

Stress levels in dogs, and its recognition by their handlers, during animal-assisted therapy in a prison

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Abstract

The stress on dogs and their handlers during animal-assisted therapy in a prison programme was evaluated using questionnaires and measurement of the dogs' saliva cortisol concentrations before and after the sessions. Their handlers were volunteers who underwent training classes with their pet dogs. Overall, the dogs did not show serious signs of stress in the programme, which was also the impression of their handlers. In most cases, the dogs' saliva cortisol values decreased following their participation in the sessions. There was an association between the dogs' stress levels and the handlers' self-reported stress. In 11% of cases, the dogs were evaluated as stressed during the session, but their saliva cortisol values did not change significantly from before to after the session. Some handlers might have misconstrued their dogs' behavioural states. Improvement of the dogs' welfare may be achievable through giving feedback to the handlers to more accurately evaluate their dogs' behaviours, by strengthening the selection of appropriate units and classes prior the programme, by developing a programme and handling methods less burdensome to the animals, and by enhancing the aftercare of animals when they are stressed in a session. Achievement of these goals would also strengthen the bonds between dogs and handlers, contributing to a more effective programme for clients.

Keywords: animal-assisted therapy, animal welfare, behaviour, cortisol, dogs, stress

Introduction

Animal-assisted programmes exist in some prisons (primarily in Western countries) as part of vocational and social skills training. Several studies have reported that these programmes have positive physiological and psychosocial effects on inmates (Moneymaker & Strimple 1991; Fredrickson 1995; Fournier *et al* 2007; Furst 2011). For the first time in Japan, our team conducted a dog-visitation therapy programme as part of stress management and communication training, where male inmates with mental problems could interact with dogs and their handlers in a specialised prison unit. We found positive psychosocial influences of the programme not only on the inmates but also on the handlers (Koda *et al* 2013a,b).

It is important that these programmes be effective for clients without placing an excessive burden on the visitation handlers and their animals. The International Association of Human-Animal Interaction Organizations stated in 1998 that safeguards should be in place to prevent adverse effects on animals involved in animal-assisted programmes, and that animals must be properly cared for. There are a number of reports about the influence of such programmes on dogs. For example, assessment of behaviour and urinary cate-

cholamine concentrations suggested that dogs might have experienced a minor degree of stress during animal-assisted activities in a nursing home for elderly people (Horii *et al* 2003), but also that the dogs readily acclimated to such a programme (Uetake *et al* 2007).

The atmosphere of prisons might stress animals in ways that other settings do not. Behaviour is a simple and useful indicator for evaluating the states of animals (Martin & Bateson 1990). Handlers are able to closely observe and monitor their animals, and notice behaviour indicating distress. Handlers working with dogs should be sensitive to the stress of their animal partners as well as their own stress, because they are perceived as authority figures by the dogs and so the handlers' behaviour during interactions also influences the dogs' stress levels (Jones & Josephs 2006; Horvath *et al* 2008). However, behavioural observations in these situations might reflect the subjective evaluation biases of the observers (Tami & Gallagher 2009), and as such their validity must be independently assessed.

Measurement of stress markers in animal saliva has recently come into general use as a non-invasive and less-stressful physiological indicator (Vincent & Michell 1992; Beerda *et al* 1996, 1998; Coppola *et al* 2006). Oyama *et al* (2014)

verified a method of collecting saliva using filter paper for monitoring saliva cortisol as a marker of stress in dogs. The merits of this method are ease of collection, tolerance to dryness, superiority in storage stability, and low price.

To elucidate the stress experienced by dogs during animal-assisted therapy in a prison and its recognition by the handlers, we conducted a questionnaire survey about the behaviours of the dogs and the stress as reported by their handlers, and measured the dogs' saliva cortisol concentrations before and after the sessions of the dog-visitation programme.

Materials and methods

Study location

We conducted a dog-assisted programme in a specialised unit in Harima Rehabilitation Program Center in Japan, which is a correctional institution. This centre housed male inmates who were 26 years of age and older, who had not engaged in advanced criminal behaviour, and did not need regular medical treatment or intensive support. The inmates had been sent to prison for the first time and were serving a sentence of between one and ten years. The specialised unit housed inmates who had mild mental problems, and provided special treatment programmes to help them reintegrate smoothly into society. The dog-assisted programme was one such programme.

