cortisol responsiveness during various cognitive and physical activities that included AAA as stimulus. In their study, dogs participated with their owners in group interventions in Kindergarten, where children had verbal and tactile contact with the dogs. To assess working concentrations of cortisol, a pre-session saliva specimen was collected and compared to a post-session sample at the end of the activity. In addition, home baseline samples were gathered. Results on working and resting salivary cortisol confirm previous findings by Glenk et al. (2013, 2014), Ng et al. (2014), Pirrone et al. (2017), and McCullough et al. (2018) in that no AAI-related increase was found. The authors stated that AAAs can be considered as low intensity exercises, and still dogs provide high psychological support to recipients. Significantly higher pre-session levels may be associated with anticipation stress or arousal during transportation to the facility, but a causal relationship cannot be inferred.

15.2.3 The Biopsychosocial Model of Dog Health in AAIs

The biopsychosocial model of health may not only refer to the human experience of AAIs but provides a comprehensive framework of categories for the canine perception as well. Research on social mammals has indicated that there exist common neural correlates that modulate social behaviors across species (Goodson 2005). Thus, effects of human–animal interaction during AAIs may influence the dog's biological, psychological, and/or social integrity in a similar way humans are affected. Figure 15.1 integrates significant common study outcomes that emerged from the literature review and are described in more detail in Table 15.2.

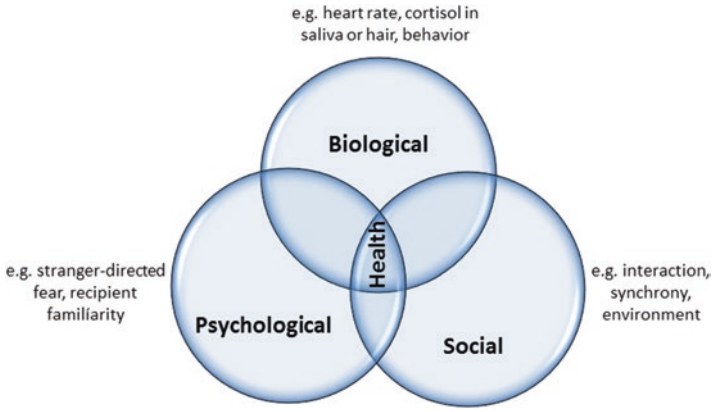

Fig. 15.1 The biopsychosocial model of dog health in AAIs as a multidimensional framework of human–animal interaction effects on dogs

15.3 Factors that Modulate Dog Welfare

15.3.1 Training Methods

In their research on training methods, problematic behaviors, and human–dog relationships, Hiby et al. (2004) found higher scores of obedience in dogs that were solely trained using reward-based methods. In comparison to punishment, specific tasks and behaviors were more easily learned if dogs were rewarded with positive praise, play, and treats. Study outcomes also indicate a causal relationship between punishment and problematic behavior, while no correlations were found between problematic behavior and reward-based training methods. The authors stressed that while positive reinforcement may improve human–dog relationships, punishment during training method may elicit anxiety in the dog which, in turn, is likely to impair dog welfare on health over time.

In a study by Deldalle and Gaunet (2014), dogs' behavioral responses to common human obedience commands were observed. In detail, the relationship between the frequency of stress signals was linked to whether the dogs were trained with positive (i.e., appearance of an appetitive stimulus like food or praise) or negative reinforcement (i.e., disappearance of an aversive stimulus like pressure or straining the lead). The study focus was set on two different popular training exercises: walking on-lead and responding the sit command. Dogs trained with negative reinforcement showed significantly more lip licking, when confronted with the sit command. Moreover, yawning, shaking, scratching, whining, and sniffing were exclusively seen in dogs that knew aversive training methods. During walking on-lead, dogs trained with positive reinforcement gazed significantly more toward their owner. Low posture (including tucked tail, ears back, and legs bent) and gaze avoidance

were more likely seen in negatively reinforced dogs during the sit command (Deldalle and Gaunet 2014).

