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Survey on the use, housing, training, and management of horses in animal-assisted interventions and on owners' attitudes

Master thesis

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1 Introduction

Equine-assisted interventions (EAI), i.e. animal-assisted interventions (AAI) involving horses as animals, are on the rise. AAI are defined as "goal oriented and structured interventions that intentionally include or incorporate animals in health, education and human service (e.g. social work) for the purpose of therapeutic gains in humans" (IAHAIO, 2014).

EAI encompass a wide range of different fields: for instance hippotherapy, medically prescribed and carried out by physiotherapists; remedial education and therapeutic support with the horse offered by special or remedial education teachers, psychotherapists, social workers a.o; occupational therapy with the horse; or riding offered as sport for humans with physical and/or mental disabilities (DKThR – Deutsches Kuratorium für Therapeutisches Reiten, 2018; OKTR – Österreichisches Kuratorium für Therapeutisches Reiten, 2018). Besides the physical component, it can result in psychological, emotional, or social benefits for the client. Clearly, for therapeutic riding to benefit humans, it must occur in a setting that does not cause any stress or frustration for the horses (Kaiser et al., 2006). If AAI and therapy settings are carried out in a proper way, they can improve patient's mental, social, emotional and physical functions. Furthermore, animal assisted therapy provides incentives and opportunities for participation in physical exercise and at the same time it can reduce anxiety and depression (Koukourikos et al., 2019; Morrison, 2007).

There is still much ongoing research in the field of AAI with focus on the health benefits for human clients. A horse as therapeutic companion can help to establish and increase self-esteem and to show new ways of communication and can support clients without judging them in any way (Schultz et al., 2007). Especially with depressive or schizophrenic people, EAI were shown to help patients to cope with their anxieties and improve their mental health balance (Jansen, 2014). Several studies (Drnach et al., 2010; Homnick et al. 2013) help to demonstrate the huge benefits of human-horse relationships in a purpose-built environment, guided, led and supported by professionals for AAI.

While the efficiency of the use of horses in therapeutic settings has often been investigated in regard of the therapeutic impact on the human clients (Jansen, 2014 Schultz et al., 2007), there has been only little research on the impact that these forms of interventions have on the animals. Few studies addressed the mental and physical states of horses used in therapeutic settings (Fazio, 2013; Kaiser et al., 2006; McKinney, 2015). Factors that influence the mental and physical states of horses and thus have a crucial impact on animal welfare, are husbandry, training,

and management practices, which are also influenced by the relationship of humans to their animals (Hemsworth et al., 2015).

In order to ensure the welfare of the animals involved in AAI, several guidelines concerning animal care, use, training, and husbandry were established and their requirements have to be fulfilled by the members performing under several leading organisations like the Austrian ÖDOT (Österreichische Dachorganisation für Tiergestützte Interventionen), the PT-CH (Pferdegestützte Therapie Schweiz) in Switzerland, the Bundesverband für therapeutisches Reiten und tiergestützte Therapien in Germany, or the US organisation PATH Intl. (Professional Association of Therapeutic Horsemanship International).

According to the guidelines for EAI by the Austrian ÖDOT, use, husbandry, and handling are the three main factors that affect the wellbeing of a horse. Regarding handling, they define human-animal relationship, training, and caregiving as the most crucial points (ÖDOT, 2016). All institutions that want to be certified by the ÖDOT have to meet the requirements regarding husbandry and needs of all horses kept by them. Concerning the use of horses, there are certain limits for a maximum work amount per day for the horses, e.g. for the frequency of therapy sessions.

The often limited exercise and training in leisure horses, as well as the lack of free exercise at pastures these days, compromise the horses' welfare (McGreevy et al., 1995; Redbo et al., 1998). Nevertheless, a permanent overstrain and too few recreations may contribute to the occurrence of injuries in horses (Murray et al., 2010). As well as sports horses during competitions (Bartolomé, 2016), horses working in the therapeutic field might also be confronted with several health challenges or exceptional environmental stimuli that can cause stress to the animals. Typical health issues in horses used in sports and leisure activities are tensions in the neck and back muscles, lameness in the feet, stifle trauma, foot soreness or problems with tendons and joints (Dyson, 2000; Lesté-Lasserre, 2014).

Two studies, done by Fazio et al. (2013) and McKinney et al. (2015), investigated the level of stress in horses in EAI. McKinney et al. (2015) compared a handicapped riders' group with a traditional riding program of a recreational riders' group, consisting of healthy children. Whereas the healthy riders group had previous experience in horseback riding, the children with mental and/or physical challenges were on the horseback for the first time. The same horses showed the same salivary cortisol levels after therapeutic sessions as after riding sessions with healthy recreational riders (McKinney et al., 2015). Thus the therapeutic riding sessions did not lead to higher stress levels and challenges for the horses and even little or no experience in riding does not cause more stress to the horses (McKinney et al., 2015).

The training methods used for horses play an important role in the relationship between humans and horses (DeAraugo et al., 2014). Horses trained by using negative reinforcement rapidly showed higher arousal as well as more negative emotional states (Sankey et al., 2010a), whereas positive reinforcement did not only result in enhanced learning and memorization of a task but led also to a greater interest in humans and more contact-seeking after training (Sankey et al., 2010a, 2010b).

In an internet survey among a convenience sample of UK leisure horse owners it was found that horse behaviour was associated not only with the experiences a horse made during its life-time but also on the current handling and attitude of the handler and rider (Hockenhull, 2014). It should be considered that the competency of the owner or handler strongly influences whether they correctly recognize problems when they arise, or if they are able to choose the best and most suitable training method. This study also showed that a better relationship between horse and caretaker may also increase the effectiveness of communication between them, with the caretakers adapting their handling procedure to suit the horse and being able to identify signs of discomfort earlier (Hockenhull, 2014). In general, it has been confirmed for different species of animals including horses that the way people treat animals has a strong link to their personal beliefs and attitudes towards the animals (Hemsworth et al. 2015). To our knowledge, only two studies (a Master's and a PhD thesis) investigated owner attitudes towards their recreational horses in relation to horse welfare (Pearson, 2003; Hemsworth, 2012). They revealed that the attitudes of owners do have an impact on their horses' welfare. Pearson's work (2003) involved observation of the animal's external appearance, behaviour and environment, and was based largely on the Five Freedoms Approach. Increased severity of welfare problems was associated with the belief that horses were difficult to care for. If horse owners regarded their horses as pets, as opposed to e.g. riding them in competitions, the welfare and condition of the horses tended to be poorer, which was associated with less time, interest, knowledge and effort concerning the special requirements of horse husbandry (Pearson, 2003). Hemsworth (2012) assessed the health of the participants' horses (e.g. body condition scores, eye and coat conditions), housing conditions and management practices (e.g. pasture quantity and quality, stable condition, regularity of vet treatments or wound/injury scores) as well as attitudes like beliefs about horse husbandry and welfare management practices of the horse owners. Horse welfare outcomes were shown to be associated with both horse husbandry and management behaviours of owners, which could be in turn predicted by owner attitudes. Attitudes towards horses involved in AAI have not been assessed so far, which constitutes a knowledge gap.

1.1 Aim of the study and hypotheses

As up to now very little literature is published on the husbandry, handling, training and management conditions of horses involved in AAI, one aim of this master thesis is to enlarge the knowledge regarding the current implementation-status of requirements that should be met by institutions providing AAI. Therefore, a questionnaire study was designed to get a comprehensive overview of diverse practices applied in EAI, such as selection criteria for horses, use and training, housing and management conditions of horses in different areas of AAI. The study also aimed to provide an insight into current health and behavioural problems that might occur in such horses. A further focus was placed on education and experience regarding horse management and the attitudes of the surveyed person, who should be the main decision maker concerning the general management of the horses. Further aims were to investigate potential influencing factors (such as housing and training conditions, work load, frequency of outdoor activities, owner attitude) on the occurrence of certain health and behavioural problems.

Our expectations regarding the potential influencing factors that could affect health and behaviour of the horses within the institutions are expressed in the following statements and hypothesis:

We expected that a lower **work load** (e.g., fewer therapy sessions per day and week, a lower number of different clients per day, longer holidays, a shorter duration of AAI therapy sessions) would be reflected in less health problems (like tensions in the neck and back area, back problems, problems of the locomotor system) and less behavioural problems (like biting or kicking the trainer/therapist).

We also expected that more favourable **caretaker attitudes** towards horses would be associated with better physical health (e.g. fewer digestive and locomotor system problems) as well as less behavioural problems (e.g., no biting, no or little anxious behaviour occurring during training sessions or during the therapy units).

Furthermore, one potential influencing factor could be the **housing and management conditions** of the horses; if horses are granted more ***outdoor access*** (more time on pasture and/or paddock in days per week), this might result in less health problems (fewer digestive, locomotor system or respiratory problems) and fewer behavioural problems (like headshaking or weaving). Additionally, we expected that ***more time for social contact to conspecifics*** (in hours per day) as well as ***more time spent personally with the horses*** besides the therapy units would be reflected in less aggressive (biting and kicking) and anxious behaviour towards conspecifics and humans, respectively.

We also assumed that the current ***training conditions*** (e.g. aversive training methods like verbal or physical punishment, locking the horse into the box) could be associated with the occurrence of certain behavioural problems, like more anxious behaviour taking place during training sessions or therapy units.

We also assumed that the ***frequency of non-working activities*** (activities beyond therapy sessions, such as grooming, grazing on hand, walking, equestrian sports, lunging, swimming or trail riding) would be reflected in lower numbers of health (less digestive and locomotor problems or tensions in the neck and back area) as well as less behavioural problems (like head-shaking, weaving or biting).

2 Material and methods

Before the online questionnaire was released, all procedures were approved by the ethical review committee of the Medical University of Vienna. Furthermore, the respondents of the questionnaire were informed that their given data is processed anonymously and that it is possible for them to stop answering the questionnaire at any point without consequences.

2.1 Online survey and recruitment of participants

The target group of respondents for this study were institutions offering and performing any kind of AAI with horses amongst the German-speaking area. Therefore, e-mail addresses of institutions all over Austria, Germany and Switzerland were searched via the internet. The e-mail addresses were either gathered with the search engines "Google" and "Bing", on different therapeutical-, medical-, veterinary-, pedagogical- or horse-focused websites, directly from the homepages of the different institutions or homepages of certain associations or holding organisations like the ÖKL (Österreichisches Kuratorium für Landtechnik und Landentwicklung). Some organisations, for example the DKThR or the PT-CH were contacted directly in order to get links to websites listing their institutional cooperation partners. To invite participants, the link to the questionnaire was sent via a separate gmail-account to 811 e-mail addresses (Austria: 175, Germany: 571 and Switzerland: 65). In 28 cases, delivery- and mail-server failures were reported (Austria: 7, Germany: 19, Switzerland: 2) resulting in 783 successfully delivered e-mails. This contact e-mail contained a short description of the study and its aim, followed by a weblink leading to the online questionnaire. The questionnaire survey was initially made available in the beginning of May 2019 and then accessible online until the beginning of September 2019 (18 weeks in total). E-mails were sent out two times to all previously gathered e-mail addresses. The first initial e-mail was sent at the beginning of May and then a second time at the end of August, in form of a reminder e-mail to all the addresses.

Participation in the study was voluntary and the identity of all participants was anonymised. There were no special inclusion criteria, but one major criterion was that the questionnaire should be filled in by the person who is mainly in charge of the husbandry, training and management decisions in the contacted institution.

2.2 Questionnaire

After examining the current literature and research about therapy work and interventions with horses, several main question areas were developed for the questionnaire. The online questionnaire was programmed with the online survey tool SurveyMonkey®. The questionnaire comprised single and multiple-choice options, questions with Likert scales, or open questions where answers could be freely filled in the form. The questionnaire consisted of 69 main questions in total and was structured into the following sections:

- General information about the study and informed consent
- Part 1) Information on institution, management and horses:

  This part comprised questions like in which area the respondents provide AAI and in which country their institution is located. Furthermore, there were questions on certain certifications of the institutions. It was also asked how many horses are kept at the institution, the age and sex of them. The respondents were also asked after which criteria horses are chosen for AAI and if there was a minimum age for the horses used in AAI.
- Part 2) Use of the horses for interventions and human-animal interactions

  This part included questions such as for which types of therapy fields and interventions the horses are used and questions targeting the work load (e.g. number of days per week the horses are used on average and at a maximum, how many sessions a horse has to do per day on average and maximum, duration in hours of one session as well as the longest, shortest and average session per client for one therapy horse, how many different clients a therapy horse has to work with on a normal AAI day). The second part also contained questions on breaks and holidays in weeks during one year. Another point which had been examined within the questionnaire were the human-animal interactions and activities taking place besides the AAI sessions in each institution (e.g. lunging, riding out, groundwork, western riding, circus tricks, cavaletti, swimming, taking a walk, massaging the horse). In addition, physical and mental strains for the horses had to be rated by the respondents on a Likert-scale.
- Part 3) Training and education of the horses

  In this section there were questions on how many persons are regularly in charge of caretaking and training of the horses used in AAI and how long the education of the therapy horses lasted in years. Respondents were also asked about training methods used for the basic training/the instruction of TGI-horses as well as during current training (e.g. clicker

training, shaping or natural horsemanship, rewards used during training sessions, as well as punishment measures). There were also questions on the qualifications of the persons who work regularly with the horses in therapy sessions.

- Part 4) Health and behaviour of the horses

  In this part there were questions on potential health problems (e.g., number of AAI-horses in the past year with tensions in neck and back area, problems of the locomotor system, respiratory or digestive tract diseases), as well as the frequency of veterinary checks and blacksmith controls. Furthermore, respondents were asked about behavioural problems of the horses within the past year (e.g., number of horses showing headshaking, wind sucking, weaving, biting or kicking against others, as well as anxious behaviour in different situations).

- Part 5) Husbandry conditions

  This part comprised questions on the husbandry system (e.g. group or single housing with or without paddock or pasture), on how many days the horses are granted outdoor access in summer and in winter time, for how many hours horses have access to certain enrichment features (e.g. brushes, clay court, horse shower), and how many hours they can have unhindered social contact with conspecifics.