Programme team

Three to seven volunteer handlers (six men and 42 women in total) participated in each session with their trained adult pet dogs. One male handler failed to collect his male dog's saliva and this dog-handler pair was excluded. As a result, 47 dogs were included in this study. This included 22 breeds of dogs: six Labrador Retrievers, five Shibas (a small Japanese breed), four Golden Retrievers, four Miniature Dachshunds, three Toy Poodles, two Shetland Sheepdogs, two Beagles, two Italian Greyhounds and others (one each), and five mixed-breed dogs. Fifteen dogs were large (height at the withers was more than 55 cm) and 32 were small (height at the withers was less than 55 cm). All dogs (28 males and 19 females) had been neutered.

The handlers kept the dogs in their home as pets and took them to the facility on the day when the animal-assisted programmes (including this study) were underway. The handlers were members of a non-profit organisation, Japan Animal-Assisted Therapy Council ('Rapport'). The dog-handler pairs had completed classes for animal-assisted therapy, including participation in several animal-assisted activities provided by 'Rapport', and were admitted to the units beforehand. In the classes, the handlers learned about healthcare of dogs, dog handling, human-dog relationships, dog behaviour, clinical psychology, psychology of learning, animal-assisted intervention, practice in animal-assisted activity, as well as participating in case conferences. All the dog-handler pairs passed the examination held by 'Rapport'. The mean (\pm SD) number of sessions in the programme that each dog-handler pair participated in was 10.92 (\pm 12.25); (range 1–59). Other team members were instructors, co-ordinators and assistants. Clinical psychologists, occupational

therapists, or social workers who were staff members at the centre attended the sessions to help the visitation team. Also, there were prison guards present during the sessions, but they did not participate in the programme itself.

Procedure

The dog-assisted programme was conducted in the afternoon in a hall within the centre for inmates with mental retardation and/or psychiatric problems. Seventy-eight male inmates, aged from 26 to their 60s, were divided into eight groups (eight or ten persons per group). The inmates were free from animal allergies and had no previous record of cruelty to animals. Twelve weekly group sessions of 70 min each constituted one course of treatment. The aims of the dog-assisted programme were to improve the basic stress management and communication skills of the inmates. As one of the rehabilitation programmes, this programme was provided as preparatory education for subsequent specific training.

The programme was semi-structured with six themes, namely dog walking, dog obedience training, dog health check, dog massage, dog healthcare, and games with dogs. We repeated each theme twice in two successive weeks with different visitation dog-handler pairs. For example, if the first week's theme was dog walking, the second week's theme was a review and advanced session of dog walking with a different dog and handler. The procedure in each session was generally as follows: a greeting to begin the session, ice-breaking (self-introduction, seasonal topics, recollection of the last session), an explanation of the day's session, division of the class into two or three groups, lecture and practice, free interaction, summarisation of the day's session, and a closing to end the session. Each group had 2–5 inmates and 1–4 dog-handler dyads to initiate and foster communication. The handlers interacted with the inmates with an accepting attitude and tried to create a relaxed atmosphere.

Questionnaire

After listening to an explanation on filling out the questionnaires at the beginning of the course, the handlers completed two types of questionnaire immediately after each session. First, the handlers rated their dog's stress and the handler's own stress, ie whether or not they perceived unneeded stress in the session as a whole, using four-point Likert scales: 'not at all', 'a little', 'somewhat' or 'severe'. The other questionnaire was a behavioural checklist about their dogs. The handlers indicated behaviours relating to 'stressful', 'relaxed' and 'positive emotional' (the number of items in each behavioural category was 22, 4 and 5, respectively) which their dogs showed in the session. The behavioural categories were selected based on previous studies (Beerda *et al* 1998; King *et al* 2011) and from a preliminary survey of the team. The behavioural categories were as follows: 22 stressful behaviours (panting, barking unusually, whining unusually, yawning frequently, licking chops frequently, licking body excessively, slobbering excessively, sniffing frequently, hanging the tail between the legs, avoiding eye contact, hesitating to go to the hall, showing signs of wanting to leave the hall, inap-

appropriate urination, inappropriate defaecation, excited behaviour, restless behaviour, unsociable behaviour, depending excessively on the handler, being distracted, slow responses, showing fear, and being inactive), four relaxed behaviours (being relaxed, taking enjoyment, interacting in a friendly way with inmates, and interacting in a friendly way with other team members) and five positive emotional behaviours (frolicking, playfulness, wagging the tail positively, going to the hall willingly, and being active and full of vigour).

