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Dog Handlers' and Dogs' Emotional and Cortisol Secretion Responses Associated with Animal-Assisted Therapy Sessions

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Abstract

The study investigated 13 dog handlers and 18 companion dogs (*Canis familiaris*) working as teams in nonhuman animal-assisted service. The handlers described in questionnaires what emotions they chose to associate with their daily life and therapeutic work. They described their emotional condition before and after therapeutic sessions, giving analogous descriptions for their dogs. Handlers collected saliva samples from themselves and their dogs (6 non-therapeutic control days) during 3 months of therapeutic work) to measure cortisol concentrations using an enzyme-immunoassay. Handlers chose different emotions from the questionnaires for themselves and their dogs, differing from the cortisol sampling results. Handlers and dogs had increased cortisol concentrations on therapy days compared to control days. Handlers had significantly higher concentrations immediately before therapeutic sessions. In handlers, cortisol concentrations increased steadily with the duration of sessions; in dogs, with the number of sessions per week. Further study of the effects of recreation periods during therapy work days or of more days scheduled without therapy will help clarify what conditions for delivering animal-assisted service best safeguard the welfare of dog and dog handler teams.

Keywords

dog handler, dog, cortisol, saliva, stress, animal-assisted activities, animal-assisted therapy, welfare, enzyme immunoassay, salivette

Introduction

The relationship between humans and their companion dogs (*Canis familiaris*) is a very old one, although opinions differ about time and purpose of their first contacts (Savolainen, Zhang, Luo, Lundeberg, & Leitner, 2002; Vila et al., 1997). Based on the works by Kellert and Wilson (1993) and Odendaal

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and Meintjes (2003), it appears that relationships between dog handlers and dogs can become very intense and may lead to joint activity. An example of such joint activities is work in animal-assisted health care service by dog handler-dog teams. These teams treat persons (clients) who are somehow suffering, diseased, or handicapped to ease their situations or even cure them. In English-speaking countries, these treatments are called either "animal-assisted activities" (AAA) or "animal-assisted therapy" (AAT), depending on the level of professional involvement.

AAAs are delivered in a variety of environments by specially trained professionals, paraprofessionals, and/or volunteers, in association with animals. They are basically the casual "meet and greet" activities that involve companion animals visiting clients. The same activity can be repeated with many clients, unlike a therapy program that is tailored to a particular person or medical condition.

AAT is a goal-directed intervention in which a nonhuman animal is an integral part of the treatment process. AAT is directed and/or delivered by health/human service professionals with specialized expertise and within the scope of practice of their professions. This process is documented and evaluated on the website, www.deltasociety.org.

These kinds of therapeutic service have become very popular in the last decades. Positive effects of nonhuman animals on humans and in therapeutic environments have been investigated in many studies (Fine, 2000). Yet, science has mostly neglected to include measurement of welfare of handler-dog teams in their empirical studies. Only a handful of scientific studies evaluated possible negative effects on health and welfare of dogs by their work in animal-assisted health care service. Iannuzzi and Rowan (1991) underlined the potential for animal abuse associated with fatigue and burnout for animals who live in institutions. Heimlich (2001) dealt with negative consequences of therapeutic work on her own companion dog. Ferrara, Natoli, and Fantini (2004) observed therapy dogs before, during, and after therapeutic sessions. They concluded that the dogs did not show stressed or stereotypic behavior due to anxiety or overstrain during their therapeutic work. No studies have investigated the effects of work in animal-assisted health care service on the handlers.

All scientific teams mentioned above used a similar approach to assess welfare of dogs. They measured the animals' reactions to situations of therapeutic environments and analyzed whether the dogs showed behavioral signs of stress, a state in which demands overwhelm resources. A different way to assess possible stress is the use of hormonal indicators: An organism appears stressed if it reacts to a situation in a characteristic physiological manner. One of these characteristics is the increased secretion of the hormone cortisol from the adrenal glands into the bloodstream.

Cortisol is an essential hormone and considered to be a major indicator of altered physiological states in response to stressful stimulation in most mammals, including humans and dogs (Von Faber, & Haid, 1995). In adult, healthy humans, approximately 8-25 mg of cortisol are secreted every day in typical daily variation patterns (Griffin, & Ojeda, 1996). Secretion starts to increase 3 to 5 hours before waking up and peaks in the morning about 1 hour after waking up. During the rest of the day, cortisol secretion decreases again and reaches its minimum between late evening and night (Griffin, & Ojeda). Adult, healthy dogs secrete about 1/10th human amounts of cortisol. The existence of similar circadian cortisol rhythms—as in humans—has been both supported (Kolevská, Brunclík, & Svoboda, 2003; Palazzolo, & Quadri, 1987; Rijnberk, der Kinderen, & Thijssen, 1968) and opposed (Kemppainen, & Sartin, 1984; Koyama, Omata, & Saito, 2003; Takahashi, Ebihara, Nakamura, & Takahashi, 1981).