- Part 6) Attitudes (of the person who mainly takes the decisions regarding husbandry, training, and management)

  This part comprised questions targeting general attitudes towards horses, i.e., beliefs about characteristics of horses, (e.g. horses are friendly, stubborn or dangerous animals) or their handling (e.g. if they are difficult to train or to load/transport) (questions modified after Hemsworth, 2012). In addition, questions targeting affective attitudes of respondents were included (e.g. how much the respondents enjoy certain activities or work routines together with the horses). Respondents were also asked to rate the importance of fulfilling needs of horses by providing the respective environment, i.e.behavioural beliefs, (e.g. how important is it to provide a shelter for protection against sun or rain or a daily access to pasture is for them or that horses are kept in social groups together with conspecifics) (questions modified after Hemsworth, 2012).

- Part 7) Demographic data of the respondents

  This part covered questions on gender, age, highest educational degree or the current position of the respondent within the institution (e.g. the owner of the institution, therapist or main caretaker of the horses). At the end, there were questions on the experience in years

the respondents have already gained with horses in general and with focus on the field of AAI.

2.3 Data analysis

The collected data was exported from surveymonkey.com into the statistical software package IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, N.Y., USA) for further analysis. Analyses were conducted at institution level, using the number of AAI horses with a certain health or behaviour problem in relation to the total number of AAI horses on the holding given in percentage. Descriptive data, intended to give an overview on current practice in EAI, was presented in graphs and tables. In case of box plots, the bold line in the boxes represents the median, the lower and upper line of the grey box to the first and third quartile. The whiskers represent the lowest and highest values that are still within a range of 1.5 ×interquartile range. Circles mark outliers (all values between 1.5 ×interquartile range and 3 ×interquartile range), and an asterisk marks extreme values (outside of a range of 3 ×interquartile range).

Principal component analyses (PCA) with Varimax rotation were calculated to reduce and summarize items related to caretakers' general and affective attitudes, rated importance of certain provisions (behavioural beliefs about horse husbandry) and items related to human-animal interactions. For all four PCAs the Kaiser–Meyer–Olkin criterion had to reach at least 0.5 and the Bartlett's test of sphericity was required to be significant ($p < 0.05$). The components (subscales) were required to have an Eigenvalue above 1.0. Moreover, visual interpretation of scree plots was used to determine the number of relevant components. Items were included in a component, if they had a loading exceeding (> 0.4) and did not load on any other component. In addition, if the largest loading on a component exceeded 0.6 and there was a loading of less than 0.4 on any of the other components, then that item was also included. Items that did not fulfil these conditions were dropped from further analyses. Component scores were obtained by calculating the mean of the items included in the respective factor.

Linear and logistic regression models were calculated to investigate potential influencing factors (such as housing and training conditions, work load, frequency of outdoor activities, owner attitude) on the occurrence of certain health and behavioural problems (percentage of AAI horses with respective problems). In case problems occurred very rarely (no occurrence in more than 83%), no models were calculated. For instance, regarding behavioural problems, only for biting the trainer/therapist a model was calculated. For preselection of independent variables, bivariate association was tested by Spearman rank correlations (in case of ordinal or metric scales), Kruskal-Wallis and Mann-Whitney U tests. The criterion for inclusion of independent

variables in the null models of regression analysis always was for each criterion to show a $p < 0.15$ in the preselection. To avoid multicollinearity, no variables with $r_s > |0.7|$ were included in the same model. This was only the case for the frequency of access to the paddock in summer or winter. Tab. *1* provides an overview on the dependent and according independent variables, which were included in the models. For the dependent variables *percentage of horses with problems of the locomotor system, percentage of horses with digestive tract diseases, percentage of horses with tensions in neck and back area, percentage of horses with respiratory tract diseases, and percentage of horses with no health problems* linear regression models were calculated. Model assumptions (normal distribution of residuals and homogeneity of variance) were checked graphically. Multicollinearity was tested for by variance inflation factor (VIF-value < 4.0). If assumptions were not fulfilled, dependent variables were transformed (logarithm with base 10). This concerned the *percentage of horses with problems of the locomotor system*, *the percentage of horses with respiratory diseases and the percentage of horses with digestive tract diseases*.

Logistic regression models were calculated to assess potential predictors for the *occurrence of skin problems,* the *occurrence of other back problems (apart from tensions and problems of the locomotor system),* and the *occurrence of biting the trainer/therapist* because model assumptions for linear regressions were violated and model assumptions were not fulfilled even after transformation. For significance levels, results with $p \leq 0.05$ are referred to as statistically significant, and $p \leq 0.1$ are interpreted as a trend.

Tab. 1 Overview on dependent variables (in percent or occurrence) and independent variables (in frequency of access, numbers or duration) used for calculation of the linear and ordinal regression models.

Dependent variables	**Included independent variables**
% of horses with no health problems	- general negative attitude - affective attitude positive contact apart from work - behavioural belief importance providing contact to conspecifics - behavioural belief importance of personal care - average number of clients per horse/day
% of horses with problems of locomotor system	- average number of holiday weeks/year - average duration of a single AAI-session per client (in minutes) - frequency access to other scratching units apart from scratching brushes - frequency access to clay court for wallowing
% of horses with digestive tract diseases	- number of days per week access to pasture in summer - frequency access to clay court for wallowing
% of horses with tensions in neck and back area	- general negative attitude - frequency hand leaded activities - frequency cross country activities - number of days per week access to paddock in summer - average number of clients per horse/day
% of horses with respiratory tract diseases	- general negative attitude - general attitude horses are demanding - affective attitude positive contact apart from work - frequency hand leaded activities - frequency cross country activities - number of days per week access to pasture in summer - average number of holiday weeks/year
occurrence of skin problems	- number of hours/day respondents spend personally together with the horses - number of days per week access to pasture in summer - frequency access to other scratching units apart from brushes? - frequency access to horse shower - frequency access to horse solarium
% of horses with other back problems	- affective attitude positive contact apart from work - number of days per week access to paddock in summer - average number of holiday weeks/year - frequency access to horse solarium
occurrence of biting of trainer/therapist	- general negative attitude - affective attitude personal positive contact apart from work - affective attitude negative interactions - average duration of a single AAI-session per client - current training food used as reward

3 Results

3.1 Response rate

In total, 136 participants completed the whole questionnaire or at least parts of it. Three of them were excluded because these respondents had stopped answering the questionnaire after only a few questions (between question number 3 and 7). Thus, 133 responses were considered in the analysis, which would constitute a response rate of 17 % considering the 783 e-mail addresses contacted directly.

3.2 Respondents

The great majority of the respondents was female (94.4% out of n=133), whereas only 5.6 % of them were male. Nearly half of them possessed a university degree (46.8%), followed by 26.6% who stated to have graduated from a professional school. Regarding the position within the institution, the majority were therapists (82.0%) and/or the main responsible person for the horses (55.6%), followed by the position of an instructor (51.9%) (Tab.2).

Tab. 2 Position(s) the participants hold within the institution (n=133). Multiple selection was possible.

position	frequency	%
owner of the institution	68	51.1
head of the institution	66	49.6
main caretaker of the horses	68	51.1
main caretaker of some of the horses	13	9.8
main trainer of the horses	64	48.1
main trainer of some of the horses	16	12.0
main responsible person for the horses	74	55.6
main responsible person for some of the horses	12	9.0
instructor	69	51.9
therapist	109	82.0

Most of the participants worked at an institution located in Germany (56.8% out of n=133). The others were located in Austria (24.2%) and Switzerland (18.9%).

More than 42% (51 out of n=121 in total) stated to have contact with horses since more than 40 years. 34.7% (42) of the respondents had regular contact to horses for more than 30 years, 16.5% (20) for more than 20 years and 6.6% (8) responded to have had less than 20 years of contact. Concerning the years of experience with training of horses, 32.2% (39 out of n=121) answered to have less than 20 years of experience. 29.8% (36) stated to have between 20 to 30 years of experience, followed by 26.4% (32) between 31 and 40 years and 11.6 % (14) with

less than 50, but more than 40 years of experience in the training of horses. Regarding the question, if the participants also ride themselves, the great majority (97.6% out of 123) answered with “yes”, whereas only three (2.4%) responded with “no”.

3.2.1 Experiences with working in AAI

When asked about for how long respondents already have been working with horses in the field of AAI, most of them, 48.3% (57 out of 118 in total) answered to have less than 20 years of experience in this certain field. Another 28.8% (34) stated to have between 20 and 30 years of experience of working with horses in AAI. 21.2% (25) answered with 30-40 years and only 1.7% (2) of respondents already have been working for more than 40 years in this certain field.

3.3 Current practice in Equine Assisted Interventions (EAI)

3.3.1 Information on the institutions and their management

32.8% of the respondents (43 out of n= 131) answered to work as a provider of AAI within an institution offering mainly AAI, 24.1% (32) stated that the horses used for AAI were stabled in an institution which did not primarily offer AAI, 8.3% (11) answered to work in a cooperation with colleagues and to have a joint use of horses, and 17.6% (23) stated to offer AAI in an agricultural facility with focus on AAI (multiple responses were possible).

Concerning the question, if the institutions participating in the study, were members in an association for AAI (e.g. ÖKTR in Austria), a great majority of 90.2 % (120 out of 133) answered with “yes”, whereas only 9.8% (13) responded with “no”. Furthermore, 63.8% (81) out of 127 participants stated that their institution was not certified by an association (e.g. by ÖKL in Austria), 36.2% (46) answered this question with “yes”, which means that 36.2% were certified by a holding organisation.

Concerning the types of AAI which the respondents reported to the horses are used in their institution, remedial therapeutic riding was mentioned most often with 61.7% (82) out of the 133 respondents, followed by 52.6% (70) where institutions used them in horse supported pedagogy. Only 5.3% (7) reported to do horse supported logopedics (Tab.3).

Regarding the qualification of the people who regularly carry out the therapy units with the AAI-horses, 68.8% (86 out of 133) of the study respondents stated that “all” of the people in their institution had obtained a specific education, whereas only 5.6% (7) answered that “none” of the persons possessed a certain degree (Tab. 4). The great majority of 66.9%, (89 out of

n=133) had a certain education in AAI, followed by an education as riding teacher 35.3% (47) and exercise instructor 30.8% (41), (Tab. 4).

Tab. 3 Type(s) of AAI in which the horses are used in the participants' institutions, in percent of responses and frequency thereof (n=133). Multiple selection was possible.

type of AAI	frequency	%
remedial therapeutic riding	82	61.7
horse supported pedagogy	70	52.6
remedial therapeutic vaulting	59	44.4
integrative riding	57	42.9
hippotherapy/physiotherapy	46	34.6
horse supported psychotherapy	41	30.8
horse supported social work	33	24.8
horse supported ergotherapy	17	12.8
horse supported logopedics	7	5.3

Tab. 4 Education of persons conducting the therapy sessions with the horses in percent of responses and frequency thereof (n=133). Multiple selection was possible for the type of qualification.

education and qualification	frequency	%
persons with specific education in handling of horses		
None	7	5.6
Some	32	25.6
All	86	68.8
type of qualification		
education for AAI	89	66.9
riding teacher	47	35.3
exercise instructor	41	30.8
vaulting teacher	28	21.1
fully qualified groom	21	15.8
horse groom	12	9.0
professional rider	9	6.8
animal trainer	9	6.8
animal keeper	6	4.5
BSc in Equine Sciences	3	2.3

Tab. 5 provides a detailed overview on the different management settings of the institutions. For instance, the number of horses kept at the institutions ranged from a minimum of one to a maximum of 70 horses (n=131). On average six horses per institution were reported to be used for AAI. The youngest reported age of horses used within AAI was one year (n=127), the oldest

reported age was 36 years (n=133). Furthermore, a number of around three (3.3) people is regularly caring for the horses and also around three (2.86) persons are regularly concerned with the training of the horses within the institution (Tab. 5).

Furthermore, the regularity of farrier checks and veterinary controls within the institutions were enquired. The average interval between farrier checks was two months, with a range of a minimum of 0.5 up to a maximum of 12 months (mean ± SD, 25%, median, 75% : 2.17 ± 1.40, 2, 2, 2, n=121). The average interval between veterinary care checks was around 6 months, with a range of 0.5 up to 19 months (mean ± SD, 25%, median, 75% : 6.19 ± 4.58, 2, 6, 12, n=108).

Tab. 5 Overview on the number of horses, their age, horses' average duration of education, the number of persons who are responsible for the horses and conduct the training (SD: standard deviation, min: minimum, 25%: lower quartile, med: median, 75%: upper quartile, max: maximum).

management settings	mean	SD	min	25%	med	75%	max	n
number of horses within the institution	13.63	13.04	1	5.00	8.00	18.00	70	131
number of horses used for AAI within the institution	5.75	4.41	1	3.00	5.00	7.00	28	133
age of the oldest horse currently used in AAI (in years)	21.85	5.87	9.00	18.00	22.00	26.00	36.00	133
age of the youngest horse currently used in AAI (in years)	9.57	3.94	1.00	7.00	9.00	11.00	25.00	127
average duration of the TGI horses' education in years	2.05	1.57	0.00	1.00	2.00	3.00	9.00	118
number of persons who regularly care for the horses	3.31	2.38	1	2.00	3.00	4.00	15	126
number of persons who regularly train the horses	2.86	1.36	1	2.00	3.00	3.00	9	127
number of persons who regularly do the educational training of the horses (to become horses for AAI)	1.86	1.36	0	1.00	2.00	2.00	8	127

Regarding the selection of horses, the most frequently reported factors for the selection of a horse for therapy work were social tolerance with others, the body size, as well as the health status of the horse (Tab. 6). Concerning the question, if there was a minimum age for the horses used in AAI, 48.8% (63 out of 129) participants answered with "no", while 51.2% (66) of them answered with "yes".

Tab. 6 Characteristics after which horses are chosen for AAI (n=133). Multiple selection was possible.

selection criteria	frequency	%
social tolerance with humans	128	96.2
size	113	85.0
health status	112	84.2
body structure	105	78.9
social tolerance with conspecifics	92	69.2
educational level	84	63.2
age	73	54.9
other character traits	51	38.3
breed	36	27.1
sex	26	19.5
appearance	24	18.0
weight	10	7.5

3.3.2 Housing of AAI horses

Respondents were also asked about the housing conditions of the horses within their institutions. The most frequently chosen housing type was group housing on pasture with shelter, selected by 38.3% (51 out of n=133) of respondents in the multiple choice question, followed by 33.1% use of group housing in multi-room-outdoor pens with an outdoor run (44). Only 6% (8) selected to keep the horses individually in indoor boxes without any opening outwards (Tab. 7).

