Stress response of dogs repeatedly participated in animal-assisted activities at special nursing homes for elderly people

Katsuji UETAKE1, Nona OTSUKA1, Sachiko OSADA1,4, Kyoko KANADA2, Satomi MIYAMOTO3, Takayuki HORII5, Megumi FUKUZAWA6, Yusuke EGUCHI7, Mitsuaki OTA1 and Toshio TANAKA1

1 School of Veterinary Medicine, Azabu University, Sagamihara-shi 229-8501, Japan
2 Volunteer Group LOVELY, Edogawa-ku, Tokyo 134-0085, Japan
3 Volunteer Group IRIS, Katsushika-ku, Tokyo 124-0013, Japan
4 Present address: RED HEART Inc., Tokyo 134-0088, Japan
5 Present address: ZECS PET COMMUNITY, Yokohama-shi 222-0033, Japan

* Corresponding author. E-mail address: uetake@azabu-u.ac.jp

Abstract

Stress response of dogs (Canis familiaris) working with their owners in animal-assisted activities (AAA) were investigated by measuring urinary catecholamine concentrations. Two factors that possibly affect arousal for dogs were considered in this study: repeated days of participation in AAA at a special nursing home for elderly people (field investigation 1), and seat arrangements of elderly people (sitting in a circle or in parallel) for face-to-face activity (field investigation 2). In the field investigation 1, mean elevation of noradrenaline concentration (MENAC) of eight initially inexperienced dogs from pre-AAA to post-AAA linearly decreased as days passed (the slope of the regression line for MENAC plotted against nine days of repeated participation was -1.213, R² = 0.50, P < 0.05). Higher elevation of adrenaline (long 15.03 ± 9.72 ng/mL vs. short 4.53 ± 2.94 ng/mL) and noradrenaline (long 12.26 ± 8.80 ng/mL vs. short 3.62 ± 3.62 ng/mL) concentrations were found when dogs were restricted their movement for a relatively long time during AAA (both P < 0.05). In the field investigation 2, mean elevation of catecholamine concentrations was not significantly different between circle (12 dogs, adrenaline 10.73 ± 9.77 ng/mL; noradrenaline 7.13 ± 8.01 ng/mL) and parallel (11 dogs, adrenaline 13.37 ± 10.63 ng/mL; noradrenaline 5.70 ± 5.19 ng/mL) sitting. These results suggest that dogs can easily, even monthly participation, acclimate to an atmosphere of AAA and/or novel surroundings of a special nursing home unless they are restricted for many minutes, and that pet dogs are unlikely to suffer discomfort even if they are enclosed by unfamiliar elderly people as and when they work with their owners.

Key Words: Animal-assisted activities, Dog, Physiological Parameters, Stress

(Received 14 May 2007; Accepted for publication 9 September 2007)

Introduction

Animal-assisted activity (AAA) and therapy (AAT) are emerging sciences using animals to solve human problems12. The AAA and AAT have gained widespread support especially in the past few decades and are finding wide application today in various clinical and nonclinical settings10. While administrators, managers and instructors of public homes exhibit interest in including AAA/AAT as a part of their daily activities for their dwellers and clients, many of them seem to have not been well exposed to the concept of AAA and AAT yet in Japan9. What is needed upon diffusion of AAA/AAT is fundamentally accumulation of accurate knowledge about them.

Many studies report the positive effects of AAA/AAT on patients with aphasia13, dementia6, cancer8, schizophrenia17, Alzheimer’s disease5, pervasive developmental disorders14 as well as elderly people in care facilities19 and hospitalized adolescents5. As challenging practice, AAT has been used even for the care of perioperative patients15 and persons with spinal cord injury5. Behind these dazzling results and benefits to humans, studies of the effects on animals used in AAA/AAT are very few in number18.

For example, it is mentioned in “Standards of Practice for Animal-Assisted Activities and Therapy” of the Delta Society that AAA/AAT may be inappropriate for the animals when (1) injuries from rough handling or from other animals may occur, (2) basic animal welfare cannot be assured, and (3) the animal does not enjoy visiting4. A previous study of ours suggests that pet dogs visiting a nursing home together with their owners...
experience some degree of psychological stress during AAA\(^{30}\). This kind of visiting-style AAA/AAAT a group of volunteers periodically takes their dogs and cats to a nursing home is popular practice\(^{30}\).

By the necessity to provide scientific information of AAA, physiological reactions of pet dogs (Canis familiaris) working with their owners in AAA were investigated by measuring urinary catecholamine concentrations\(^{10}\). In this study two factors that possibly affect physiological arousal for dogs were considered: repeated days of participation in AAA at a special nursing home for elderly people (field investigation 1), and seat arrangements of elderly people (sitting in a circle or in parallel) for face-to-face activity (field investigation 2).