One general problem of stress evaluation by cortisol measurement is evaluation itself. Several scientists point out that blood sampling might be a stressor and therefore lead to biased results (Beerda, Schilder, Janssen, & Mol, 1996). Saliva cortisol concentrations have been shown to be well correlated with plasma concentrations in different species, including humans (Kirschbaum, & Hellhammer, 1989) and dogs (Beerda et al., 1996; Vincent, & Michell, 1992). It has also been shown that saliva cortisol is a useful method for investigating the concentrations of both acute (Beerda, Schilder, Van Hooff, De Vries, & Mol, 1998) and chronic (Beerda, Schilder, Van Hooff, De Vries, & Mol, 1999) stress in dogs. Hence the analysis of salivary cortisol has already become an established method of stress evaluation, both for humans (Fujiwara et al., 2004; Kunz-Ebrecht, Kirschbaum, Marmot, & Steptoe, 2003; Kunz-Ebrecht, Kirschbaum, & Steptoe, 2004; Schlotz, Hellhammer, Schulz, & Stone, 2004; Yang et al., 2001) and dogs (Beerda, Schilder, Van Hooff, & De Vries, 1997; Beerda, Schilder, Van Hooff, De Vries, & Mol, 2000). Kobelt, Hemsworth, Barnett, and Butler (2003) point out that, within the first 4 minutes after beginning to handle a dog, no changes in saliva cortisol concentration can be measured. If the collection of saliva samples is done in less than 4 minutes, data can be gained, including a minimum of stress influence by handling.

In general, reasons for physiological stress and thus increased cortisol secretion are individual—within a certain range typical for the species investigated. Various kinds of unusual or extraordinary situations, activities, and emotions may cause it (Beerda et al., 1998; Herbert, & Cohen, 1993), depending on perception and handling of stimuli, information processing of outside influences, and interior factors such as genetic disposition and individual past experiences (Feddersen-Petersen, 2004). Nagel and Von Reinhardt (2003) list deficit of

sleep, corporal or mental exhaustion, hectic atmosphere, wrong handling, and too much attention as characteristic sources of stress in dogs. These stimuli typically occur during therapeutic sessions. In humans, working in a health care environment has been shown to be a cause of stress and increased cortisol concentrations, due to dealing with disease and death of the patients (Yang et al., 2001). Scientific literature disagrees about whether physical exercise (sports or other activities) leads to increased cortisol secretions in humans. Radosevich et al. (1989) support this hypothesis, Kirschbaum (1991) opposes it.

The purpose of this study is to investigate individual emotions (measured by questionnaires) and physiological reactions (measured by saliva cortisol sampling) of dog handler-dog teams who worked in animal-assisted health care service while they were exposed to the same situations. As a result, the search for stress-causing parameters within animal-assisted health care service begins, along with associated notions for their resolution and for further investigation.

Methods

Participating Teams

Thirteen teams consisting of 13 handlers and 18 companion dogs (*Canis familiaris*) participated in this study. Three handlers were guardians (owners) for two dogs; one handler owned three dogs. Twelve dog handlers were female; one was male. The handlers' ages ranged from 28 to 68 years at the time of the sampling period (March 2004 until February 2005). Dogs were of different breeds and between 2 and 9 years old. Fifteen dogs were female (4 neutered); 4 dogs were male (1 neutered). None of the non-neutered females were in estrus during the time of evaluation. None of the dogs suffered from pathological allergies, skin diseases, vomitus, diarrhea, or any other chronic disease. All teams were members of the Austrian organization *Tiere als Therapie* (TAT)—translated *Animals as Therapy*—and had done the same kind of training through TAT.

Settings

In Austria, the term "*tiergestützte Therapie*" (animal-supported therapy) is used as a joint term for both animal-assisted activities and animal-assisted therapy. Thus, no clear distinction can be made as to whether the animal-assisted health care service provided by the participating dog handler-dog teams of this study was either AAA or AAT. The Austrian approach to animal-supported therapy combines elements of both AAA and AAT, can (but must not) be supervised

by professionals, is always documented and evaluated, and may or may not include therapeutic goals for each session. A more detailed description of differences and conformities will be provided in Haubenhofer and Kirchengast (2006). Animal-supported therapy may take place in very different places: kindergartens, primary schools, hospitals, rehabilitation centers, institutions for people with psychological disorders, or homes for the elderly.

In this study, animal-supported therapy took place in primary schools, hospitals, rehabilitation centers, and in homes for the elderly. During a visit, time spent was suitable for the patients' abilities. With children, time was spent actively with playing; with the elderly, much talking and dog-hugging were done. Usually, a visit to one of these facilities lasted 1 to 3 hours maximum. These short visiting sessions were characterized in the clients' facilities as visits of the 1-dog teams. Typically, the teams went to the clients' facility, accomplished their therapeutic program in a more-or-less fixed manner, and then went home. None of the visiting teams were new to the facilities. Typical for such programs is a lack of breaks or resting periods due to the short time available. In addition, this study included long sessions. Long sessions (5-8 hours) were an integral part of the dog handlers' own occupations. The handlers took the dog with them to their own working place and did the therapeutic program as part of their own work (physiotherapists, ergo-therapists, social workers, and teachers).

Such sessions typically include many breaks for the dogs, because they cannot be involved in all parts of the handlers' work. For the handler, however, it is a normal working day. Some teams worked only in short sessions, others only in long, and some did both types. All teams did from 9 to 50 therapeutic sessions within the sampling period.

Apparatus

The study was designed to minimize the influence on the teams' daily life activities. A self-administered questionnaire (Appendix, English translation) was used to gather general information about dog handlers and dogs (dogs' age, sex, breed, and—if done—neutalization). Some questions investigated what emotions the dog handlers associated with their own daily life and therapeutic work; other questions investigated what emotions the dog handlers associated with their dogs' lives and therapeutic work. Each of these questions was followed by lists of emotions from which the handlers chose those that were, in their opinion, most appropriate. The handlers could choose an unspecified number of emotions to answer each question. The questionnaire was slightly adapted for this study from another self-administered questionnaire tested and proved by Haubenhofer (2003). The method of humans

describing the emotional condition of animals has established reputation in scientific research (Gosling, Kwan, & John, 2003; Morris, Gale, & Duffy, 2002); therefore, it also was chosen for this study.