Tab. 7 Overview regarding the housing types of the horses in the institutions (n=133). Multiple selection was possible.

housing type	frequency	%
individual housing in indoor boxes (no opening outwards)	8	6.0
individual housing in outdoor boxes (with opening outwards)	18	13.5
individual housing in boxes with at least during daytime permanently accessible paddock	26	19.5
group housing in single-room-outdoor pen with outdoor run	26	19.8
group housing in multi-room-outdoor pen with outdoor run	44	33.1
group housing on pasture with shelter	51	38.3

As presented in Tab. 8, the respondents indicated that horses were granted on average 6.5 days per week access to pasture in summer, and 3.5 days per week in winter. Moreover, respondents stated that their horses could have on average 19 hours per day unhindered social contact with conspecifics (e.g. while in the outdoor area, group housing) (
Tab. 8).

Tab. 9 gives a detailed overview on different equipment available within the institution and at which time periods it is accessible for the horses. For example, a clay court and other scratching units were reported to be permanently accessible for the horses in 74.4% and 71.8% (out of 129 in total) respectively, whereas a horse shower was permanently accessible in only 6.5% (Tab. 9).

Tab. 8 Overview on number of days per week horses are granted access to pasture or paddock in summer and winter and number of hours of social contact with conspecifics per day (SD: standard deviation, min: minimum, 25%: lower quartile, med: median, 75%: upper quartile, max: maximum).

access to pasture, paddock, conspecifics	**mean**	**SD**	**min**	**25%**	**med**	**75%**	**max**	**n**
days/week with access to pasture in summer	6.49	1.52	0.00	7.00	7.00	7.00	7.00	123
days/week with access to pasture in winter	3.45	3.18	0.00	0.00	3.00	7.00	7.00	112
days/week with access to paddock in winter	6.41	1.88	0.00	7.00	7.00	7.00	7.00	113
days/week with access to paddock in summer	6.17	2.21	0.00	7.00	7.00	7.00	7.00	112
average hours/day of unhindered social contact with conspecifics	19.08	6.99	3.00	12.00	24.00	24.00	24.00	115

Tab. 9 Frequency of horses' access to different equipment, in percentage of responses and total frequency thereof (in brackets).

	frequency of access								
equipment	never	< 1x/ month	once/ month	several times/ month	1x/week	several times/ week	1x/day	several times/ day	permanently
clay court for wallowing (n=121)	1.65 (2)	0.00 (0)	0.00 (0)	0.83 (1)	0.83 (1)	4.96 (6)	9.09 (11)	8.26 (10)	74.38 (90)
scratching brushes (n=110)	49.09 (54)	0.00 (0)	0.00 (0)	0.91 (1)	0.00 (0)	0.00 (0)	2.73 (3)	1.82 (2)	45.45 (50)
other scratching units (n=114)	10.53 (12)	0.88 (1)	0.88 (1)	0.88 (1)	0.00 (0)	0.88 (1)	5.26 (6)	7.89 (9)	72.81 (83)
horse shower (n=108)	30.56 (33)	6.48 (7)	6.48 (7)	14.81 (16)	5.56 (6)	24.07 (26)	5.56 (6)	0.00 (0)	6.48 (7)
horse solarium (n=111)	84.68 (94)	1.80 (2)	1.80 (2)	1.80 (2)	0.90 (1)	1.80 (2)	2.70 (3)	0.90 (1)	3.60 (4)

3.3.3 Work load of the horses

According to the respondents, the horses are used in AAI sessions rarely only on one or on seven consecutive days a week for AAI sessions (Tab. 10). The majority of the horses has AAI sessions on average on three (22.3%) to four (24.6%) days per week. Asked about the maximum

number of days per week with AAI sessions for the horses, the majority (33.8% out of 130) answered that it would be five days (Tab. 10).

Tab. 10 Average and maximum number of days per week on which the horses are used in AAI therapy sessions, in percent of responses and frequency thereof (in brackets) (n=130).

days per week	average number of days	maximum number of days
1	3.1 (4)	0.8 (1)
2	20.8 (27)	8.5 (11)
3	22.3 (29)	20.8 (27)
4	24.6 (32)	19.2 25)
5	19.2 (25)	33.8 (44)
6	8.5 (11)	13.8 (18)
7	1.5 (2)	3.1 (4)

The horses were reported to have on average one to four, and at maximum one to six AAI-sessions per day (Tab. 11). The average duration of a therapy session per client was reported to last from ten minutes up to 120 minutes (Tab. 11). The longest maximum duration is 121 minutes per client. The average number of clients per day for one horse is 2.6 ± 1.6 (mean ± SD) clients. The average number of holiday weeks for the horses was reported to be 7.1 ± 6.9 weeks (mean ± SD) and ranged from 0.5 up to 52 weeks per year (Tab. 11).

Tab. 11 Overview on different parameters concerning the work load in relation to AAI sessions, and average number of holiday weeks per year (SD: standard deviation, min: minimum, 25%: lower quartile, med: median, 75%: upper quartile, max: maximum).

AAI work load & holidays	mean	SD	min	25%	med	75%	max	n
average number of AAI-sessions/ day	2	1	1	1	2	2	4	129
maximum number of AAI- sessions/day	2.72	1	1	2	3	3	6	129
shortest duration of a single AAI-session per client (in minutes)	31	14	9	20	30	30	90	128
longest duration of a single AAI-session per client (in minutes)	72	27	15	50	60	90	121	129
average duration of a single AAI-session per client (in minutes)	49	18	10	40	45	60	120	122
average number of clients/day/horse	2.56	1.60	1.00	1.00	2.00	3.00	10.00	126
average number of holiday weeks	7.11	6.85	0.50	3.00	6.00	8.00	52.00	120

3.3.4 Human-animal interactions including training conditions for the horses

The number of hours per day which the respondents spend personally together with the horses range from a minimum of half an hour to a maximum of 14 hours per day (mean ± SD, 25%, median, 75%: 4.4 ± 2.2, 3.0, 4.0, 6.0).

Tab. 12 provides an overview on different activities that are done together with the horses, besides the AAI sessions, like grazing, grooming, riding out, massaging the horse or cavaletti work. Activities that were reported to take place mostly daily were grooming or riding out (daily in 74.2%, or 45.9%). In contrast, western riding or showjumping nearly never took place (81.3%, or 64.5%). Also the horse walker was never used in 97.2 % of the responses (Tab. 12).

Tab. 12 Different activities with the horses at the institutions beyond AAI units, in percent of responses and frequency thereof (in brackets).

activities beyond AAI	never	1x/ month	several times per month	once per week	several times per week	once per day	permanent access
lunging (n=122)	5.7 (7)	7.4 (9)	6.6 (8)	22.1 (27)	34.4 (42)	23.0 (28)	0.8 (1)
taking a walk (n=116)	6.9 (8)	7.8 (9)	6.9 (8)	25.9 (30)	17.2 (20)	35.3 (41)	0.0 (0)
grazing on hand (n=103)	32.0 (33)	12.6 (13)	6.8 (7)	15.5 (16)	4.9 (5)	27.2 (28)	1.0 (1)
riding out (n=122)	3.3 (4)	1.6 (2)	6.6 (8)	18.9 (23)	23.8 (29)	45.9 (56)	0.0 (0)
grooming (n=120)	0.0 (0)	0.0 (0)	0.0 (0)	1.7 (2)	2.5 (3)	74.2 (89)	21.7 (26)
trail riding (n=108)	60.2 (65)	35.2 (38)	1.9 (2)	1.9 (2)	0.0 (0)	0.9 (1)	0.0 (0)
dressage riding (n=119)	12.6 (15)	5.0 (6)	3.4 (4)	18.5 (22)	21.8 (26)	38.7 (46)	0.0 (0)
showjumping (n=110)	64.5 (71)	7.3 (8)	11.8 (13)	8.2 (9)	6.4 (7)	1.8 (2)	0.0 (0)
western riding (n=107)	81.3 (87)	1.9 (2)	2.8 (3)	1.9 (2)	1.9 (2)	10.3 (11)	0.0 (0)
groundwork (n=120)	1.7 (2)	3.3 (4)	5.0 (6)	36.7 (44)	19.2 (23)	33.3 (40)	0.8 (1)
cavaletti (n=116)	4.3 (5)	8.6 (10)	20.7 (24)	32.8 (38)	19.8 (23)	13.8 (16)	0.0 (0)
circus tricks (n=111)	31.5 (35)	21.6 (24)	14.4 (16)	19.8 (22)	7.2 (8)	5.4 (6)	0.0 (0)
swimming (n=106)	85.8 (91)	10.4 (11)	0.0 (0)	1.9 (2)	0.0 (0)	1.9 (2)	0.0 (0)
massaging the horse (n=117)	17.9 (21)	20.5 (24)	11.1 (13)	23.9 (28)	10.3 (12)	15.4 (18)	0.9 (1)
horse walker (n=108)	97.2 (105)	0.0 (0)	0.0 (0)	0.0 (0)	0.9 (1)	1.9 (2)	0.0 (0)

PCA and Varimax rotation revealed three components (for scree plot see Appendix, Fig. 3. These three components accounted for 42.68% of the variance. Bartlett's test of sphericity was

significant (Chi^2 = 175.21, p<0.001) and the Kaiser-Meyer-Olkin (KMO) criterion was 0.59. For the rotated component matrix see Tab. 13.

Tab. 13 Varimax rotated component matrix of different activities with the horses at the institutions beyond AAI units. The PCA was based on the complete responses of n=82 respondents. Loadings below 0.3 are not shown in the matrix. Items included in the final component are bold.

	components		
HAI	work/activities on the hand/lead rope	equestrian sport disci-plines	cross-country riding & relax-ing activities
lunging		0.582	0.368
taking a walk	0.456	0.307	
grazing on hand	**0.601**		
riding out			**0.677**
grooming			**0.472**
trail riding			**0.616**
dressage riding		**0.653**	
showjumping		**0.639**	
western riding		**-0.523**	
groundwork	**0.788**		
cavaletti	0.478	0.541	
circus tricks	**0.607**		
swimming			**0.474**
massaging the horse	**0.710**		

Cronbach's alphas were 0.641 (N= 92), 0.529 (N= 105), and 0.338 (N= 99) for components 1, 2, and 3, respectively. Equestrian sports were performed most often, followed by work/activities on the hand/lead rope (1).

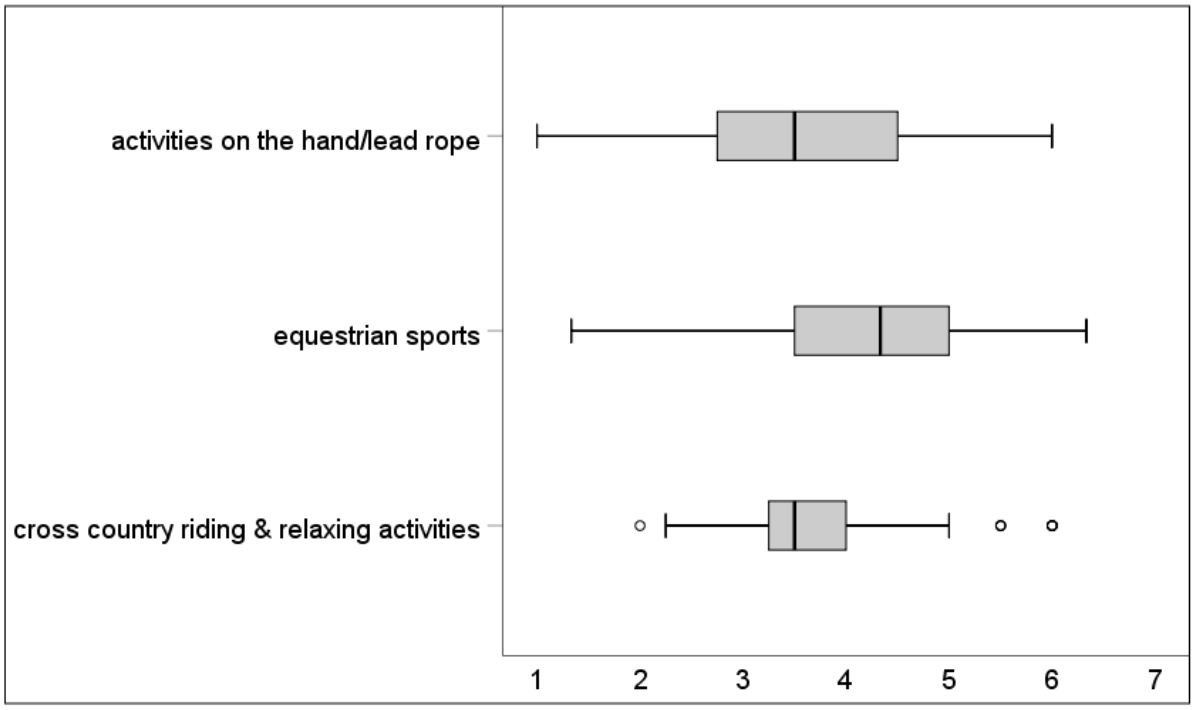

Fig. 1: Distribution of the frequency of human-animal interactions outside the therapy context (activities on hand:.n = 125, equestrian sports: n = 121, cross country: n = 124). Questionnaire items targeting the frequency of different types of interactions were summarized into three factors following a PCA. The numbers on the bottom line correspond to 1= 'never', 2= 'once a month', 3= 'several times per months', 4= 'once per week', 5= 'several times per week', 6= 'once per day', and 7= 'permanent access'.

Concerning the question, if the horses were trained by the participants themselves, 68.5% of the respondents (87 out of 127) answered with "yes", 29.1% (37) with "partly" and only 2.4% (3) stated "no", which means the horses were trained and educated mostly by the respondents themselves.