Monitoring saliva cortisol

We explained to the handlers how to collect saliva using filter paper (diameter of 5.5 cm, Ashless Quantitative Filter Paper Grade No 4A, Advantec, Tokyo, Japan). They collected their dogs' saliva by putting the paper into the dogs' mouth with their hands and wetting it thoroughly. Saliva was collected twice (pre- and post-session). Each filter paper with saliva was placed in a separate zippered plastic bag, and stored at -20°C until cortisol extraction. The dogs were not fed for at least 4 h prior to the post-session saliva collection.

Saliva cortisol was extracted from the filter paper using ether. To extract saliva cortisol, each filter paper was folded and placed in the bottom of a glass tube, and 2 ml of diethyl ether (Wako Pure Chemicals, Osaka, Japan) was poured into each tube, and the tubes were vortexed for 3 min. After vortexing, the ether was transferred into glass tubes and evaporated to dryness at 60°C . Ether (0.5 ml) was then added to the tube to dislodge any hormone attached to glass, and the mixture was evaporated again. After cooling, 250 μL of phosphate buffer containing 1% bovine serum albumin (BSA, SIGMA-Aldrich, Tokyo, Japan) was poured into the tube and mixed for another 3 min. Fifteen μL of the sample was aliquoted to the assay tubes and diluted with 85 μL of phosphate buffer with 1% BSA for radioimmunoassay.

The cortisol concentrations were measured using a double-antibody radioimmunoassay method with ^{125}I labeled radioligands (MP Biomedicals, LLC, OH, USA) and antiserum against cortisol (anti-cortisol-3-[O-carboxymethyl] oximino: BSA; HAC-AA71-02RBP), as described in Taya *et al* (1985). The intra- and inter-assay coefficients of variation were below 10 and 15%, respectively.

Data analysis

There were originally 524 questionnaires and saliva samples (pre- and post-session sets) from 47 dog-handler pairs, but eleven cases were not included in the analyses due to a shortage of saliva for assay. We then analysed the remaining 513 cases. Two-sample *t*-tests, and χ^2 analyses were performed to assess differences in the handlers' evaluations. Shapiro-Wilk tests and Wilcoxon signed ranks tests were used for changes in dog saliva cortisol values using the STATISTICA™ software package. Statistical significance was set at $P < 0.05$.

Ethical considerations

Informed consent was obtained from each participant prior to the study. We informed them that they could refuse to have their data collected, and there would be no consequences as a result of their responses. The data were anonymous and used for research purposes only. The handling of the dogs followed the guidelines of 'Rapport' for safe practice and avoidance of unneeded stress for both dogs and humans. The procedure was in accordance with the Code of Ethics and Conduct of the Japanese Psychological Association and the ethical regulations of Harima Rehabilitation Program Center, and was approved by the Centre and 'Rapport'.

Results

Stress evaluation

The interactions among the participants were affiliative, and no overt agonistic event occurred in any sessions. Of the 513 data-set cases, 29 dogs (11% of cases) were evaluated by the handlers as having been stressed considerably during the session. Stress was not significantly associated with the sex ($\chi^2 = 2.23$, $df = 1$; ns) or the size ($\chi^2 = 0.48$, $df = 1$; ns) of the dogs.