Salivette tubes (number 51.1534, Sarstedt, Wiener Neudorf, Austria) were used for collecting saliva samples. Saliva samples were analyzed using a special kind of enzyme-immunoassay (EIA): double-antibody, biotin-linked enzyme-immunoassay. This method can be used for very low concentrations of sample hormones, lower than detectable by Standard EIAs (Palme & Möstl, 1997). Reliability of this method was shown by Palme and Möstl). Applicability of the EIA used here to saliva samples of dogs was demonstrated by Patzl (1990). Haubenhofer (2003) adapted this special EIA analysis procedure for both humans and dogs and tested the suitability of this double-antibody, biotin-linked enzyme-immunoassay to evaluate saliva concentrations of dog handler-dog teams. In addition, the dog handlers recorded in special protocol forms every cortisol sampling point:

1. date;
2. time of day;
3. actions before the sampling point;
4. possible events before the sampling point; and
5. duration and place of therapeutic session.

Dog handlers with more than one dog always did the same types of sessions with the same dogs.

Procedure

The questionnaires were filled out in the pre-test period of the study (during the first 3 control days). Questions C, D, and F6-F11 (Appendix) were statistically analyzed as follows: From the list of emotions answering each question, one group of positive emotions and one group of negative emotions were created. Positive emotions were defined as those that indicated no subjective perception of en-or distress; negative emotions were those indicating either physical or emotional eu-or distress. It is important to underline that this definition of negative emotions can, but must not automatically, include a conscious feeling of stress. Then, frequency scales in the form of bar charts were created to evaluate how often each emotion had been chosen by the dog handlers. Emotions chosen by more than 50% of the dog handlers were defined as main answers to each question.

Handlers were taught how to apply the cotton swabs of the Salivettes to themselves and to the dogs. First, they took the cotton swab of their own Salivette from the Salivette tube and put it into their cheek pouch. Next, they put the cotton swab of the dog's Salivette into the dog's cheek pouch. Dog handlers

owning more than one dog were instructed to consider an order among the dogs and to retain this order. After the cotton swabs were saturated with saliva (usually after 30 seconds to 1 minute), they were put back into the plastic Salivette tubes in the same order to avoid confusion. At the beginning of the evaluation, all dog handlers were provided with enough Salivettes for the whole sampling period. All Salivettes were exactly labeled for one sampling point.

In addition, dog handlers were provided with some unlabeled Salivettes in case of loss or other happenings. While at home, they took saliva samples 3 times a day (8 a.m., 2 p.m., 8 p.m.) on 3 non-consecutive control days without therapeutic work. Samples from the dogs were collected the same way. Control samples were put into household freezers immediately after each sampling point. Control days were characterized as days without the teams' therapeutic work. That means that control days included all typical daily activities (even work) of both dog handlers and dogs. During a following period of 3 consecutive months, saliva samples were taken each time immediately before and after a therapeutic session while the teams were already/ still at the session's location. These samples were packed on ice until the teams got home to put them into their household freezer.

After these 3 consecutive months, cortisol samples were taken during another 3 control days using the same procedure as before. The sampling period lasted from March 2004 until February 2005; then all samples were brought to the laboratory of the Institute for Biochemistry at the University of Veterinary Medicine, Vienna. There they were defrosted sequentially and centrifuged for about 10 minutes at 1 500g. Samples that contained not enough saliva for at least two assay runs (100µl) were separated and not used for any evaluation. To choose for the correct statistical analysis, the Kolmogorov-Smirnov Test was used to check whether the data were normally or non-parametrically (not normally) distributed. As the test showed, data were non-parametrically distributed (degree of probability for normal distribution, using Kolmogorov-Smirnov Test for handlers: $p \leq 0.001$; degree for probability for normal distribution using Kolmogorov-Smirnov Test for dogs: $p \leq 0.001$).

Therefore, statistical methods for non-parametrically distributed data were chosen (median indication). Further analysis was done according to the Wilcoxon-Signed Rank Test for symmetry for related samples, due to the relatively small sampling size of 13 handlers and 18 dogs (Steyn, Smit, du Toit, & Strasheim, 1994). Cortisol data from control days were grouped into the 3 times of day of sample collection (8 a.m, 2 p.m., 8.p.m.). Data from therapy days were grouped, depending on the time of day the therapeutic sessions had taken place (before 12 p.m., 12-2 p.m., after 2 p.m.). Due to the differing duration of the therapeutic sessions, a more precise classification related to the times of day of the control data was not possible.

Results

Questionnaires

In questions C (for dog handlers) and D (for dogs) from the questionnaire, dog handlers had to choose those emotions they associated most with their own daily lives, respectively their dogs' lives. The group of positive emotions included (in alphabetical order): "calm, hardly encumbering, hardly straining, interesting, joyful, not hectic, pleasant, positive, uneventful." The group of negative emotions included (again, in alphabetical order): "encumbering, eventful, exciting, exhausting, full of activities, hectic, negative, sapping, straining, too long, too short." The results are shown in Figure 1. Within the group of positive emotions, "interesting" and "positive" were named by more than 50% of the dog handlers. "Interesting, joyful, pleasant," and "positive" emotions were more often associated with the lives of the dog handlers than with those of the dogs. The emotions "calm," "hardly encumbering, hardly straining, not hectic," and "uneventful" were more often associated with the dogs' lives than with the lives of the dog handlers.