When answering the question about training methods and use of certain reward or punishment techniques during current training, the respondents stated that they mostly use 'verbal praise/ voice' 88% (117), followed by 'stroking, ruffling' 79.7% (106) to praise the horses during current training units. Only 5 out of 133 people stated to use 'no reward' (3.8%) and one stated that 'there is no current training' 0.8% (1) (Tab. 14). Concerning the use of punishment for behavioural corrections of the horses during current training sessions, 'dismissive body postures' are used by 89% (121) and 'verbal punishment/voice' by 56.4% (75) (Tab. 14).

Asked about the training methods used for the basic training/the instruction of TGI-horses used in the institutions, a great majority of them claimed to use the training method called "Skala der Ausbildung" 72.2% (96), followed by natural horsemanship training 60.9% (81) and join-up/roundpen training 26.3% (35) (Tab. 14).

Tab. 14 Use of different reward/punishment practices during current training of horses in AAI; training methods for the basic training/instruction of the TGI-horses used in respondents' institutions in percentages of responses (n=133) and frequency thereof (in brackets). Multiple selection was possible.

Reward/punishment practices	**%**
reward during current training	
verbal praise/ voice	88 (117)
stroking/ ruffling	79.7 (106)
feed	36.1 (48)
patting/ tapping	33.1 (44)
grazing	16.5 (22)
playing	15.0 (20)
clicker	9 (12)
no reward	3.8 (5)
there is no current training	0.8 (1)
punishment during current training	
dismissive body posture	89 (121)
verbal punishment /voice	56.4 (75)
physical punishment	45.1(60)
ignoring the behaviour	30.1 (40)
no punishment	6.1 (8)
locking into the horsebox	0 (0)
basic AAI training methods	
training method „Skala der Ausbildung"	72.2 (96)
natural horsemanship training	60.9(81)
join-up/roundpen training	26.3(35)
Parelli	18.8(25)
clicker training	12.0(16)
target training	2.3(3)
Shaping	1.5(2)
none of them	2.3(3)

3.4 Health and behaviour of horses in AAI

Tab. 15 provides an overview on the occurrence of certain health and behavioural problems of horses used in the institutions. The most frequent problems stated by the respondents were tensions in the neck and back area (mean percentage of AAI-horses ± S.D.: 21.24% ± 26.38%), followed by problems of the locomotor system (14.33% ± 20.52%) and skin problems (12.96% ± 19.76%). The most common behavioural problems were biting of the trainer/therapist (3.81% ± 10.16%) or anxious behaviour in different situations, whereas weaving and rearing in none

of the institutions occurred. Participants also stated that kicking against conspecifics (0.25% ± 1.26 %) or against clients (0.21 % ± 1.89 %) appeared very seldom in daily practice (Tab. 15).

Tab. 15 Overview on the percentages of health and behavioural problems of the AAI-horses.

health and behavioural problems	mean	SD	% none[1]	min	25%	median	75%	max	n
tensions in neck and back area	21.24	26.38	41.5	0	0	15.48	33.33	100	82
other back problems	7.53	16.95	75.3	0	0	0.00	0.00	75	73
problems of locomotor system	14.33	20.52	47.7	0	0	8.39	20.00	100	86
respiratory diseases	12.13	20.65	58.5	0	0	0.00	16.67	100	82
digestive tract diseases	9.83	16.78	60.3	0	0	0.00	15.38	100	78
skin problems	12.96	19.76	56.3	0	0	0.00	20.00	100	87
other health problems	7.95	15.76	70.8	0	0	0.00	11.25	67	48
% no health problems	41.47	40.23	40.0	0	0	33.33	80.00	100	90
headshaking	1.28	6.69	94.9	0	0	0.00	0.00	50	78
wind sucking	0.95	3.86	93.9	0	0	0.00	0.00	20	82
weaving	0.00	0.00	100	0	0	0.00	0	0.00	78
frequent biting of conspecifics in stable	0.50	3.24	97.4	0	0	0.00	0	25.00	78
frequent biting of conspecifics on pasture	0.81	3.61	93.5	0	0	0.00	0	25.00	77
biting of trainer/therapist	3.81	10.16	82.7	0	0	0.00	0	50.00	81
biting of client	1.18	4.99	93.7	0	0	0.00	0	33.33	79
frequent kicking against conspecifics	0.25	1.62	97.4	0	0	0.00	0	12.50	78
kicking against trainer/therapist	0.45	3.04	97.4	0	0	0.00	0	25.00	78
kicking against client	0.21	1.89	98.7	0	0	0.00	0	16.67	78
rearing during therapy units	0.00	0.00	100	0	0	0.00	0	0.00	77
anxious behaviour in presence of conspecifics	2.25	7.65	88.6	0	0	0.00	0	50.00	79
anxious behaviour during training sessions	2.76	7.48	86.1	0	0	0.00	0	33.33	79
anxious behaviour during therapy units	2.63	8.50	88.5	0	0	0.00	0	50.00	78
% no behavioural problems	35.41	45.80	59.2	0	0	0.00	100	100	103

[1] percentage of respondents indicating that 0 horses within their institution had the problem in question

3.5 Respondents' attitudes towards AAI

3.5.1 Participants' assessment regarding physical and mental strain

When asked to rate the physical and mental strains for their horses used in AAI, most of the respondents, 80.8% (101 out of 133), assessed the physical strains as "medium" and also the mental strains were assessed by 57.3% (71) respondents as medium (Tab. 16).

Tab. 16 Overview on how respondents rate the physical and mental strains for the horses used in AAI in their own institution (n=133).

	physical strains	**mental strains**
	% (frequency)	% (frequency)
very low	10.4 (13)	4.8 (6)
medium	80.8 (101)	57.3 (71)
high	8.8 (11)	32.3 (40)

3.5.2 General attitudes

Concerning questions on respondents' general attitudes towards horses, they were asked to rate on a 7-point Likert-scale (ranging from 'totally disagree' to 'fully agree') how much they agreed or disagreed with 13 different statements about certain characteristics of horses (e.g. horses are affectionate, friendly, stubborn,…) Clearly more than half of the respondents rated that horses require a lot of time (59.7 %), that they are friendly (52.8 %) as well as that they are like companions (50.8%) (Tab. 17).

Tab. 17 Overview of caretakers' beliefs about characteristics of horses in percent of responses and frequency thereof (in brackets).

	totally disagree	disagree	rather disagree	partly agree/partly disagree	rather agree	agree	fully agree
… are affectionate (n=123)	0.8 (1)	1.6 (2)	4.1 (5)	33.3 (41)	8.1 (10)	18.7 (23)	33.3 (41)
… are friendly (n=123)	0	0	0.8 (1)	5.7 (7)	11.4 (14)	29.3 (36)	52.8 (65)
… are stubborn (n=120)	39.2 (47)	32.5 (39)	15.0 (18)	10.0 (12)	0	2.5 (3)	0.8 (1)
… are intelligent (n=123)	0	0	1.6 (2)	11.4 (14)	11.4 (14)	26.0 (32)	49.6 (61)
… are dangerous animals (n=123)	39.0 (48)	28.5 (35)	8.1 (10)	19.5 (24)	1.6 (2)	2.4 (3)	0.8 (1)
… are like companions (n=122)	0.8 (1)	1.6 (2)	0	7.4 (9)	13.1 (16)	26.2 (32)	50.8 (62)
… are difficult to train (n=124)	40.3 (50)	32.3 (40)	9.7 (12)	16.1 (20)	0.8 (1)	0	0.8 (1)
… are very cost-intensive (n=123)	0.8 (1)	2.4 (3)	2.4 (3)	8.9 (11)	13.8 (17)	28.5 (35)	43.1 (53)
… are easy to handle (n=122)	0	8.2 (10)	11.5 (14)	42.6 (52)	15.6 (19)	15.6 (19)	6.6 (8)
… are difficult to load/transport (n=123)	11.4 (14)	35.8 (44)	18.7 (23)	28.5 (35)	2.4 (3)	0.8 (1)	2.4 (3)
… require a lot of care (n=122)	0	0	1.6 (2)	6.6 (8)	19.7 (24)	32.8 (40)	39.3 (48)
… require a lot of time (n=124)	0	0	0	1.6 (2)	9.7 (12)	29.0 (36)	59.7 (74)
…enjoy being petted (n=124)	0	0.8 (1)	0.8 (1)	19.4 (24)	13.7 (17)	25.8 (32)	39.5 (49)

PCA and Varimax rotation helped to reduce the attitude items to three components, explaining 52.36 % of the variance (for scree plot see Appendix 10.1, Fig. 4, Tab. 18). Bartlett's test of sphericity was significant (Chi2 = 386.00; $p < 0.001$) and the Kaiser–Meyer–Olkin criterion was 0.75. Cronbach's alphas were 0.807 (N= 120), 0.647 (N= 121), and 0.515 (N= 118) for components 1, 2, and 3, respectively. Fig. 2 shows the distribution scores for the three generated components. Respondents showed the highest agreement to horses being demanding (general attitude *horses are demanding*) and the lowest agreement to negative characteristics of horses (*general negative attitude*) (Fig. 2).

Tab. 18 Varimax rotated component matrix of caretakers' beliefs about characteristics of horses. The PCA was based on the complete responses of n=113 respondents. Loadings below 0.3 are not shown in the matrix. Variables that were included in the final components are bold.

	components		
general ATT	general positive attitude	horses are demand-ing	general negative attitude
… are affectionate	**0.803**		
… are friendly	**0.713**		-0.331
… are stubborn			**0.645**
… are intelligent	**0.656**		
… are dangerous animals			**0.593**
… are like companions	**0.721**		
… are difficult to train			**0.587**
… are very cost-intensive		**0.703**	
… are easy to handle			
… are difficult to load/transport			**0.656**
… require a lot of care		**0.796**	
… require a lot of time		**0.820**	
…enjoy being petted	**0.807**		

3.5.3 Affective attitudes

Respondents were asked to rate on a six-point scale (from very unpleasant to very pleasant) how much they enjoy the contact to horses within certain situations or activities together with the horses. Stroking (86.2 %) and observing the horses on pasture (84.7 %) was rated as very pleasant by a great majority of respondents. Activities often rated as very unpleasant were shouting at horses (37.1%) and physical punishment of the horses (28.9%) (see Tab. 19).

Tab. 19 Overview of caretakers' ratings about different situations with the AAI-horses in percent of responses and frequency thereof (in brackets).

	very unpleas-ant	**unpleasant**	**rather un-pleasant**	**partly/partly**	**rather pleas-ant**	**pleasant**	**very pleasant**
feeding of horses (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	0	1.6 (2)	18.5 (23)	79.8 (99)
mucking the stables out (n=123)	0.0 (0)	0.0 (0)	0.0 (0)	15.4 (19)	14.6 (18)	28.5 (35)	41.5 (51)
taking care of sick horses (n=124)	0.0 (0)	0.0 (0)	4.8 (6)	21.8 (27)	9.7 (12)	25.0 (31)	38.7 (48)
stroking of horses (n=123)	0.0(0)	0.0 (0)	0.0 (0)	1.6 (2)	3.3 (4)	8.9 (11)	86.2 (106)
shouting at horses, if necessary (n=124)	37.1 (46)	25.8 (32)	23.4 (29)	12.1 (15)	0.8 (1)	0.0 (0)	0.8 (1)
observing horses on pas-ture (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	0	2.4 (3)	12.9 (16)	84.7(105)
observing horses in sta-ble (n=120)	0.8 (1)	0.0 (0)	0.8 (1)	5.8 (7)	7.5 (9)	16.7 (20)	68.3 (82)
training of TGI-horses (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	1.6 (2)	7.3 (9)	21.0 (26)	70.2 (87)
to instruct TGI-horses (n=123)	0.0 (0)	0.0 (0)	0.0 (0)	1.6 (2)	8.1 (10)	22.0 (27)	68.3 (84)
grooming the horses (n=123)	0.0 (0)	0.0 (0)	0.8(1)	6.5 (8)	8.1 (10)	22.0 (27)	62.6 (77)
riding the horses (n=121)	0.0 (0)	1.7 (2)	0.0 (0)	2.5 (3)	5.0 (6)	28.1 (34)	62.8 (76)
talking a walk with the horses (n=123)	0.0 (0)	0.0 (0)	1.6 (2)	6.5 (8)	7.3 (9)	27.6 (34)	56.9 (70)
groundwork (n=122)	0.0 (0)	0.0 (0)	0.0 (0)	2.5 (3)	6.6 (8)	21.3 (26)	69.7 (85)
physical punishment of the horses (n=121)	28.9 (35)	26.4 (32)	23.1 (28)	18.2 (22)	1.7 (2)	1.7 (2)	0.0 (0)
TGI-work itself (n=123)	0.0 (0)	0.0 (0)	0.0 (0)	0.8 (1)	5.7 (7)	21.1 (26)	72.4 (89)

PCA and Varimax rotation helped to reduce the attitude items to three components, explaining 49.20 % of the variance (for scree plot see Appendix 10.1, Fig. 5, Tab. 20). Bartlett's test of sphericity was significant ($Chi2 = 501.21$; $p < 0.001$) and the Kaiser–Meyer–Olkin criterion was 0.68 (see Fig. 2).

Tab. 20 Varimax rotated component matrix of caretakers' ratings about different situations with the AAI-horses. The PCA was based on the complete responses of n=113 respondents. Loadings below 0.3 are not shown in the matrix. Variables that were included in the final components are bold.

	components		
affective ATT	working with AAI horses	positive contact apart from work	negative interac-tions
feeding of the horses	0.354	0.313	
mucking out the stables	0.552	0.318	
taking care of sick horses	0.525	0.362	
stroking of the horses		**0.720**	
shouting at the horses. if necessary			**0.742**
observing the horses on pasture		**0.735**	
observing the horses in the stables		**0.760**	
current training of the horses	**0.802**		
basis training of the horses	**0.740**		
grooming of the horses	0.497	0.365	
riding of the horses	**0.576**		
going for a walk with the horses	0.305	0.436	-0.530
groundwork with the horses	0.484	0.334	-0.390
physical punishment of the horses			**0.791**
the AAI-work itself	**0.552**		

Cronbach's alphas were 0.610 (N= 121), 0.602 (N= 119), and 0.725 (N= 121) for components 1, 2, and 3, respectively. Fig. 2 shows the distribution scores for the three generated components in a Boxplot. Respondents rated positive contact apart from the AAI work as most pleasant and negative interactions as least pleasant (Fig. 2).