**Materials and methods**

**Field investigation 1**

A field investigation was conducted with the cooperation of a group of volunteers who monthly took their own dogs to a special nursing home for elderly people. The group had some experience in the AAA at the special nursing home before the investigation. Eight dogs that were newly brought into the AAA were monitored their urinary concentrations of catecholamine for nine months (in fact, nine days of participation over nine month). The dogs consisted of three small (Toy Poodle) dogs, and five midsize and big (Hokkaido-inu, Golden and Labrador Retrievers, and Irish Wolfhound) ones. The ages of the dogs ranged from 2.4 to 7.9 years old. One small and two big dogs were male and other five dogs were female. In the monthly AAA, activity started at about 14:00 h and was run for 30 to 40 min. Fifteen to 20 elderly people joined in the activities each time. The elderly people sat in a circle and had a face-to-face interaction with dogs accompanied by their owners. Small dogs were mainly put on elderly people’s lap and were caressed. Midsize and big dogs were made sit on the floor and were fondled by the elderly people. At the end of activity, each dog performed her/his histrionics. Behavior of subject dogs and elderly people was recorded using 8-mm video camera to observe the run of activity. Total time that each dog was restricted her/his movement during the activity was measured with continuous recording at a later date.

Urine samples were taken from subject dogs by their owners at three time points: at the same time on the day before AAA and just before and after the AAA. The samples were taken in their home for the pre-AAA points and at the special nursing home for the post-AAA point. The samples were packed in dry ice and then kept in a deep freezer at 80 degrees below freezing until the measurement of catecholamine concentrations. Catecholamine (adrenaline and noradrenaline) concentrations were measured with high-performance liquid chromatography (HPLC; SHIMADZU: LC-10ADvp, CTO-10ACvp, ED703, DGU-12A) after the extraction of catecholamine using a kit (ESA: Plasma catecholamine analysis kit). Elution conditions of the HPLC were as described below.

| Column: | Inertsil ODS-3 (25 cm × 4.6 mm i.d., GL Science) (5 µm) |
| Column Temperature: | 40 degrees centigrade |
| Mobile phase: | 50 mM NaH\(_2\)PO\(_4\) + 5 mM Sodium Octanesulfonate / Acetonitrile = 93 / 7, 6 mg EDTA2Na/L |
| Flow rate: | 1 mL/min |

In preliminary analysis, catecholamine concentrations just before AAA (adrenaline 3.60 ± 3.28 ng/mL; noradrenaline 8.21 ± 5.38 ng/mL) were not different from those at the same time on the day before AAA (adrenaline 8.87 ± 7.31 ng/mL; noradrenaline 10.50 ± 6.16 ng/mL). So magnitude of the effect of AAA on physiological arousal for dogs was estimated by subtracting concentrations just before AAA (pre-AAA) from those after AAA (post-AAA). Linear regression analysis was used to determine the relationship between mean concentration differences of adrenaline and noradrenaline between pre-AAA and post-AAA and nine days of repeated participation over nine months.

Total time that dogs were restricted their movement during the activity was divided into two levels of relatively short time (small dogs: less than 26 min; midsize and big dogs: less than three min) and long time in 50 percentile. Mean concentration differences of adrenaline and noradrenaline were compared between the two levels by one way analysis of variance (ANOVA).

**Field investigation 2**

Physiological alteration of dogs in three groups of volunteers including the group in the field investigation 1 was investigated. In the field investigation 2, experienced dogs were used as subject animals. Two groups performed AAA for elderly people sitting in a circle and one group did AAA in parallel sitting. In a circle sitting dogs were completely encompassed by elderly people, but not in parallel sitting with two openings on both sides of the lines. With the exception of seat arrangement, implementation of AAA was similar in the three groups.

Urine samples were taken from 11 dogs of the two groups and 12 dogs of the one group. The dogs
consisted of five small (Toy Poodle, Miniature Dachshund, Longcoat Chihuahua and Wire-haired Miniature Dachshund) dogs, and six midsize and big (Penbrooke Welsh Corgi, Golden and Labrador Retrievers, and Belgian Tervuren) ones in the former groups, and six small (Toy Poodle, Miniature Dachshund, Cavalier King Charles Spaniel, Maltese, Shih Tzu and Jack Russell Terrier) dogs, and six midsize and big (Mixed breed, Irish Setter, Golden and Labrador Retrievers, and Australian Shepherd) ones in the later group. In our previous study, it is shown that dogs’ body size determines some of the variation in their behavior during AAA[10]. So the number of dogs with each physical size was balanced as much as possible. Methods of sampling including timing and measuring of catecholamine concentrations were the same with the field investigation 1.

Mean concentration differences of adrenaline and noradrenaline were compared between the two seat arrangements by one way ANOVA.

Results and discussion

Field investigation 1

Mean elevation of noradrenaline concentration (MENAC) of eight dogs from pre-AAA to post-AAA linearly decreased as days passed: the slope of the regression line for MENAC plotted against nine days (D) of repeated participation was -1.213 (MENAC = -1.213D + 11.354, $R^2 = 0.50, P < 0.05$) (Fig. 1). Adrenaline showed similar downward trend, but it was not statistically significant. At the same time, higher elevation of adrenaline (long 15.03 ± 9.72 ng/mL vs. short 4.53 ± 2.94 ng/mL) and noradrenaline (long 12.26 ± 8.80 ng/mL vs. 3.62 ± 3.62 ng/mL) concentrations were found when dogs were restricted their movement for a relatively long time during AAA (both $P < 0.05$) (Fig. 2).