The handlers observed their dogs' stress-related behaviours that occurred in the sessions, and checked them for 22 possible behavioural categories. The more frequently checked behaviours for the 513 cases were, in decreasing order: excited behaviour (26%), restless behaviour (21%), being distracted (17%) and sniffing frequently (11%). The dogs that showed stressful behaviours also showed the other relaxed and positive emotional behaviours in different situations and even within the same session. Both relaxed and positive emotional behaviours occurred relatively frequently. Relaxed behaviours were frequently identified in four possible behaviour categories: interacting in a friendly way with inmates (53%), being relaxed (44%) and interacting in a friendly way with other team members (36%). Positive emotional behaviours were frequently identified in five possible behaviour categories: going to the hall willingly (49%), wagging the tail positively (46%) and being active and full of vigour (46%). Table 1 shows the relationships between the severity of the dogs' stress and the number of behavioural categories that were observed in the sessions as reported by handlers. The dogs that the handlers evaluated as experiencing severe stress showed stress behaviours more often than the dogs that were evaluated as experiencing some minor degree of stress, rated as 'somewhat', 'a little' or 'not at all'. On the other hand, the dogs that the handlers evaluated as manifesting some minor degree of stress showed relaxed and positive emotional behaviours more frequently than the dogs that were evaluated as showing severe stress.

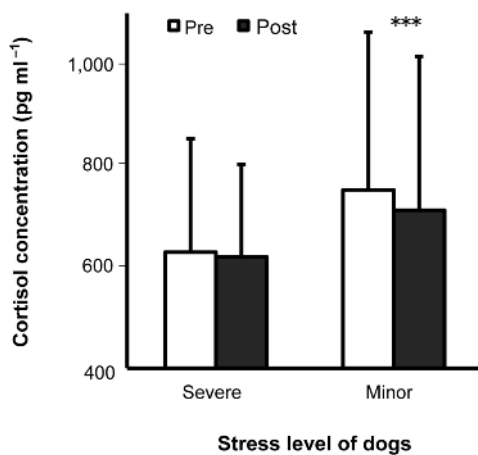
Table 1 Statistical analysis showing mean (\pm SD) results of stress levels in dogs evaluated by handlers, and number of behavioural categories in sessions as reported by handlers.

Behavioural category	Stress level of dogs		t	P-value
	Severe	Minor		
Stressful (max: 22)	4.45 (\pm 2.98)	1.12 (\pm 1.42)	14.14	< 0.001
Relaxed (max: 4)	2.25 (\pm 2.38)	3.78 (\pm 2.59)	4.20	< 0.001
Positive emotional (max: 5)	1.50 (\pm 1.64)	2.04 (\pm 1.52)	2.50	< 0.05

df = 511.

Table 2 Percentage of stress levels in handlers and their dogs evaluated by handlers during sessions.

Stress level of handlers	Stress level of dogs	
	Severe	Minor
Severe	5	7
Minor	6	82

Figure 1

Changes in cortisol concentrations in saliva of dogs (median and quartile deviation) from before to after sessions divided into two groups as to whether their handlers judged that their dogs received severe or minor stress in the session. *** $P < 0.001$.

In 88% of the cases, the handlers considered their own stress levels in the sessions to be minor. The stress of the dogs as evaluated by the handlers and the self-reported stress of the handlers correlated well. When the handlers acknowledged that their dogs did not show severe stress in the sessions, significantly more handlers reported their own stress as minor ($\chi^2 = 71.57$, $df = 1$; $P < 0.001$; Table 2). Thus, 82% of dog-handler units were evaluated as free from severe stress in sessions.

Saliva cortisol

In the previous evaluations, the evaluation of the dogs' stress was based on the subjective evaluations of the handlers. Cortisol levels in the dogs' saliva were measured as a physiological indicator of stress. Figure 1 shows the changes in saliva cortisol levels of the dogs from pre- to post-session, analysed with reference to the handlers' evaluations of their dogs' stress severity. Since Shapiro-Wilk tests showed that the saliva cortisol values were not normally distributed, Wilcoxon signed ranks tests were performed. The dogs that were evaluated as showing severe stress did not show significant changes in saliva cortisol values from pre- to post-session ($T = 618$, $n = 56$; ns). Conversely, the dogs that were evaluated as manifesting a minor degree of stress had significantly decreased saliva cortisol values ($T = 41,560$, $n = 457$; $P < 0.001$).

Changes in dogs' stress

Many dogs participated repeatedly in the sessions, and each course was composed of multiple sessions. There were individual differences in the number of sessions that each dog participated in, and it is necessary to clarify whether the experience of participation influenced stress in the dogs. Therefore, we focused on the dogs' stress as evaluated by the handlers, since it was associated with the behaviours observed by the handlers and saliva cortisol levels of the dogs.