3.5.4 Behavioural beliefs about needs of horses regarding husbandry

To find out more about the attitudes of respondents regarding the importance to fulfil the needs of horses, i.e. their behavioural beliefs about horse husbandry, respondents were asked to rate on a 7-point Likert-scale (ranging from not important at all to very important) how important they assess fulfilment of different needs of horses and provisions for horses. For the entire group of 123 respondents (100%) the horses' exposure to regular physical exercise was rated as very important. To be attentive during the handling of horses appears also as very important for most of the respondents (97.6%) (see

Tab. *21*).

Tab. 21 Overview of caretakers' ratings about different needs of the horses in percent of responses and frequency thereof (in brackets).

It is important …	not important at all	not important	rather not important	partly/partly	rather important	important	very important
...to provide the horses with regular physical exercise(n=123)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	100 (123)
... to take care for the horses according to the work they perform (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	1.6(2)	3.2 (4)	95.2 (118)
… to keep horses within a social group (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	1.6 (2)	5.6 (7)	92.7 (115)
… to control the horses every day (n=124)	0.0 (0)	0.0 (0)	0.8 (1)	0.8 (1)	0.0 (0)	6.5 (8)	91.9 (114)
… to provide the horses with daily access to pasture (n=124)	0.0 (0)	0.0 (0)	3.2 (4)	8.9 (11)	8.9 (11)	14.5 (18)	64.5 (80)
… to provide outrun together with conspecifics (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	0.8 (1)	0.8 (1)	4.0 (5)	94.4 (117)
… to provide the horses with a shelter against wind (n=124)	0.0 (0)	0.0 (0)	8.1 (10)	5.6 (7)	8.9 (11)	12.1 (15)	65.3 (81)
… to provide the horses with a shelter against sun (n=124)	0.0 (0)	0.0 (0)	1.6 (2)	3.2 (4)	4.0 (5)	8.9 (11)	82.3 (102)
… to provide the horses with a shelter against rain (n=123)	0.8 (1)	2.4 (3)	5.7 (7)	7.3 (9)	12.2 (15)	23.6 (29)	48.0 (59)
… to react immediately to the lowest signs of stress (n=124)	0.0 (0)	0.0 (0)	0.8 (1)	6.5 (8)	10.5 (13)	21.8 (27)	60.5 (75)
… to personally spend time with the TGI-horses besides the TGI units (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	3.2 (4)	5.6 (7)	9.7 (12)	81.5 (101)
… that somebody spends time with the horses besides the therapy sessions (n=122)	4.9 (6)	5.7 (7)	5.7 (7)	9.0 (11)	10.7 (13)	22.1 (27)	41.8 (51)
… that the horses can spend time in their social group undisturbed by humans (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	0.8 (1)	0.8 (1)	6.5 (8)	91.9 (114)
… to be attentive during the handling of horses (n=124)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.8 (1)	1.6 (2)	97.6 (121)

PCA and Varimax rotation helped to reduce the attitude items to three components, explaining 46.68% of the variance (for scree plot see Appendix 10.1, Fig. 6, Tab. 22). Bartlett's test of sphericity was significant (Chi2 = 336.36; $p < 0.001$) and the Kaiser–Meyer–Olkin criterion was 0.62.

Tab. 22 Varimax rotated component matrix of caretakers' ratings about different needs of the horses. The PCA was based on the complete responses of n=122 respondents. Loadings below 0.3 are not shown in the matrix. Variables that were included in the final components are bold.

	components		
It is important…	provision of shelter	contact to conspecif-ics	personal care for the horses
…to care for the horses according to the work they perform			**0.618**
…to keep horses within a social group		**0.874**	
… to control the horses every day	**0.460**		
… to provide the horses with daily access to pas-ture			**0.440**
… to provide outrun together with conspecifics		**0.893**	
… to provide the horses with shelter against wind	**0.795**		
… to provide the horses with shelter against sun	**0.785**		
… to provide the horses with shelter against rain	**0.820**		
… to react immediately to the lowest signs of stress	0.483		0.558
… to personally spend time with the TGI-horses besides the TGI units	0.305		0.529
… that somebody spends time with the horses besides the therapy sessions			
… that the horses can spend time in their social group undisturbed by humans		0,351	0,510
… to be attentive during the handling of horses			**0.469**

Cronbach's alphas were 0.720 (N= 123), 0.832 (N= 124), and 0.082 (N= 124) for components 1, 2, and 3, respectively. Fig. 2 shows the distribution scores for the three generated components. The component *contact to conspecifics* was rated as most important by the respondents.

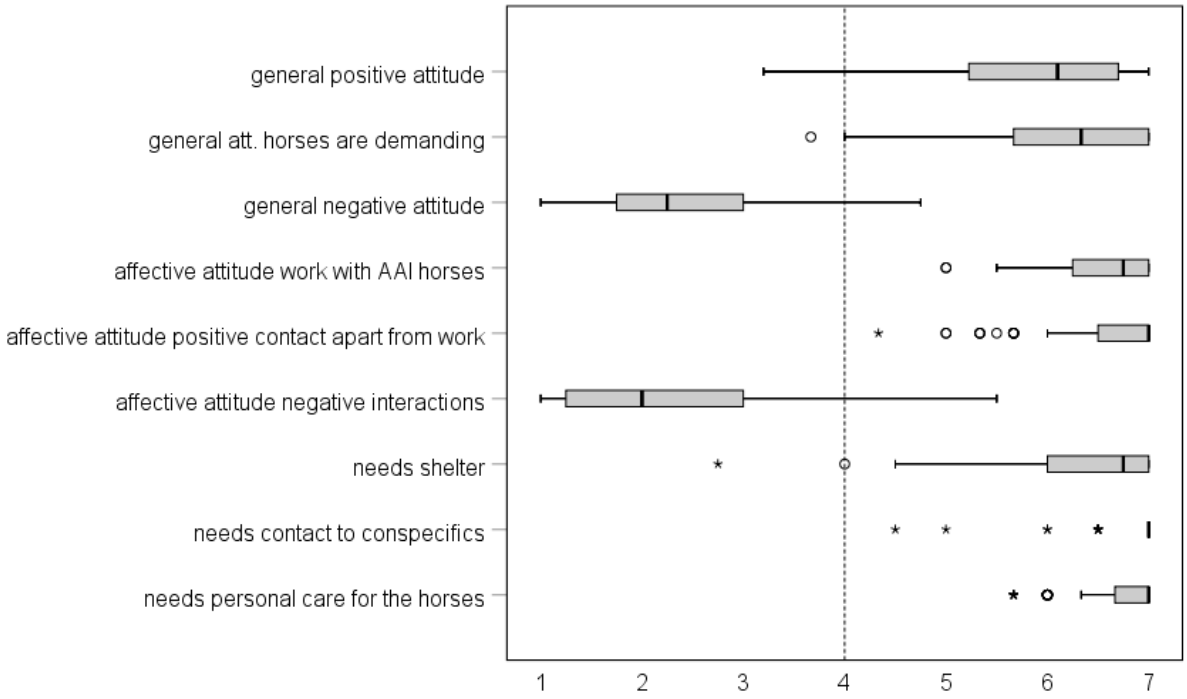

Fig. 2: Boxplots with distribution of scores on the nine attitude components, generated based on PCA analyses, in 124 respondents. The numbers on the bottom line correspond to complete disagreement, discomfort or lowest importance, on the left hand side (1), and strongest agreement, enjoyment or strongest importance, regarding the corresponding items of the attitude components on the right hand side (7). The dashed line indicates the neutral value (4; 'partly / partly').

3.6 Associations of certain health and behavioural problems with training and husbandry conditions, work load, respondents' attitudes and human-animal interactions

In Tab. 23 the results of the calculated linear and logistic regression models are depicted. All models were significant and they explained between 5.9% and 28.3% of the variance. General housing conditions were not related to health or behavioural problems in the bivariate analysis and thus not included in the regression analysis A higher work load, this means a lower average number of holiday weeks per year and a higher average duration of a single AAI-session per client, was associated with a higher percentage of horses with problems of the locomotor system. A further finding was that more frequent access to pasture in summer or a clay court for wallowing were associated with a lower percentage of horses with digestive tract diseases. The percentage of horses with tensions in neck and back area was higher in case of a higher frequency of hand leaded activities and lower in case of a higher frequency of cross country activities. Respiratory tract diseases occurred in a lower percentage of horses in case of more

frequent access to pasture in summer and a higher average number of holiday weeks per year. Caretakers tended to agree more that horses were demanding if there was a higher percentage of horses with respiratory tract diseases. The occurrence of skin problems was less likely reported in case of more frequent access to a solarium. In case of other back problems (which was not defined in the questionnaire) it was more likely that caretakers reported more frequent access to a solarium and that they found positive contact apart from work more pleasant. The percentage of horses with no health problems, i.e. healthy horses, had the lowest variance explained. It was higher in case of a lower work load in terms of average number of clients per horse/day and if caretakers agreed more to horses needing personal care. For behavioural problems, only for biting the trainer/therapist a model could be calculated because other problems occurred even rarer. Biting was more likely if food was used as reward for the current training and tended to be more likely in case caretakers had higher ratings on general negative attitude and in case of longer average durations of a single AAI-session per client. For further details, see Tab. 23.

Tab. 23 Final stepwise linear regression models for % of horses with problems of locomotor system (n=76), % of horses with digestive tract diseases (n=77), % of horses with tensions in the neck and back area (n=73), % of horses with respiratory tract diseases (n=75), and of logistic regression models for the occurrence of skin problems (n=75), the occurrence of other back problems (n=62), the % of horses with no health problems (n=79) and the occurrence of biting of trainer/therapist (n=76).

Dependent variable	**Independent variables & model summary**	**Estimate[a]**	**SE**	**Beta[b]**	**t**	**p[c]**
% of horses with problems of locomotor system	average number of holiday weeks/year	-0.033	0.013	-0.284	-2.545	0.013
	average duration of a single AAI-session per client (in minutes)	0.009	0.004	0.253	2.272	0.026
	adj. R^2 = 0.092, F = 4.859, p (model) = 0. 010					
% of horses with digestive tract diseases	access to pasture in summer	-0.148	0.060	-0.270	-2.482	0.015
	clay court for wallowing	-0.091	0.049	-0.203	-1.868	0.066
	adj. R^2 = 0.088, F = 4.720, p (model) = 0.012					
% of horses with tensions in neck and back area	hand leaded activities	9.916	2.495	0.462	3.974	0.000
	cross country activities	-10.825	3.455	-0.365	-3.133	0.003
	adj. R^2 = 0.184, F = 9.213, p (model) < 0.001					
% of horses with respiratory tract diseases	access to pasture in summer	-0.123	0.054	-0.250	-2.276	0.026
	average number of holiday weeks/year	-0.025	0.012	-0.219	-2.006	0.049
	horses are demanding	0.180	0.106	0.187	1.703	0.093
	adj. R^2 =0.121, F= 4.442, p (model) = 0.006					
% of horses with no health problems	average number of clients per horse/day	-6.127	2.749	-0.245	-2.229	0.029
	needs personal care for the horses	18.294	10.926	0.184	1.674	0.098
	adj. R^2 = 0.059, F = 3.476, p (model) = 0.036					
		B[d]	**SE**	**OR[e]**	**95% CI[f]**	**Wald**	**p**
occurrence of skin problems	horse solarium	-0.66	0.425	0.517	0.225-1.188	2.415	0.120
	R^2 = 0.133, *Chi*^{2} = 7.784, p (model) = 0.005						
occurrence of other back problems	affective attitude positive contact apart from work	6.738	3.895	3.788	0.408-1744294.980	2.993	0.084
	horse solarium	0.421	0.223	1.523	0.983-2.358	3.551	0.059
	R^2 = 0.283, *Chi*^{2} = 12.740, p (model) = 0.022						
occurrence of biting of trainer/therapist	general negative attitude	0.720	0.446	2.055	0.857-4.928	2.607	0.106
	average duration of a single AAI-session per client (in minutes)	0.027	0.015	1.028	0.998-1.058	3.426	0.064
	food used as reward	1.514	0.745	4.543	1.055-19.562	4.129	0.042
	R^2 = 0.269, *Chi*^{2} = 13.378, p (model) = 0.004						

[a] Estimate: estimated regression coefficient (linear regression); [b] Beta: standardised regression coefficient (linear regression); [c] significance value; [d] B: regression coefficient (logistic regression); [e] OR: odds ratio; [f] 95% CI: 95% confidence interval of lower and upper bound of OR, R^2: adjusted R^2 for linear regression models, Nagelkerke R^2 for logistic regression;

4 Discussion

4.1 General limitations of the study

As the target group of this study was the German speaking area, respondents stem from the three countries Austria, Germany and Switzerland. Due to the different size and number of inhabitants of the three countries, also the total nationwide number of existing institutions keeping horses for AAI differ. Accordingly, the number of institutions contacted per e-mail differed, and therefore also the number of the participants who answered revealed different numbers per country. Out of 811 e-mail contacts 21 % were located in Austria, 70 % in Germany and 8% in Switzerland. According to these amounts, relatively more responses were received from Austria and Switzerland than from Germany. Nevertheless, Germany was represented in our study with more than the half (56.8 %) of the participants involved in the final analysis.

As participating in the study was voluntary, it might be that especially keener and motivated providers of AAI more likely took part in the survey. The outcome, that the majority of more than 90 % of respondents were members in an association for AAI could be linked to the fact, that a large number of our contacted e-mail-addresses had been received from associations or via the associations' official homepages. Furthermore, contact data and e-mail addresses of potential respondents were also obtained via homepages of associations for AAI, so it depended also on whether providers of AAI were members in a national association to be contacted.

The fact, that most of the respondents in this study were female (94.4%) fits to the common circumstance that participants in surveys are most of the time women (Smith, 2008). E-mails with an invitation for participating and the link to the online-survey were sent out twice and all in all 17% of the contacted persons finally took part in the study. As the link was just sent out directly to the e-mail -addresses and not posted on generally accessible social media platforms, it was not possible to reach all of the existing institutions, because some of them might have no homepage and could not be found via search engines or homepages of associations.

Despite all those limitations, online data collection has nevertheless many benefits including cost effectiveness, the ability to recruit large numbers of respondents, and the ease and speed of global spread, as well as the ability to target specific groups of potential respondents (Fenner et al., 2020).