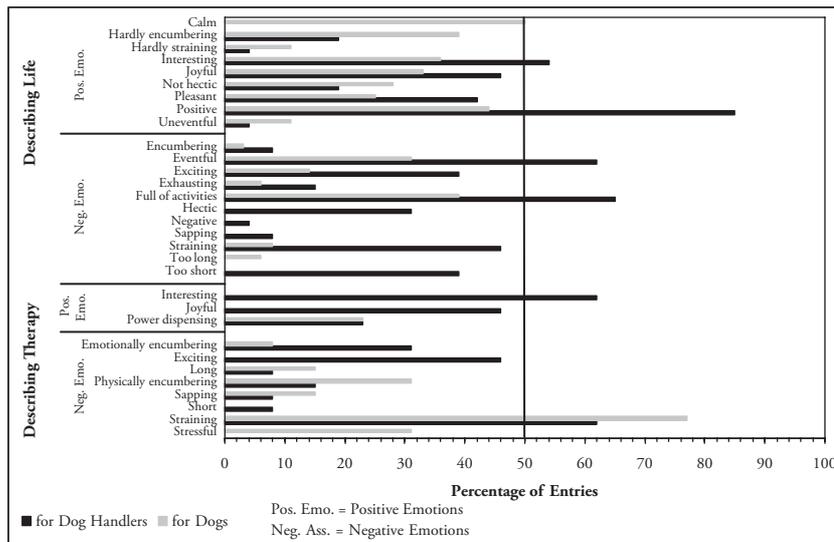


Figure 1. List of emotions as given in questions C and D (daily life), or rather F6 and F7 (therapeutic work) of the questionnaire. Bars describe the percentage of how often the emotions were named by the dog handlers. 50% level (= more than 50% of the dog handlers named a certain emotion) is marked with a line from the X-axis. Emotions are grouped into positive and negative emotions, and within one group alphabetically. Black bars describe emotions for dog handlers, grey bars those for dogs.

Within the group of negative emotions, “eventful” and “full of activities” were named by more than 50% of the dog handlers. All negative emotions were more often associated with dog handlers’ lives than with the dogs’ lives. “Hectic, negative, sapping,” and “too short” emotions were not mentioned for the dogs’ lives.

In questions F6 (for dog handlers) and F7 (for dogs), dog handlers chose what emotions they associated with the team’s typical therapeutic work. The list to choose from included three positive emotions (“interesting, joyful, power dispensing”) and eight negative emotions (“emotionally encumbering, exciting, long, physically encumbering, sapping, short, straining,” and “stressful”). The results are also shown in Figure 1. Within the group of positive emotions, “interesting” was named by more than 50% of the dog handlers to describe their own emotions. The emotions “interesting” and “joyful” were more often associated with effects on the dog handlers than on the dogs. The emotion “power dispensing” was equally often associated with effects on the dog handlers and dogs. Within the group of negative emotions, more than 50% of the dog handlers named “straining” for both dog handlers and dogs. The emotions “emotionally encumbering, “exciting,” and “short” were more often associated with effects of therapeutic work on the dog handlers than on the dogs. All other emotions (“long, physically encumbering, sapping, straining,” and “stressful”) were more often associated with effects of therapeutic work on the dogs than on the dog handlers.

In questions F8 (for dog handlers) and F9 (for dogs), dog handlers chose what emotions they associated most with their own/ their dogs’ conditions before typical therapeutic sessions. They could choose from a list of four positive emotions (“happy mood, neutral, relaxed,” and “unwinded”) and five negative emotions (“excited, full of anticipation, nervous, strained,” and “stressed”). All results are shown in Figure 2. Within the group of positive emotions, “happy mood” and “relaxed” were named by more than 50% of the dog handlers to describe their own emotions. Almost all emotions were more often associated with the dog handlers’ conditions directly before a therapeutic session, except for the emotion “neutral,” which was equally often associated with dog handlers and dogs. Within the group of negative emotions, “excited” and “full of anticipation” were named by more than 50% of the dog handlers. The emotions “nervous” and “stressed” were associated more often with the dog handlers’ conditions, whereas the emotions “excited,” “full of anticipation,” and “strained” were more often associated with the dogs’ conditions.

In questions F10 (for dog handlers) and F11 (for dogs), dog handlers chose what emotions they associated most with their own/ their dogs’ conditions after typical therapeutic sessions. They could choose from a list of five positive emotions (“happy mood, joyful, relaxed, released,” and “satisfied”) and six negative emotions (“emotionally strained, irritated, overstrained, physically strained, stressed,” and “tired”). The results are shown in Figure 2.

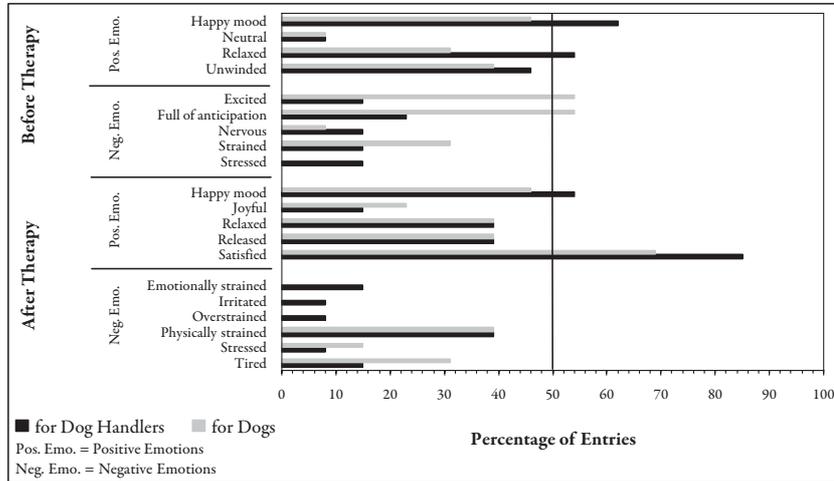


Figure 2. List of emotions as given in questions F8 and F8 (immediately before therapy), or rather F9 and F10 (immediately after therapy) of the questionnaire. Bars describe the percentage of how often the emotions were named by the dog handlers. 50% level (= more than 50% of the dog handlers named a certain emotion) is marked with a line from the X-axis. Emotions are grouped into positive and negative emotions, and within one group alphabetically. Black bars describe emotions for dog handlers, grey bars those for dogs.