Table 3 shows percentage changes in stress levels of the dogs resulting from repeated participation from the first to the eleventh session, which was close to the average frequency of participation. It can be seen from the table that the percentage of dogs evaluated as severely stressed in the first session was high (32%), however, in the second session it dropped to approximately mean level for all sessions. Five of the dogs participated in the programme just once, and three dogs among them were evaluated as being severely stressed. The remaining 12 dogs that were also reported as being severely stressed remained in the programme.

Table 4 shows percentage changes of stress levels in the dogs with each additional session during the course. The percentage of dogs that were evaluated as severely stressed fluctuated among sessions, with the percentage of severely stressed dogs being the highest in the first session.

Discussion

Overall, the dogs appeared to exhibit little if any stress in the visitation programme at the prison. In most cases, the saliva cortisol values of the dogs decreased following their participation in the session. Most of the handlers did not feel that the programme gave their dogs any serious difficulties. In terms of their behaviours, the dogs that were evaluated as severely stressed showed stress behaviours more often than dogs that were evaluated as exhibiting minor stress. Conversely, the dogs that were evaluated as manifesting minor stress showed relaxed and positive emotional behaviours more frequently than dogs that were evaluated as severely stressed. These results show to some extent the validity of the handlers' recognition of the stress levels of their dogs from the viewpoints of physiological

and behavioural indicators. The behavioural indicators in this study were simple and focused on the occurrence of behaviours only (lacking information on the frequency, intensity, duration, etc); they are easy for handlers to use without specialist knowledge or skills. To obtain more detailed information, it would be necessary to expand the behavioural checklist. At the same time, it would be important to improve the accuracy of the handlers' evaluation of the stress levels of their dogs. We suggested that the handlers identified their dogs' stress levels using the clues of the dogs' behaviours. However, in 11% of the cases the dogs were evaluated as stressed in sessions, but their saliva cortisol values did not change significantly from pre- to post-sessions. Some handlers might have misconstrued their dogs' behavioural states, and placed an unnecessary stress burden on themselves.

There was an association between the dogs' stress levels and the handlers' own stress levels, as reported by the handlers. This could be due to the fact that they worked as a unit. Jones and Josephs (2006) found that among losing dog-handler units in agility competitions, the handlers' testosterone levels were related to changes in their dogs' saliva cortisol levels. This was also mediated through the handlers' punitive and affiliative behaviours toward their dogs immediately after the competition. While this type of contagion might have been a factor for the stress levels of the dog-handler pairs in our study, most of the handlers believed that both they and the dogs experienced little if any stress from the programme as a whole. In fact, the inmates never show rude behaviour toward the dogs and were polite to the handlers. In addition, the dog-handler units had previously participated in the classes for animal-assisted therapy. We had predicted that they had some aptitude for attending to the inmates and group work without showing much stress. Haubenhofer and Kirchengast (2007) reported that the handlers recognised that both they and the dogs felt that animal-assisted therapy was a strain but not stressful, and their saliva cortisol concentrations were higher on therapy days than on control days. However, we also need to be cautious in concluding whether the phenomena observed were eustress (ie, a pleasant or positive form of stress) or distress.

According to the handlers' reports, the dogs that participated in the programme for the first time were susceptible to stress, but this susceptibility dropped considerably in the second session. It is likely that the dogs may have been stressed in the novel environment of their first session. However, the dogs adapted very quickly because they had the necessary aptitude for the programme. Moreover, the percentage of dogs that were evaluated as severely stressed in the first sessions was the highest during the courses. We suggest that these findings should be taken into consideration in the management of similar programmes in the future.

Affiliative human-dog interaction itself decreases the cortisol concentrations of dogs (Coppola *et al* 2006; Bergamasco *et al* 2010; Handlin *et al* 2011; Oyama *et al* 2014). This would help to alleviate dogs' stress in animal-assisted programmes. When programmes of animal-assisted therapy are managed appropriately, they can be conducted without much burden on

Table 3 Changes in percentage of stress levels in dogs evaluated by handlers with repeating participation.