Concerning data analysis, it sometimes was difficult to handle answers when respondents chose the option “others”, but their statements would rather fit into one of the possible answers in the list. In such cases their given answers were counted as one of the answering options from the list, to which it was fitting best. If this was not possible, the question result was skipped for this person. A further limitation of this work was that some respondents skipped single questions during the survey and therefore some data points were missing at several points.
Despite the fact, that the sample size of the conducted study was limited, some of the outcomes can provide a stimulus to rethink the use, housing and training conditions of horses used in AAI.

4.2 Information about and management of the institutions

Regarding the certain field of AAI, the institution is primarily acting, in our survey the type of AAI for which horses were used mostly was remedial therapeutic riding. The majority of 61.7 % of respondents offered this type of AAI, followed by horse supported pedagogy. In both of these therapeutic areas, horses have a very close contact with often disabled human clients (Arrazola & Merkies, 2020).

When asked about management and experience, more than 42 % of the respondents stated to have contact with horses since more than 40 years. To have sufficient knowledge about horses’ biology and long-term experience in the handling of horses seems to be essential for keeping horses according to their needs (Hockenhull & Creighton, 2013).

As management practices and horse owner’s performance of husbandry determine predominantly the welfare and health of recreational horses (Hemsworth et al., 2015), these factors most probably also influence the welfare of horses used in AAI. When investigating different management practices, it is necessary to keep in mind that horse-keeping and maintenance practices can differ according to the purpose for which the horses are kept, i.e. competition horses versus retired horses or broodmares (Thompson & Clarkson, 2019).

4.3 Housing of the AAI horses

When asked about the housing conditions of the horses within their institutions, the most frequently chosen option (38.3 %) was group housing on pasture with shelter, which is one of the best solutions regarding horse welfare as stated by Hartmann et al. (2015), followed by group housing in multi-room-outdoor pens with an outdoor run (33.1). According to literature it is indicated that keeping horses in groups best fulfils their physical and behavioural needs and has beneficial effects on horse-human interactions (Hartmann et al., 2012).

In contrast to these positive results concerning appropriate practices, horses were nevertheless kept singly relatively often. In our current study individual housing was chosen by in total around 40 % of the participants and 6 % of the institution kept their AAI horses even in individual indoor boxes with no opening outwards. This may be based to the concern of horse owners concerning potential risks of injuries caused by fighting, kicking or biting within a group of horses (Hartmann et al., 2015).

Regarding associations of housing and health of horses, our findings show that regular access to pasture in summer and to a clay court for wallowing can reduce the percentage of horses with digestive tract diseases.. According to literature this might be explained by a reduction in stress levels when horses are allowed to move about freely and play out their natural behavioural patterns like grazing or wallowing or interacting with conspecifics (Hines et al., 1996). In addition, more frequent access to pasture in summer was linked to a lower percentage of horses with respiratory tract diseases. This might be based on the fresh air and more climatic changes, as well as a positive effect by moderate exercise during moving on pasture, which can help the horses to strengthen their immune system (Hines et al., 1996). Therefore, our hypothesis that the housing and management conditions of the horses are linked to health problems, for example if horses are granted more outdoor access and more time on pasture, it will result in less health problems (fewer digestive, locomotor or respiratory problems) was verified. Concerning the association of housing and behavioural problems, we cannot make any statement according to our findings at this point, because behavioural problems, apart from biting, occurred too rarely for analyses.

According to participants AAI horses in our survey had on average 19 hours per day unhindered social contact with conspecifics, with more than 50% of respondents offering it the whole day, more than 75% at least 12 h per day and 3h was the minimum. This housing/management practice can be linked to a lower level of stereotypic behaviour than in stables without such social

contact (McGreevy et al., 1995), which may explain our low occurrences of behavioural problems.

As most of horse people argue that whenever possible, horses should be offered the opportunity to socialise with other horses (Hartmann et al., 2012), also persons working in the field of AAI are aware of the circumstance that keeping horses in groups is better for their welfare compared with keeping them alone, which was also shown by our results. The decision and way how horses are kept and stabled represent essential influencing factors for promoting good horse welfare (Hartmann et al., 2015; Thompson & Clarke, 2019; McGreevy et al., 2018). Whereas housing a horse in isolation is considered a substantial affront to welfare (McGreevy et al., 2018), the majority of respondents in several studies agreed that keeping horses in groups promotes good horse welfare (Hartmann et al., 2015; Thompson & Clarke, 2019). A housing of many animals together should be possible, except eventually for medical reasons (McGreevy et al., 2018).

A study conducted by Hartmann et al. (2015) in the Scandinavian countries (Denmark, Finland, Norway, Sweden) revealed that competition horses are more likely to be kept individually, compared to horses used for breeding or leisure riding, which are mostly kept in groups (Hartmann et al., 2015). Due to our results which show a high rate of group housing, we assume that it is likely that horses used for AAI are more similarly kept like leisure riding horses and therefore tend to have more favourable housing conditions than horses used for competition purposes.. Moreover, people offering AAI most of the time have a certain qualification and knowledge concerning the needs of horses (IAHAIO, 2014) and thus in general they aim for more favourable working conditions for the horses including the reduction of stress (Kaiser et al., 2006).

4.4 Work load of the horses

One crucial point we looked at in our study was the work load and the length of recreational time for the horses between and after therapy sessions. Results reveal that the majority of the horses is used in AAI sessions on average on three or four days per week and the number of AAI-sessions per day range from one to four sessions. At maximum, a horse had six AAI-sessions per day.

The importance of enough time to recover after therapy sessions was underlined by our findings of a lower percentage of horses with problems of the locomotor system and with respiratory

tract diseases in case of a higher average number of holiday weeks per year. The results confirm our hypothesis that a lower work load, in this case the number of holiday weeks, would be reflected in less health problems. The results also correspond to findings from the Netherlands where injuries and physical problems occurred more often when horses were not granted a temporary training break (Munsters, 2013). Furthermore, our results confirm that the work load regarding the duration of a single therapy unit influences the health status of the horses. Our findings show that the longer the average duration of a single AAI-session per client (in minutes) lasts, the more locomotor system problems occur.

Further, in the present study, a higher average number of clients per horse per day was linked to a lower percentage of horses with no health problems in the institution. Thus, our results indicate that the number of clients can have a major influence on the health of the horses. This suggests that a larger number of different clients per day enlarges the strain for the horses with negative consequences on horses' health. Our hypothesis regarding the number of AAI sessions per day could not be verified, as we did not find an association with the health and behaviour of the AAI horses in our study. It seems that the duration of one therapy unit as well as the number of clients per day have a higher impact on health and behaviour status, in this case it might be that with a higher number of sessions with a shorter duration each, more breaks for recreation might be possible in between the sessions.

Intense training sessions as well as the use of certain training methods could influence the locomotion and could cause distress in horses (Bartolomé & Cockram, 2016). Furthermore, Bartolomé & Cockram (2016) state that sports horses taking part in challenging training sessions are likely to suffer from different limb and muscle pathologies, such as desmitis, suspensory branch injuries or degenerative joint diseases, AAI sessions also have to be rated as intense work for horses, especially due to the additional mental strains because of a constant change in clients (Arrazola & Merkies, 2020). Arrazola & Merkies (2020) conducted a study in which they observed and recorded the occurrence and frequency of affiliative and avoidance behaviours during riding and grooming by adolescents with disabilities. They found out that handicaps of the clients heightened the horses' heart rate and the frequency of avoidance behaviours, resulting in more stress for the horses (Arrazola & Merkies, 2020). Over time, therapy horses seemed to get used to certain groups of clients and showed less variability in their stress response (heart rate and avoidance behaviours, Arrazola & Merkies, 2020). This might also fit to horses in our study group, as there were nearly no behavioural problems regarding interactions with clients.

The average duration of an AAI therapy session per client was reported to last from ten minutes up to 120 minutes in our study. In comparison to AAI horses, the training plan for a privately owned sports horse for dressage riding could look like the following: it involves defined work for 1–2 lesson sessions per day for 5 days/week each of the sessions taking about 45 minutes On the other two days horses are only walked once a day for half an hour in the horse walker (Munsters, 2013). This could mean that sometimes AAI horses with more and longer sessions per day would perform more work than a trained sports horse, because the duration of the therapy sessions in many cases in our study exceeds the duration of a sports horses' training lesson.

4.5 Human-animal-interactions

We investigated the role of human activities with the horses for the welfare of the horses. Our hypothesis that the frequency of non-working activities (activities beyond therapy sessions, such as grooming, grazing on hand,…) would be reflected in lower numbers of health as well as less behavioural problems, was partly supported. We found out that cross-country activities, such as riding out, or trail riding, but also swimming and grooming the horse, combined in one component, were significantly linked to a lower amount of tensions in the neck and back area, supporting our hypothesis. However, with respect to activities at hand / lead rope the hypothesis was not confirmed; we found even the opposite result: a higher frequency of hand leaded activities was associated with a higher percentage of horses with tensions in the neck and back area. Activities besides the AAI sessions that regularly took place once per day at one third or more of the institutions were riding out and taking a walk. Grooming of the horses was the most common activity and took place daily in three quarters of the institutions. Therefore, it seems to be an essential activity amongst human-animal-interactions. Also a study done by Butler et al. (2019) revealed that within a daily routine for racehorses, giving the horses a 'dressing over', that is a thorough groom, would be the norm. Other activities never took place at a large majority of AAI institutions, namely western riding (never: 81.3 %) or swimming (85.8 %) and a horse walker was nearly never used (97.2 %). Due to stakeholder surveys done by Butler et al. (2019) and Fenner et al. (2020) activities together with the horses and time spent actively interacting with them, could have a positive influence on the welfare and behaviour of the horses. Nevertheless, in the present study, a higher frequency of hand leaded activities was associated with a higher percentage of horses with tensions in the neck and back area. This might be attributed to the more restricted and narrowing movement patterns for the horses when guided by hand or on a short leash.

According to the results of our study the number of hours per day which the respondents spend personally together with the horses ranged from a minimum of half an hour to a maximum of 14 hours per day, which shows that respondents' time management seem to vary a lot. Human–horse interaction is particularly important during repeated equine-assisted activities (EAA). This bonding activities need to be reliable, positive and reciprocal to create a secure human–horse attachment and achieve improvements in EAA participants (Arrazola & Merkies, 2020).

4.6 Training conditions

Focusing on training techniques, these can be categorised in terms of whether respondents apply negative or positive reinforcement schedules or a combination of both. Respondents in our study largely used positive reinforcements during training such as verbal praise/ voice, stroking and ruffling. Only 5 out of 133 people stated to use no reward at all. Both forms of reinforcement involve associative learning, the linking of one stimulus to another and the association of actions with the attainment of something positive, like food, or the avoidance of something the animal considers to be unpleasant, like physical pressure or pain (Innes & McBride, 2008). According to our results only the factor food has an influence on the behaviour of AAI horses, as we found out that the use of food during current training was linked to an increased likelihood of biting the trainer or therapist. This confirms our hypothesis that te current training method affects the occurrence of behavioural problems, although the direction of effect was opposite to the expected one. Further, our hypothesis regarding effects of current training methods (e.g. aversive training methods) with the occurrence of other behavioural problems, like more anxious behaviour taking place during training sessions or therapy units, could not be tested, because such behavioural problems were reported by the participants as quite low and thus it was not possible to calculate any models in this field with our data.

Regarding punishment techniques, most of the participants (89%) used dismissive body posture. But also, verbal punishment/voice was used by 56.4% and even physical punishment is regularly used by 45.1 % of the respondents. These results appear as high, due to the fact, that especially physical punishment cannot only harm the welfare of horses but as well lead to risks of flight responses, habituation to pressure cues and can in the end lead to safety risks for riders and handlers (Hemsworth et al., 2015).

As food basically seems to be a positive reinforcement and motivational tool (Hockenhull & Creighton, 2010; Innes & McBride, 2008) the negative effect shown in our study may point to inappropriate use of food reward. One possible explanation of food reward being associated with biting of the trainer, might be, that horses which are used to get food start begging for it and this might lead to less shyness to start pinching which can then end up in biting. This assumption suits to a study conducted by Hockenhull & Creighton (2014), in which leisure horses display unwanted behaviour prior to receiving food. These horses reacted stressed and arrogating when they were expecting to get fed by carers (Hockenhull & Creighton, 2015).

Thus, a sensitive and accurate way of using food during training is very important. The training methods used play an important role and can influence the behaviour of horses (Innes & McBride, 2008). An improved training is also rated by the majority of horse owners as desirable (Thompson & Clarkson, 2019), therefore training methods were analysed in the results of our study.

In contrast to our study, Hockenhull & Creighton (2010) did not find associations of hand-feeding with nipping or biting behaviour by the horse; however they did not distinguish between hand-feeding as a positive reinforcer during training or in other situations.

According to results 68.5% of the respondents trained the horses used for AAI themselves. As most of the participants have a certain qualification and/or education in the field of horses participants should have the knowledge necessary to train the horses themselves. Guidelines for horse professionals seem to be of high importance due to the fact that humane training requires a comprehensive understanding of the processes and underlying behaviour of horses (Innes & McBride, 2008). This includes knowledge of behaviour under natural conditions, learning processes, the influence of early experience and motivational forces.

4.7 Health and behaviour of AAI horses

While AAI have been shown in many studies to have a positive impact on the people involved (Jansen, 2014; Merkies et al., 2018; Schultz et al., 2007) and can have strong therapeutic benefits for clients, our study put the emphasis on the welfare and health of the horses involved in such kind of therapy. Due to the results of our current survey the most frequently occurring

health problems of horses used in AAI were tensions in neck and back area with an average number of 21.24 %, also problems of the locomotor system and skin problems and respiratory diseases occurred on average with more than 10 % of the AAI horses in the surveyed institutions. In other studies which were looking at the welfare of horses used in sports and leisure time horseback riding, the amount of health problems was often found to be much higher (Munsters, 2013); in a survey in Australia the percentage of participants reporting horses with an injury or illness amounted to 73% (Thompson et al., 2018). Thus, compared to the literature the horses of our participating AAI institutions seem to have less health problems compared to horses used for other purposes. Moreover, behavioural problems occurred very rarely in our survey group and amounted that low, that it was not possible to calculate any models with the obtained data. There were no problems like headshaking or weaving and kicking against conspecifics or against clients also appeared very seldom in daily practice.