Within the group of positive emotions, “happy mood” and “satisfied” were named by more than 50% of the dog handlers (the first only for dog handlers; the latter for both dog handlers and dogs). The emotions “relaxed” and “released” were equally often associated with dog handlers and dogs; “joyful” was more often associated with the dogs’ conditions. Within the group of negative emotions, none was named by more than 50% of the dog handlers. The emotions “emotionally strained, irritated,” and “overstrained” were associated only with the dog handlers’ conditions; “Physically strained” was equally often associated with the dog handlers and dogs; “stressed” and “tired” were more often associated with the dogs’ conditions.

Levels of Salivary Cortisol in Humans and Dogs

A valid sample size of $n = 655$ was collected from the dog handlers. 90% of these valid samples ranged between 4.03nmol/L and 39.8nmol/L salivary cortisol. A valid sample size of $n = 554$ was collected from the dogs. 90% of these valid samples ranged between 0.3nmol/L and 11.3nmol/L salivary cortisol.

Both dog handlers and dogs showed lower cortisol concentrations on control days than on therapy days (Table 1). The differences between control days and therapy days were significant for both dog handlers and dogs (Wilcoxon Sign Rank Test: dog handlers $Z = -2.79$ based on negative ranks, $p \leq 0.005$; dogs $Z = -4.24$ based on negative ranks, $p \leq 0.001$). Dog handlers and dogs showed different trends among their cortisol concentrations before and after therapeutic sessions. Dog handlers had significantly higher cortisol concentrations before therapeutic sessions than after (Wilcoxon Sign Rank Test: $Z = -7.43$ based on negative ranks, $p \leq 0.001$). Table 1 shows that dogs had insignificantly lower cortisol concentrations before therapeutic sessions than after (Wilcoxon Sign Rank Test: $Z = -2.046$ based on negative ranks, $p \leq 0.041$). Table 1 also shows that both dog handlers and dogs had higher averaged cortisol concentrations before and after therapeutic sessions than on control days (independent from the time of day when the samples were taken).

Grouping of the cortisol data in the quartiles (percentile 25, 50 = median, and 75) of their distribution and all cortisol concentrations are shown in nmol/L. For both dog handlers and dogs, these three groups of percentiles are given for control days, therapy days, and (on therapy days) before and after therapy. Comparison within one percentile group (dog handlers: percentile 25 of control days comparable to percentile 25 of therapy days) and within one group of days (dog handlers: percentile 25 of control days comparable to percentile 50 of control days) is possible. All valid control, all valid therapy data, and all valid data collected immediately before and after a therapeutic session are taken together to form one group.

Table 1. Cortisol Data for Dogs and Dog Handlers on Control and Therapy Days

Dog Handlers	Percentile 25	Percentile 50	Percentile 75
control days	6.59	12.43	21.92
therapy days	8.73	14.12	22.65
before therapy	10.53	16.11	25.57
after therapy	7.62	12.68	18.29
Dogs			
control days	1.19	1.72	2.51
therapy days	1.10	2.15	4.42
before therapy	1.17	2.06	4.25
after therapy	1.03	2.18	4.64

Table 2. Sampling Sizes and Statistical Results of Dogs and Dog Handlers' Cortisol Concentrations

Dog Handlers	Sample Size	Percentile	Percentile	Percentile
		25	50	75
Duration 1-2h	279	7.07	12.9	19.61
Duration 2-3h	90	9.27	13.36	17.64
Duration 5-6h	10	21.4	29.24	43.37
Duration 6-7h	6	22.54	40.58	73.58
Duration 7-8h	33	29.89	56.13	81.82
Dogs				
Duration 1-2h	248	0.88	1.93	4.17
Duration 2-3h	57	1.29	2.48	15.53
Duration 5-6h	10	1.91	2.62	3.44
Duration 6-7h	6	1.27	1.76	2.95
Duration 7-8h	33	1.45	2.58	4.46

Dog handlers and dogs' cortisol concentrations varied in different patterns as they were correlated to the different durations of therapeutic sessions. Sampling sizes and statistical results are shown in Table 2. There were no statistical differences between teams that did short sessions, long sessions, or both. In dog handlers, cortisol concentrations increased directly proportional to the duration of therapeutic sessions. There was no such trend among the dogs.

Grouping of the cortisol data in the quartiles (percentile 25, 50 = median, and 75) of their distribution. All cortisol concentrations are shown in nmol/L. For both dog handlers and dogs, these three groups of percentiles are given for the different durations of sessions. Comparison within one percentile group (e.g. dog handlers: percentile 25 of duration 1-2h comparable to percentile 25 of duration 2-3h) and within one group of durations (dog handlers: percentile 25 of duration 1-2h comparable to percentile 50 of duration 1-2h) is possible. Time of day during which samples were taken is not taken account of. Additionally given is the size of valid samples for each group. The great majority of sample sizes for duration 1-2h is explainable by the fact that most sessions that were done lasted only 1 to 2 hours.