Session	Stress level of dogs		Number of dogs analysed
	Severe	Minor	
1	32	68	47
2	12	88	42
3	10	90	40
4	18	82	33
5	6	94	31
6	7	93	28
7	17	83	23
8	5	95	20
9	6	94	18
10	0	100	13
11	0	100	12

Table 4 Changes in percentage of stress levels in dogs with each additive session during the course, as evaluated by their handlers.

Session	Stress level of dogs		Number of dogs analysed
	Severe	Minor	
1	18	82	44
2	12	88	42
3	7	93	43
4	10	90	41
5	17	83	41
6	16	84	44
7	5	95	41
8	9	91	43
9	7	93	43
10	7	93	44
11	14	86	43
12	9	91	44

both dogs and handlers. In a visitation programme in a nursing home, the dogs were readily acclimated to the programme and did not suffer even when they were surrounded by unfamiliar elderly people (Uetake *et al* 2007). There is a possibility that the data in this study underestimated the increment in saliva cortisol concentrations by taking the baseline saliva on the therapy days, compared

with other studies that used the baseline saliva data from off-therapy days (Haubenhofer & Kirchengast 2007; King *et al* 2011). We considered collecting saliva sampling as pre-session data on the day prior to therapy, but it was impossible due to restrictions on the part of the handlers and dogs, such as demanding private schedules, and the burden on the handlers, who were laypersons, to collect the dog's saliva, store it at home, and bring it on therapy days. Other studies have measured the baseline saliva level immediately prior to an event (Jones & Josephs 2006; Pastore *et al* 2011). Further studies are needed to clarify various factors that affect cortisol concentrations in different conditions, such as in laboratories where it is easy to control the environment. Nevertheless, several points in our programme would protect the dogs from experiencing unneeded stress. The sessions were conducted over a relatively short duration (70 min) and only once per week with relatively small fixed-group members of inmates in a calm hall. The contents of the programme were semi-structured, and both dogs and their handlers could anticipate what would happen and how they should behave in the session. Additionally, the dogs did not incessantly interact with the inmates during the session.

Animal welfare implications

Based on the results of this study, further improvements in the programme are possible in order to achieve better animal welfare. For example, providing positive feedback to the handlers based on the results of this study could help handlers make more accurate evaluations of the conditional states of their dogs. Accurate evaluation by each handler is also essential to minimise bias caused by teams with different frequencies of participation in team sessions. It would be necessary for the team leader to strengthen the accurate selection of appropriate dog-handler units and classes prior to the programme, and develop a programme and handling methods that burden the animals less. For example, it is possible to arrange for experienced dogs to participate at the beginning of a course as opposed to novices that would be more likely to feel stress. Moreover, restricting the movements of dogs for extended time-periods should be avoided, because it might cause an elevation of adrenaline and noradrenaline concentrations (Uetake *et al* 2007). Furthermore, it would also be important to enhance the aftercare of animals when they are stressed in a session. Although it is natural to feel tired due to work-related issues, it is ideal to recover within a day to prevent one from becoming chronically stressed. The handlers participating in the programme for the first time should be informed in advance that they should be attentive to the stress level of their dogs during the first session, due to the effects of the novel environment on the dogs, but nevertheless, that they should not worry unduly, because many dogs are able to adapt quickly. Affiliative interactions with the dogs that are provided by the handlers as daily caretakers should contribute greatly to relieving the dogs' stresses (Hennessy *et al* 1998; Coppola *et al* 2006; Bergamasco *et al* 2010; Handlin *et al* 2011; Oyama *et al* 2014). This would strengthen the bonds between dogs and handlers, which would also provide the clients with a more effective programme.

Conclusion

Most dogs showed only minor stresses overall when they participated with their handlers in a visitation programme for prison inmates with mild mental problems. In many cases, the saliva cortisol levels of the dogs decreased after attending the sessions. In terms of behaviour, most of the handlers did not feel that the programme stressed their dogs. Some dogs were evaluated by their handlers as being stressed in the sessions, but their saliva cortisol values did not change significantly from pre- to post-sessions. Participation in a dog-visitiation therapy programme in a prison setting can provide a positive and non-stressful experience for the dogs and their handlers. However, the programme still needs to be improved in terms of the preparation and performance of the programme, the aftercare of the dogs for their better welfare, and the overall effectiveness of the programme.

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