Although the percentages of problems altogether were very low, the most common behavioural problems were biting of the trainer/therapist and anxious behaviour in different situations.

As explained already above, the factor food as reward appeared as significant predictor for the occurrence of biting of the trainer/ therapist, but all the other behavioural problems, that were stated in the questionnaire occurred so rarely that there were not calculated any models for these factors. There were also questions on anxious behaviour patterns included in the survey questionnaire, but again these problems were too rarely mentioned by the respondents, therefore these problems weren't included in the analysis. Such a low number of problems can be due to favourable housing conditions, like group housing and a high percentage of daily access to pasture and/or paddock.

No or little biting as well as generally less behavioural problems occurring, was also in literature assumed to be linked to caretaker attitudes being more favourable (Fenner et al., 2020).

Whereas the benefits for the human clients are throughout positive and effective and according to a study by Hemingway et al. (2019), all participants of a research group experienced a positive temporal change in mood during the intervention progress, horses used in such sessions definitely get confronted with different stressors and thus react physiologically measurable, which can be also very much influenced by the setting of the therapy session itself (Neff, 2013).

Several studies investigated certain stressors occurring in AAI and confirmed some negative impacts on the horses, also depended on the demands and expectations of clients. A study conducted by Mendonca et al. (2019a) demonstrated that the horses' behavioural and HRV parameter changes were higher in horses involved in AAI with patients who had both physical and psychological therapy expectations than in horses involved in AAI with patients who had only psychological therapy expectations. Another study found that cortisol concentrations of horses were higher during sessions for patients suffering from motor disabilities than during sessions for patients suffering from cognitive and sensory disabilities (Fazio et al. 2013). Especially horses submitted to therapeutic riding sessions for mental disabilities showed increased concentrations of total and free iodothyronines after exercise. Nevertheless, our study results reveal a very low number of behavioural problems that might also occur due to stress. One possible explanation for this could be that all of the horses were specially trained and educated horses, which therefore might have a higher tolerance to stress, because also according to the literature trained horses deal much better with the stress during therapy units and showed no such high levels in cortisol (Fazio et al., 2013).

Regarding the literature not only the characteristics of the group of clients and quantity and length of therapy units have an impact, but also the setting itself, as well as the handling and expectations from the client side. Arrazola and Merkies (2020) found that a more predictable and less negative physiological and behavioural response of therapy horses toward participants in AAI with emotional and behavioural difficulties can be mediated by a clearer instructed human behaviour.

As we expected that training conditions (i.e. aversive training methods and punishment) as well as the general management of the horses could have an impact on the health and behaviour of the therapy horses, we compared the occurrence of behavioural problems in comparison to previous study results. A survey on British horse stakeholders found out that horses which are trained also by aversive training methods often suffered from on-going health issues such as stomach ulcers and repetitive injuries as cause of a lack of performance (Butler et al., 2019). Lameness was also often reported to occur as a problem due to high-intense-training units (Butler et al., 2019).

4.8 Respondents' attitudes

A t this point our study clearly revealed that attitudes and beliefs of respondents can be rated as mostly careful and aware of their responsibility towards their horses. Most of the participants agreed on importance to provide regular contact to conspecifics and most of them share the opinion that horses are demanding animals and cost a lot of time and money. Furthermore, study participants rate their personal care for the horses of high importance, which shows that they might assign high value to the human-horse-relationship and personally enjoy spending time with them also beside the therapy sessions. In our hypothesis we expected that more favourable caretaker attitudes towards horses would be associated with less health problems and less behavioural problems occurring during training sessions or during the therapy units; the results regarding general attitudes confirm this hypothesis: the more respondents agreed on negative characteristics of horses (general negative attitudes) the more likely was the occurrence of biting of AAI horses. Our results are in line with findings of a previous survey in Australia: Hemsworth et al. (2015) identified that within recreational horse welfare, there are relationships between horse owner attributes and horse welfare outcomes. The owner's attitudes were associated with their performance of husbandry and management practices and therefore were linked to an improvement or impairment of the welfare conditions of recreational horses (Hemsworth et al., 2015). However, in contrast to our expectations, occurrence of 'other back problems' was higher when the affective attitude component 'positive contact apart from work' was also higher. These findings might be related to a higher diligence of respondents with a high rating in this affective attitude component, because they enjoy observing their horses more, observe them for a longer time and more often and thus recognise problems which were stated in the questionnaire earlier, because they generally have more contact to their horses.

Our findings further are in line with studies in other animal species. Waiblinger et al. (2002) found out, that fear of humans, behaviour and milk yield of cows is strongly influenced by the stockperson's attitudes and personality. More positive affective attitudes and behavioural beliefs about interacting with cows were associated with more positive interactions of the milkers with the cows, which in turn was related to lower avoidance distance and higher milk yield of cows (Waiblinger et al., 2002). Another study concerning alpaca behaviour also revealed that interactions with the alpacas were more difficult in cases of a more negative general attitude of the caretakers and that negative general attitudes were associated positively with the occurrence of behavioural problems (Windschnurer et al., 2021). In addition, it is not surprising that a general negative attitude triggers the occurrence of biting of the trainer or therapist, because a

negative attitude and treatment towards the horse by the rider (unjustified punishment, a too harsh negative reinforcement) leads to stress and creates risks of increased levels of agonistic behaviour such as biting, kicking, bucking or rearing (McGreevy & McLean, 2005) Furthermore, a problematic behaviour appearing in handling of horses, can result in owner's attitudes towards the horse getting worse and instable. This could further lead to a serious compromise in the horse-human relationship, which is an essential link to the health and welfare of horses (Hemsworth et al., 2015).

When assessing the characteristics and attributes concerning their horses, more than half of the respondents in this study fully agreed that horses are friendly (52.8%) and that they are like companions to them (50.8%). These ratings correspond to the circumstance, that a horse is very often considered as companion animal and friend by owners (Hemsworth et al., 2015).

In our study, nearly 60 % of respondents fully agreed that horses require a lot of time and that they are very cost-intensive (43.1%). These results fit to Butler et al. (2019) who found out that a shortage in money and staff, meaning also that less time could be given to each horse, is highlighted as very problematic by participants of their study, because this limits the opportunity to build up a horse-human rapport, seen as integral part in the horse-human-relationship (Butler et al., 2019). A high percentage of respondents disagreed with the statement that horses are difficult to train or that they are stubborn animals, thus an effective training seemed to represent a minor problem. These positive evaluation of training by our study participants could be based on the fact, that most of them have an appropriate education in the field of AAI like professional horse riders or trainers and most of them have several years of experience in this field.

4.8.1 Affective attitudes

Asking respondents how pleasant they perceive certain activities done with the horses besides the AAI sessions, stroking of horses (86.2 %), observing the horses on pasture (84.7%) as well as feeding of the horses or grooming were rated as most pleasant activities. Considering the fact, that much of these horse-human interactions rated as most favourable, as for example, stroking, grooming and leading, are activities taking place nearly every day, such actions might strengthen the bond between horse and human easily and with little effort and therefore are

enjoyed by both sides. Although negative interactions with the horses, like shouting at the horses and physical punishment of the horses, were rated as very unpleasant by most of the respondents, still some rated it as only partly unpleasant or, very few, even rather pleasant.

4.8.2 Behavioural beliefs

Concerning respondents' beliefs about the different needs and demands of horses, respondents manifested very clear positions. For the entire group of 123 respondents (100%) of our survey the horses' exposure to regularly physical exercise is rated as very important. To be attentive during the handling of horses appears also as very important for most of the respondents (97.6%) as well as to provide social contact together with conspecifics. Our results are in line with similar findings of a survey in Scandinavian countries, where horse owners rate the social contact of their horses as highly important, but in practice it is not always implemented in this way (Hartmann et al., 2015). Also, the results of another questionnaire study done by Thompson & Clarkson (2019) revealed that performing of behaviour patterns that horses perform naturally due to their biology, like exercise and locomotion outdoors, as well as social contact to conspecifics are most important for horse people.

5 Conclusion

In conclusion, our study revealed that the overall welfare and working conditions of AAI horses seem to be quite good in most cases, but there are still some challenges to deal with. Our results show that the housing conditions of the horses are quite favourable for many of them, the majority of AAI-institutions use group housing systems, but still quite a lot of institutions use individual housing systems, even though often combined with social contact up to 12 hours a day. Moreover, horses are granted regular access to pasture in summer or a clay court for wallowing and a higher frequency of access to these resources was related to a lower percentage of digestive tract and respiratory tract diseases and thus might be an important factor in successful and welfare-focused horse husbandry.

A lower work load, in our current study represented by a larger number of holiday weeks, lower duration of a single therapy unit and a lower number of clients, was associated with improved health status of the horses, in detail a lower percentage of neck and back problems and less locomotor system problems. Further investigations on the actual stress levels during therapy sessions would be needed to be able to evaluate the stress burden of the horses in more detail.

Another central outcome of our study were the health problems. The most frequently occurring health problems of horses used in AAI were tensions in neck and back area and problems of the locomotor system but compared with other studies concerning sports horses the amount was moderate. Cross-country activities were linked to a lower amount of tensions in the neck and back area, while, unexpectedly, a higher frequency of hand leaded activities were associated with a higher percentage of such tensions. At this point a more specific examination of certain kinds of activities would be necessary as would be a prospective study to better be able to identify cause and effect.

In addition, horses showed very little behavioural problems. However, biting the trainer or therapist was positively related to the usage of food reward during current training pointing at some lack of knowledge of its appropriate use.

Further, our study clearly revealed that attitudes and beliefs of providers of AAI can be rated as mostly careful and aware of their responsibility towards their horses. Nearly all of them had a special education, had lots of experience both with horses and in the field of AAI and were sensitive to the needs and health status of their horses.

Our study for the first time provides insight in housing, management and training of horses used in AAI in German speaking countries as well as data on their health and behavioural problems and their managers' attitudes. Further studies are needed, especially in the field of health problems and how they can be avoided in daily AAI-routine. Furthermore, it would be necessary to investigate experimentally if there might be a causal link between the length of sessions and health and behavioural problems of the horses used in AAI. Overall, it is most important for the welfare of the AAI horses to understand in more detail which factors can threaten their health and wellbeing and what kind of measures can be taken in order to establish an AAI-environment that is beneficial not only for the human part, the clients, but also for the animals, the therapy horses.

6 Summary

In the field of animal assisted interventions (AAI) there is still much ongoing research with focus on the health benefits for human clients. In contrast, research concerning the welfare of horses used in AAI is scarce and information on housing, management and owner-horse relationship is lacking. Thus, the aim of this Master thesis was to obtain insight into the current state of housing, management, training conditions, work load, health status and behavioural problems of therapy horses, as well as caretakers' attitudes towards their animals and how they are linked to horse welfare. For this a questionnaire was developed and sent out via e-mail to 783 institutions offering AAI of which 136 responded and 133 could be considered in the final analysis. The study participants were located in Austria (24.2%), Germany (56.8%) and Switzerland (18.9%). Principal component analyses (PCA) were calculated concerning items related to caretakers' general attitudes, affective attitudes and behavioural beliefs about horse husbandry, as well as items related to human-animal interactions. Linear and logistic regression models were calculated to investigate potential influencing factors (such as housing and training conditions, work load, frequency of outdoor activities, owner attitude) on the occurrence of certain health and behavioural problems.

Most of the surveyed persons possessed a certain qualification in the field of horses and AAI (66.9 %) and had quite favourable attitudes towards horses and interacting with them. More than 42 % stated to have contact with horses since more than 40 years and 68.5% of the respondents train the horses by themselves.

The most frequently used housing type was group housing on pasture with shelter (38.3%), followed by group housing systems with multi-room-outdoor pens (33.1%); but still nearly 40% indicated to use individual boxes (multiple responses were possible). Horses were granted regular access to pasture (on average 6.5 days per week in summer) and 74 % of respondents offered a permanently accessible clay court for wallowing. The more often horses had access to these two resources, the fewer digestive tract and respiratory tract diseases of AAI horses were reported. The most frequent health problems were tensions in the neck and back area (21.24%) followed by problems of the locomotor system (14.33%) and skin problems (12.96%). The most common behavioural problems were biting of the trainer/therapist (3.81%) or anxious behaviour in different situations, whereas weaving and rearing occurred in none of the institutions. In our study a lower work load, represented by a larger number of holiday weeks, lower duration of a single therapy unit and a lower number of clients was associated with improved health, in detail with a lower percentage of neck and back problems and fewer

locomotor system problems. Occurrence of behavioural problems was too low for evaluation except for biting against trainer/therapist which was higher when food was used as reward during current training. Nearly no other behavioural problems occurred within the surveyed institutions, which could also be linked to a quite favourable husbandry of the horses.

In sum, this Master thesis provides a first insight into the husbandry and welfare of horses working in AAI. Our results clearly reveal that housing conditions as well as work load were linked to the health status of horses and can have a major impact on it. Therefore, these factors should be optimised in the management decisions. Furthermore, training methods used need to be chosen carefully and applied knowledgeably in order to avoid reported problems like biting against the trainer or therapist.

7 Zusammenfassung

Im Bereich der tiergestützten Interventionen (TGI) ist viel Forschungsarbeit, die auf die Gesundheitsvorteile und positiven Aspekte für menschliche Klient*innen abzielt, vorhanden. Andererseits ist Forschung bezüglich des Wohlbefindens der Therapiepferde, die eingesetzt werden, nur spärlich zu finden und es fehlen Informationen zu Haltung, Management und Beziehung zwischen Pferd und Besitzer. Das Ziel dieser Masterarbeit war es daher, einen Einblick in den Status quo zu Haltung, Management, Training und Arbeitsbelastung, sowie zu Gesundheitszustand und Verhaltensproblemen der Pferde zu geben. Dazu wurde ein Fragebogen erstellt und via E-Mail an 783 Institutionen, die TGI mit Pferden anbieten, ausgesendet, wovon 136 antworteten und 133 in die Auswertung einbezogen werden konnten. Die Studienteilnehmer*innen stammten dabei aus Österreich (24,2%), Deutschland (56,8%) und der Schweiz (18,9%). Hauptkomponenten-Analysen wurden bezüglich der Einstellungen der Befragten gegenüber Pferden und Haltungsfragen, sowie der Mensch-Tier-Interaktionen berechnet. Lineare und logistische Regressionsmodelle wurden hinsichtlich potenzieller Einflussfaktoren (wie Haltungs- und Trainingsbedingungen, Arbeitsbelastung, Häufigkeit von Outdoor-Aktivitäten und Einstellung der Teilnehmer*innen) auf das Auftreten von bestimmten Gesundheits- und Verhaltensproblemen gerechnet.