Figure 3 shows that cortisol concentrations peaked at sessions of about 3 hours duration. Then, concentrations declined again, showing a second, smaller peak at sessions lasting about 7 hours.

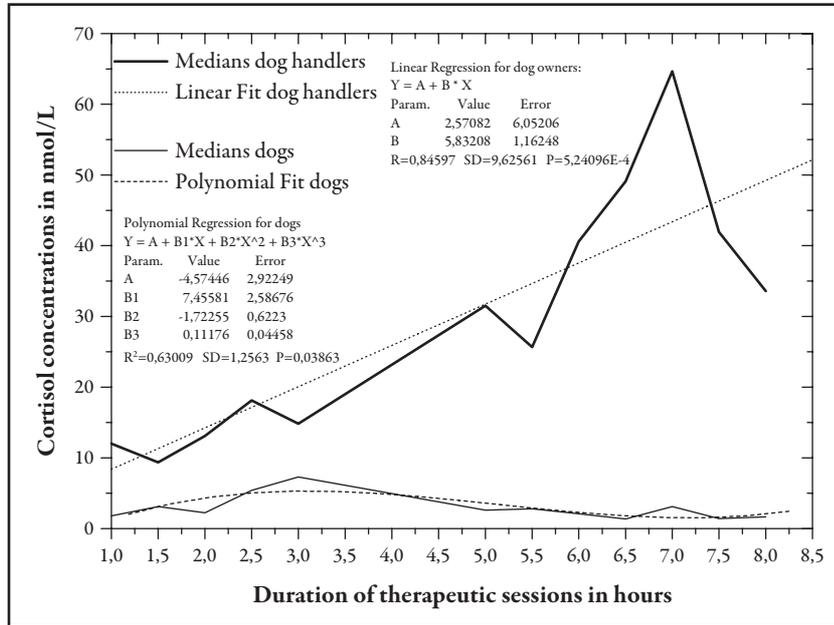


Figure 3. Medians of cortisol concentrations on therapy days for dog handlers and dogs for therapeutic sessions of different duration. Run of dog handlers' curve fit best by linear regression, run of dogs' curve fit best by polynomial regression. X = single cortisol concentrations in nmol/L on X-axis; Y = single duration of therapeutic sessions in hours on Y-axis; A = intercept value and standard error; B (1, 2, 3)= slope values and standard errors; R/R² = Correlation Coefficient = match of the curve function to the set of data—if R = 0.85, then 85% of all data fit to the curve function; SD = Standard deviation from R/R²; P = P value for the t-test of the slope = 0

Table 3 shows a summary of sample size and cortisol concentrations for all groups of numbers of sessions. Grouping of the cortisol data in the quartiles (percentile 25, 50 = median, and 75) of their distribution. All cortisol concentrations are shown in nmol/L. For both dog handlers and dogs, these three groups of percentiles are given for the different numbers of sessions during the sampling period (3 months). Again, comparison within one percentile group and within one group of sessions is possible. Time of day during which samples were taken is not taken account of. Additionally given is the size of valid samples for each group.

Table 3. Sample Size and Cortisol Concentrations Summary for All Groups of Numbers of Sessions

Dog Handlers				
Sessions	Sample Size	Percentile 25	Percentile 50	Percentile 75
9	18	8.81	12.76	17.79
10	40	8.88	11.63	17.8
13	16	11.13	14.54	17.43
14	27	3.20	7.54	12.35
16	59	12.59	5.0	21.46
17	48	3.64	6.05	11.65
19	35	20.03	29.19	56.13
25	47	34.81	44.14	71.44
30	58	12.17	17.04	21.29
50	99	5.22	11.52	15.55
Dogs				
Sessions	Sample Size	Percentile 25	Percentile 50	Percentile 75
9	3	1.04	1.47	–
10	41	1.23	2.16	2.74
13	10	0.09	0.28	0.99
14	22	1.36	1.86	2.49
16	63	0.79	1.82	2.95
17	61	0.04	0.29	1.56
19	34	1.37	1.79	2.17
25	47	2.19	3.15	6.75
30	29	1.97	3.31	7.53
50	79	2.78	8.9	22.72

As shown in Figure 4, cortisol concentrations in dogs increased on therapy days directly proportional to the number of therapeutic sessions done. Furthermore, cortisol concentrations did not exceed a level of about 3nmol/L in dogs who did less than about 25 sessions within a sampling period. Dogs who did more than this number of sessions showed a steady increase in their cortisol concentrations. There was no such trend among the dog handlers. Here, cortisol concentrations showed a great peak at about 25 sessions within 3 months. The dog handler's results can be seen as artifacts. These results are also shown in Figure 4.