The implications from these studies for dogs performing AAIs are obvious. Appropriate training via positive reinforcement will result in a more positive human–dog relationship and increased control of the owners over the dogs. Especially during interactions with strangers in unfamiliar environments, where the animal handler is urged to recognize subtle signs of discomfort immediately, dogs that seek eye contact may have a clear advantage.

15.3.2 Inequity Aversion

A phenomenon that has not yet been considered in the literature with regard to dog welfare in AAIs is inequity aversion, a sensitivity toward disadvantageous reward distribution. The pioneer work on inequity aversion in animals was carried out by Brosnan and De Waal (2003) and Brosnan et al. (2004) who investigated conditions under which capuchin monkeys and chimpanzees were willing to exchange a token with the experimenter for food. Study results indicate that the animals refused collaboration if they watched a conspecific obtain a more attractive food reward for equal or less effort. As demonstrated by Range et al. (2009), unequally rewarded dogs refuse participation in a paw lifting task earlier, hesitate longer to respond to human commands, and exhibit more stress behaviors. Bruck et al. (2016) replicated the results in a follow-up study, demonstrating that after the experiment, unequally rewarded dogs tended to avoid the experimenter and the conspecific dog in a neutral environment.

The prevalence of inequity aversion in dogs should be considered if multiple dogs participate simultaneously with multiple recipients in an AAI session, which is common in on-campus programs similar to the study by Ng et al. (2014) or in Kindergarten (Colussi et al. 2018) or in prison (Koda et al. 2015).

15.3.3 Attachment

An attachment refers to an intense, emotional relationship between two individuals. Previous studies have sought to attribute the dog–human relationship characteristics described for human caregiver–infant relationships. Thus, attachment has been associated also with the human–dog dyad and is characterized by behaviors including proximity seeking, exploration, and separation. Moreover, stressful experience may be buffered by the support of the human attachment figure (Payne et al. 2015). An experimental protocol to investigate attachment patterns explored whether aged dogs (7 years and older) reacted differently than adult dogs under 7 years. Attachment behaviors were similarly expressed between the groups, but the social challenge procedure led to an increase in salivary cortisol concentrations in older dogs

(Mongillo et al. 2013). These findings have important implications for dogs in AAIs as it appears that dogs are sensitive to separation from their handlers and that handler presence may help to attenuate a stressful event. Simultaneously, physiological correlates of separation distress are more prevalent in older dogs.

15.4 Future Directions and Summary

Similar to the limitations in research into how human can benefit from AAIs, the studies on dog welfare are characterized by small numbers of studied subjects, suitable control conditions and groups, and limited or lacking randomization. Moreover, as indicated by Glenk (2017), a researcher bias may exist if scientists are convinced of the positive effects of AAIs and may therefore be less willing to report unfavorable findings regarding therapy animals. Considering the emerging practice of dogs in therapeutic environments, standardized protocols for monitoring dog welfare in AAIs would be desirable. However, considering the large number of different types, therapeutic contents, and goals of AAIs, universal standardization of such protocols may not be feasible. More studies are needed that account for the heterogeneity in programs, patients, and dog characteristics. Factors that were described to have a modulating effect on the human–dog relationship (i.e., training methods, attachment) should be considered in future research on AAIs as it would be interesting whether these factors affect dogs' performance and perception.

In summary, as previously concluded by Glenk (2017), no acute manifestations of compromised dog welfare arose across the studies that would advise immediate prohibition or modification of AAI practices. Nevertheless, incidences of mild behavioral and physiological signs of stress warrant a closer inspection of the animal perspective of AAIs. Environmental factors such as temperature, familiarity of the surroundings and recipients, the presence of conspecifics, and the possibility to withdraw from unpleasant interactions can affect dog welfare and should therefore be carefully monitored. Considering these factors in combination with rigorous methodology will be valuable to researchers conducting both qualitative and quantitative studies on dog welfare in AAIs in the future.

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