Die meisten der befragten Personen verfügten über eine spezielle Qualifikation in der Arbeit mit Pferden und TGI (66,9 %) und hatten sehr positive Einstellungen gegenüber Pferden und den Interaktionen mit ihnen. Mehr als 42% gaben an, seit mehr als 40 Jahren Kontakt zu Pferden zu haben und 68,5% der Befragten trainierten ihre Pferde selbst.
Das am meisten verwendete Haltungssystem war die Gruppenhaltung auf der Weide mit Unterstand (38,3 %); gefolgt von Gruppenhaltung im Mehrraum-Außenlaufstall mit Auslauf (33,1 %); dennoch gaben fast 40 % an, Einzelhaltung in Boxen (*Mehrfachauswahl möglich*) als Haltungssystem zu nutzen. Die Pferde hatten regelmäßigen Zugang zur Weide (durchschnittlich an 6,5 Tagen pro Woche im Sommer) und/oder einen permanenten Zugang zum Sandplatz (74% der Teilnehmer*innen). Je öfter die Pferde Zugang zu Weide oder Sandplatz erhielten, desto weniger Verdauungs- und Atemwegsprobleme traten bei den TGI-Pferden auf. Die häufigsten Gesundheitsprobleme waren Verspannungen im Nacken und Rückenbereich (21,24%), gefolgt von Problemen des Bewegungsapparats (14,33%) und Hautproblemen (12,96%). Als häufigstes Verhaltensproblem wurde das Beißen von Trainer/Therapeut (3,81%) oder ängstliches Verhalten in verschiedenen Situationen angegeben, wobei manche Verhaltensprobleme gar nicht auftraten. Unsere Studie zeigte, dass eine geringere Arbeitsbelastung, wie längere Urlaubszeiten,

kürzere Therapieeinheiten und eine geringere Anzahl an Klient*innen, mit einem verbesserten Gesundheitszustand, wie weniger Nacken- und Rückenprobleme, in Zusammenhang stehen. Verhaltensprobleme traten zu selten auf und konnten daher nicht auf Zusammenhänge untersucht werden, mit der einzigen Ausnahme, dass Beißen von Trainer/Therapeut häufiger auftrat, wenn Futter als Belohnung im Training eingesetzt wurde.

Zusammengefasst bietet diese Masterarbeit einen ersten Einblick in die Haltung und den Einsatz von Pferden in der TGI-Arbeit. Unsere Ergebnisse zeigen, dass Haltungsbedingungen und Arbeitsbelastung starke Auswirkungen auf den Gesundheitszustand von Pferden haben und daher in den Management-Entscheidungen optimiert werden sollten. Weiters müssen Trainingsmethoden sorgfältig ausgewählt und bewusst eingesetzt werden, um Problemen, wie dem Beißen von Trainer oder Therapeut, vorzubeugen.

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10 List of figures

11 List of tables

12 Appendix – Scree plots of the principle component analyses

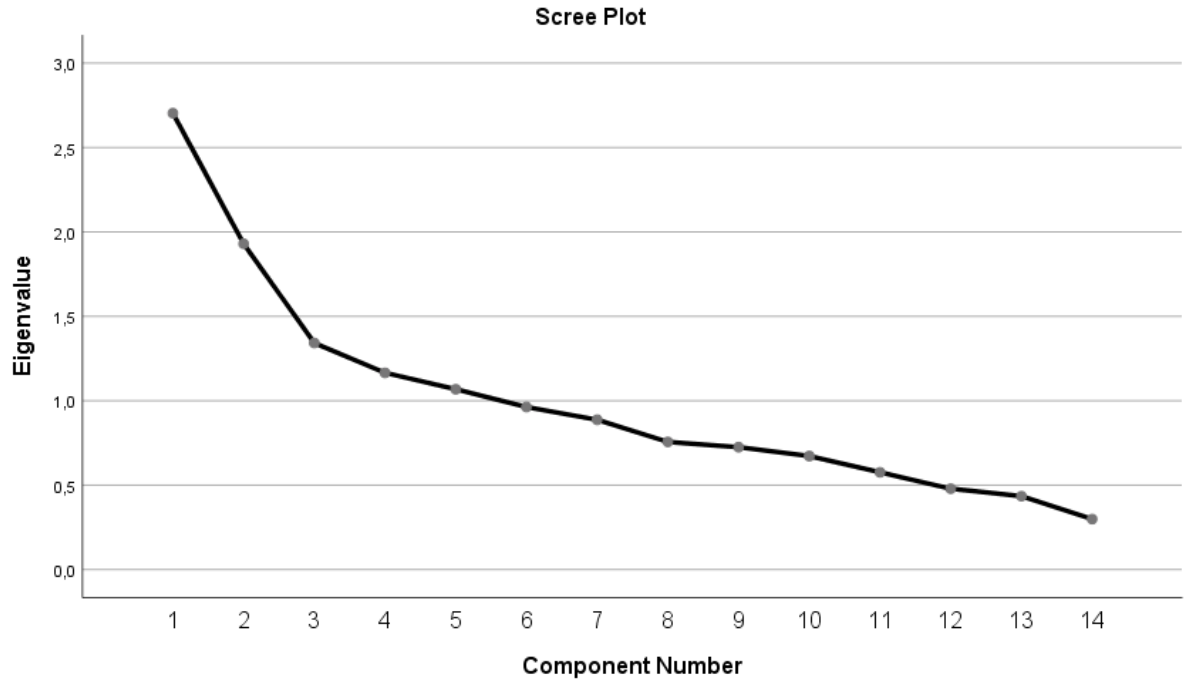

Fig. A 1:Scree plot for the PCA of human-animal interactions outside the therapy and training context.

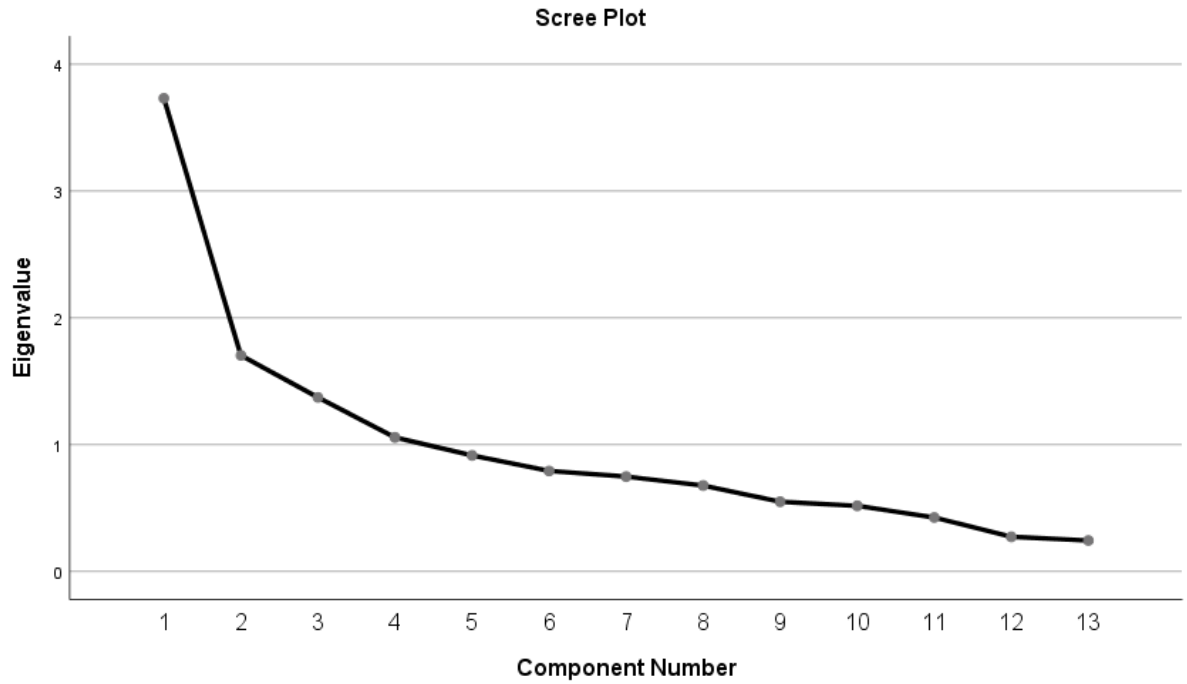

Fig. A 2: Scree plot for the PCA of general attitudes.

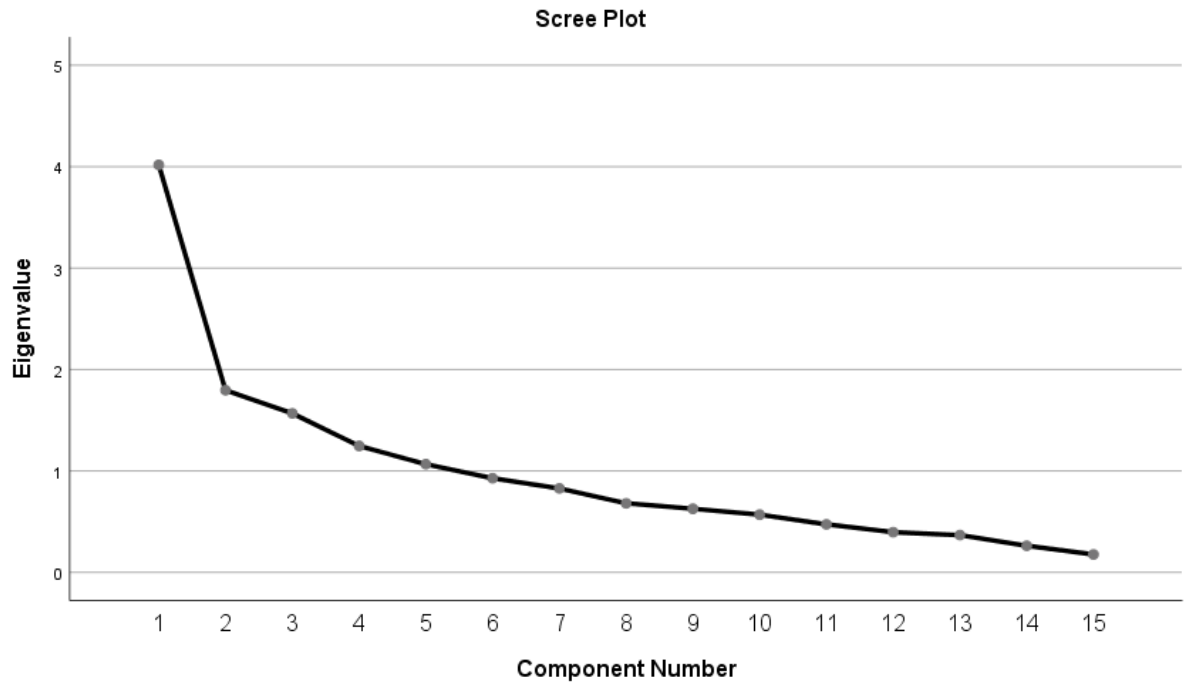

Fig. A 3:: Scree plot for the PCA of affective attitudes.

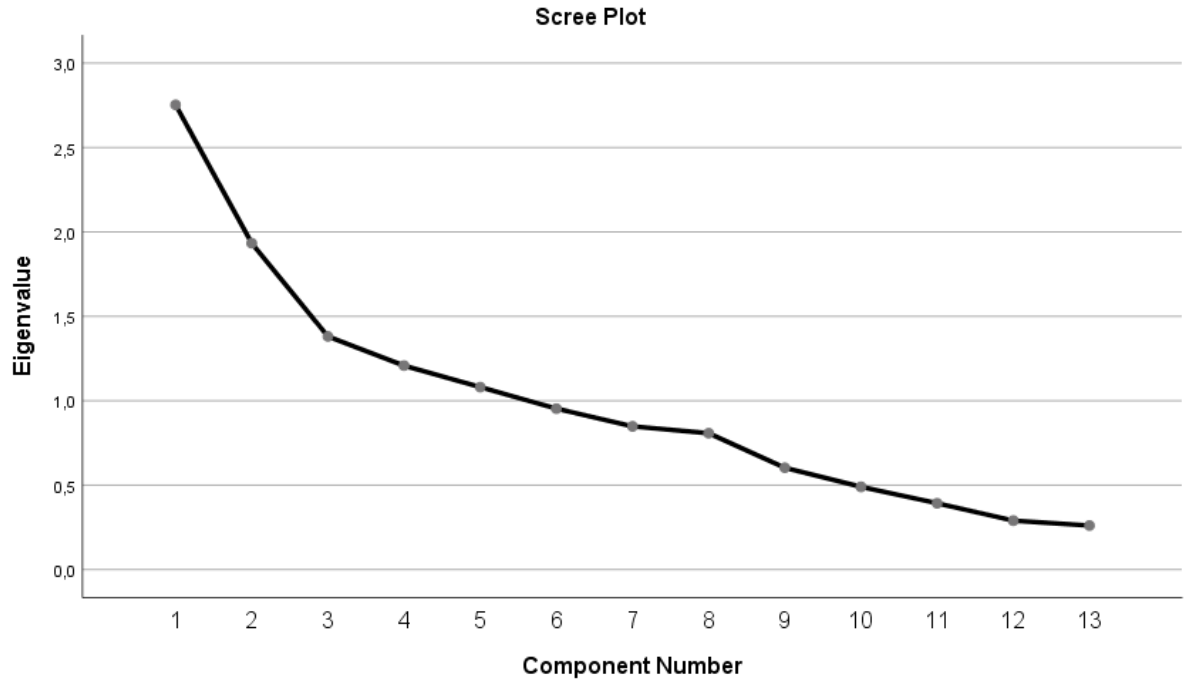

Fig. A 4: Scree plot for the PCA of attitudes regarding needs of horses.