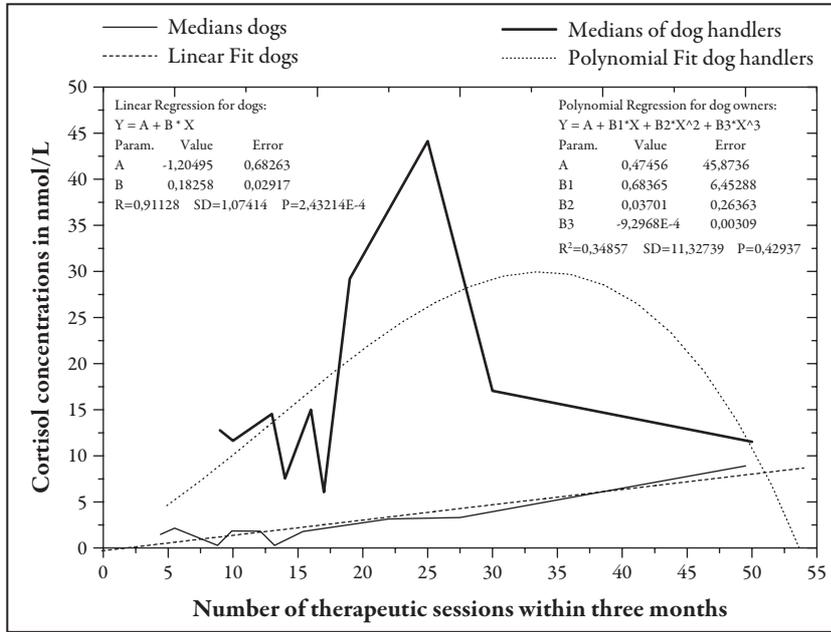


Figure 4. Medians of cortisol concentrations on therapy days for dog handlers and dogs for different numbers of therapeutic sessions within sampling period (three consecutive months). Run of dog handlers' curve fit best by polynomial regression, run of dogs' curve fit best by linear regression. X = single cortisol concentrations in nmol/L on X-axis; Y = single duration of therapeutic sessions in hours on Y-axis; A = intercept value and standard error; B (1, 2, 3) = slope values and standard errors; R/R² = Correlation Coefficient = match of the curve function to the set of data—if R = 0.91, then 91% of all data fit to the curve function; SD = Standard deviation from R/ R²; P = P value for the t-test of the slope = 0. Dog handlers' peak at 25 sessions could be artifact.

Discussion

The dog handlers chose the emotions associated with daily life, effects of therapeutic work, and emotional conditions before and after therapeutic sessions for themselves and their dogs. More than 50% of the dog handlers associated “positive” and “interesting” emotions from the list of positive emotions and “eventful” and “full of activities” from the list of negative emotions with their own, typical life. As they associated the emotions to their dogs' lives, none were named by more than 50% of the dog handlers; most often named were the emotions “calm” and “positive” from the list of positive emotions and “full of activities” and “eventful” from the list of negative emotions.

Selye (1974) had already emphasized that physiological stress can have negative and harmful (“distress”) or positive and beneficial effects (“eustress”). Whether individuals perceive their condition as distress or eustress depends on how they subjectively evaluate this condition (Selye). Because of the emotions that more than 50% of the dog handlers chose, it seems that they associated eu-/distress in parts for their daily lives.

Therapeutic work seemed to have a similar effect among the dog handlers. More than 50% associated the emotions “interesting” and “straining” with their therapeutic work; almost 50%, “joyful” and “exciting.” This again indicates perception of eu-/distress partly for their therapeutic work. Dog handlers described the effects of therapeutic work with their dogs differently. They associated rather negative emotions with therapeutic work with their dogs, which indicates they perceived more eu-/distress for their dogs’ therapeutic work than for their own. The results seem similar on the questions as to what emotions the dog handlers associated with the times directly before and after therapeutic work. For themselves, they chose mostly positive emotions, indicating no eu-/distress. For before therapy, they chose “happy mood, relaxed,” and “unwinded.” For after therapy, they chose “happy mood” and “satisfied.” For their dogs, however, the handlers chose both positive and negative emotions, indicating partly eu-/distress. For positive emotions before therapy, handlers chose “happy mood”; for after therapy, “happy mood” and “satisfied.” For negative emotions before therapy, the handlers chose “excited,” and “full of anticipation”; for after therapy, “physically strained.”

Both dog handlers and dogs had higher levels of salivary cortisol on days of therapeutic work than on control days. Although daily variation patterns may play their role for certain analyses, this result can be taken as valid for two main reasons:

1. For statistical evaluation, all valid data from control days were correlated against all valid data from therapy days; thus, daily variation patterns were subsumed in both sets of data.
2. Control days were characterized as being free from therapeutic work, not free from any kind of eustress or distress.

In a non-laboratory environment, as in this study, stressful situations cannot be avoided. Therefore, the main difference in the lives of dog handlers and dogs on control days and therapy days was not the absence—or, rather, existence—of eu-/distress but the absence—or rather existence—of therapeutic work. The conclusion is that therapeutic work was a source of increased cortisol concentrations, independent from the dog handlers’ associated emotions. The questionnaires indicate that the dog handlers had emotions indicating

only partly eu-/distress on control and therapy days; their dogs' emotions indicated distress rather than eustress. Cortisol sampling showed that physiological stress for both dog handlers and dogs was higher on therapy days than on control days.

Certainly one limitation of this study is that, on the basis of salivary cortisol data alone, no conclusion can be drawn as to whether the individuals tested perceived stress consciously and whether they perceived it as eustress or distress. Another limitation is that there was only one male dog handler participating in this study. The really interesting question of whether the results in men tend to be different from those in women cannot be answered on the basis of this study's results. There is another limitation of this study pertaining to its design. Because the therapeutic sessions had different durations (at least 1 hour; at maximum, 8 hours), data on therapy days could not be collected exactly at the same times as could data from control days.

Results further showed that dog handlers had significantly higher levels of salivary cortisol before therapeutic sessions than after. There was no such significant result for the dogs. Maybe the only reason for this result is a human's normal daily variation pattern of cortisol secretion. This objection cannot be entirely rebutted by means of the design of this study. However, the study showed that even the cortisol concentrations after therapeutic sessions were higher than the cortisol concentration averaged from all valid control data— independent from the daytime of the therapeutic sessions or their duration. Therefore, it appears that there was a certain amount of unconscious level of eu-/distress for the dog handlers caused by therapeutic work. Similar conclusions were drawn in other studies dealing with work-related stress: Schlotz et al. (2004) mention that cortisol concentrations increased in their 219 human participants if these participants worried about work-related happenings in their near future. Kirschbaum (1991) arrives at the same conclusion, reviewing that worries, especially about one's future, lead to increased cortisol concentrations.

Results from the questionnaires showed that the dog handlers associated only little eu-/distress for themselves before and after therapeutic work. For their dogs, they associated more eu-/distress before therapeutic work than after. Results from cortisol sampling, however, showed that the dog handlers were physiologically stressed before therapeutic work rather than after. No such trend in cortisol concentrations would be measured for the dogs. Here, results from questionnaires and from cortisol sampling differ.

In dogs, highest cortisol concentrations were caused by therapeutic sessions of about 3 hours duration. It seems unlikely that this set of data is some kind of artifact because it includes data from different dogs in different therapeutic

sessions. The result could indicate that the dogs were troubled by the novelty of the situations they encountered when beginning a therapeutic sessions. During longer sessions, dogs would have had more time to adapt to the new situation than they had during short sessions. Yet, this assumption seems unlikely in some ways:

1. Dogs tended to have higher levels of cortisol concentrations after therapeutic sessions than before, independent from the duration of the sessions;
2. Neither therapeutic work nor where this work was done was new to any of the dogs; and
3. The assumption above does not explain the peak of salivary cortisol concentrations caused by 3-hour. Sessions.

It seems more likely that the dogs were affected by the type of therapy they were doing, which is closely connected to the duration of sessions. Short sessions typically included no major breaks and lasted from 1-3 hours. A steady increase of cortisol secretion can be noticed for this kind of therapeutic work. Long sessions, although lasting from 5- 8 hours, included many breaks; thus, the time dogs in long sessions spent in therapeutic work was not longer than the time dogs in short sessions spent. In dog handlers, cortisol concentrations increased proportionally with the duration of the sessions. This may be explained by the fact that the samples before the start of a long therapeutic session always were taken during early morning, as this therapeutic work was part of the dog handlers' own jobs. Yet, this hypothesis seems unlikely, because short sessions also were sometimes done during the morning hours. If only a daily variation pattern of cortisol secretion had caused this steady increase proportional to longer lasting sessions, short sessions done during the morning would have equalized this phenomenon. It seems more likely that longer sessions provided greater sources of arousal for the dog handlers than did short sessions. Reasons for this arousal may be manifold: again, the different type of therapeutic work or lack of longer breaks during work.

Cortisol concentrations in dogs increased with the number of sessions. This could indicate that dogs need a certain amount of time after each therapeutic session for recreation and relaxation. About 25 within 3 months was the number from which cortisol concentrations started to rise steadily. This is equal to 2 therapeutic sessions each week. Further investigation should test whether changing the scheduling would lead to other results in questionnaires and in cortisol results. Dog handlers peaked at about 25 sessions within 3 months. It is possible that this result is some kind of artifact caused by the small sampling size (almost all data for the set, "dog handlers, 25 sessions" came from one dog handler).

Conclusion

We can conclude that results of this study are a confluence of perceived emotions and measured cortisol concentrations. Because of the limitations of this study already named and others (small sampling size, majority of female dog handlers participating), reasons are not always clear; further investigation of this topic is highly recommended. Yet, it can be assumed that therapeutic work affects handler-dog teams who work in animal-assisted health care service both emotionally and physiologically. More studies should be designed to investigate the effects of rescheduling (concerning the frequency of therapeutic work, duration of therapeutic work, and breaks within therapeutic work) on emotions and cortisol concentrations in dog handlers and dogs.

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Appendix

English Translation of the Portions of the Self-Administered Questionnaire Used in This Study

- A.** General information about the dog handler:
1. Sex:
 2. Date of birth:
 3. Today's occupation (what and where):
- B.** General information about the dog(s):
1. Breed:
 2. Date of birth:
 3. Sex:
 4. Neutered (yes, no):
- C.** My (dog handler) typical day is (choose as many qualities as you like): In alphabetical order:
- | | |
|--------------------|------------|
| calm | joyful |
| encumbering | negative |
| eventful | not hectic |
| exciting | pleasant |
| exhausting | positive |
| full of activities | sapping |
| hardly encumbering | straining |
| hardly straining | too long |
| hectic | too short |
| interesting | uneventful |
- D.** My dogs typical day is (choose as many qualities as you like): In alphabetical order:
- | | |
|--------------------|------------|
| calm | joyful |
| encumbering | negative |
| eventful | not hectic |
| exciting | pleasant |
| exhausting | positive |
| full of activities | sapping |
| hardly encumbering | straining |
| hardly straining | too long |

9. How does/ do your dog (s) feel before a therapeutic session? My dog (s) feel(s) (choose as many answers as you like): In alphabetical order:

excited	relaxed
full of anticipation	strained
happy mood	stressed
nervous	unwinded
neutral	

10. How do you feel after a therapeutic session? I (dog handler) feel (choose as many answers as you like): In alphabetical order:

emotionally strained	relaxed
happy mood	released
irritated	satisfied
joyful	stressed
physically strained	tired
overstrained	

11. How does/ do your dog (s) feel after a therapeutic session? My dog (s) feel(s) (choose as many answers as you like): In alphabetical order:

emotionally strained	relaxed
happy mood	released
irritated	satisfied
joyful	stressed
physically strained	tired
overstrained	

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