![Graph showing change in mean elevation of urinary catecholamine concentrations of dogs from pre-AAA to post-AAA as days of participation passed.](image)

Fig. 1. Change in mean elevation of urinary catecholamine concentrations of dogs from pre-AAA to post-AAA as days of participation passed.

Dogs gradually got used to an atmosphere of AAA and/or surroundings of a special nursing home from experience of repeated participation. They seem to physiologically acclimate themselves to those novel circumstances to the extent of ignoring them after several times of participation even if that is once a month. Similar day-by-day process of acclimation to new surroundings is reported with dogs confined in an animal shelter[9]. As mentioned before, the group of volunteers had already gained their experience in activities at the special nursing home so that handlers’ skill seems to have little effect on dogs’ acclimation. It is defined that AAA should never be delivered with animals when the animal does not enjoy visiting[9]. In this criterion the ability of dogs for acclimation would relieve volunteers of their anxiety about their pet dog’s aptitude for AAA.

On the one hand dogs showed acclimation to AAA practice, but on the other hand they indicated arousal response to a relatively long time of restriction during AAA. Volunteers wrapped up the day’s AAA within 40 min of commencement. This total time of activities is compliant with a criterion (approximately within 45 min) of the standards of the Japanese Animal Hospital Association[10] and would be in itself of little problem. The problem is dogs must suffer discomfort when they were restricted for many minutes in an individual session of AAA. In our previous study[10] it is also demonstrated that longer restricted time of movement and posture of dogs during one session increases the frequency of posture related to refusal. To prevent discomfort and refusal of dogs from occurring, an observant eye for dog behavior would be needed for dog handlers or owners at the specifically trained professional level.
Adrenergic response of AAA dogs

Fig. 2. Mean (+SD) elevation of urinary catecholamine concentrations of dogs from pre-AAA to post-AAA under relatively short and long restriction of their movement during AAA. See the text for the boundary value between short and long restriction time.

Fig. 3. Mean (+SD) elevation of urinary catecholamine concentrations of dogs from pre-AAA to post-AAA in circle and parallel sitting of elderly people during AAA.

Field investigation 2
Mean elevation of both catecholamine concentrations was not significantly different between circle (adrenaline 10.73 ± 9.77 ng/mL; noradrenaline 7.13 ± 8.01 ng/mL) and parallel (adrenaline 13.37 ± 10.63 ng/mL; noradrenaline: 5.70 ± 5.19 ng/mL) sitting (Fig. 3).

We assumed that dogs must feel more discomfort and stressed when they are enclosed by unfamiliar people, but this assumption proved wrong. As long as adrenergic response was seen, there were no appreciable differences in dogs' arousal level between circle and parallel sitting of elderly people. There would be some possibilities to interpret this. First, domestic dogs have an innate tendency to be communicative to humans. Secondly, continuous verbal communication with dogs is effective in interspecific social learning even with an unfamiliar person. Owners being at the side of their dogs during AAA and keep speaking with them as well as elderly people might enhance this effect. Thirdly, gentle handling by...
elderly people must have calming effect on dogs. This interpretation is lined with a report that children are at a higher risk of being bitten by a dog than other age groups\(^3\). In either case, dogs seem unlikely to be worried about sitting configuration of elderly people.

In conclusion, results of the present study suggest that dogs can easily, even monthly participation, acclimate to an atmosphere of AAA and/or novel surroundings of a special nursing home unless they are restricted for many minutes, and that pet dogs seem unlikely to suffer discomfort even if they are enclosed by unfamiliar elderly people as and when they work with their owners.

Acknowledgments

The present study was supported by a grant from the promotion and mutual aid corporation for private schools of Japan in 2003 and 2004. We gratefully acknowledge the caring staff and elderly people at special nursing homes for participating in our investigations.

References


Adrenergic response of AAA dogs


特別養護老人ホームでの動物介在活動に繰り返し参加した飼い犬のストレス反応

植竹勝治1*・大塚野奈1・長田佐知子1,4・金田京子2・宮本さとみ3・
堀井隆行1,5・福澤めぐみ1・江口祐輔1・太田光明1・田中智夫1

1 麻布大学獣医学部, 相模原市 229-8501
2 ポランティア団体ラブリーの会, 東京都江戸川区 134-0085
3 ポランティア団体アイリス, 東京都葛飾区 124-0013
4 現所属：レッドハート株式会社東京営業所, 東京都江戸川区 134-0088
5 現所属：株式会社ゼクスペットコミュニティ, 横浜市 222-0033

*Corresponding author. E-mail address: uetake@azabu-u.ac.jp

要 約

動物介在活動（AAA）に飼い主と共に参加する飼い犬（Canis familiaris）のストレス反応を、
尿中カテコールアミン濃度を測定することにより調べた。イスの覚醒状態に影響すると考えら
れる次の 2 要因について検討した：特別養護老人ホームでの AAA への参加日数（現地調査 1）
および対面式での活動時における者の座席配置（車座と並列）（現地調査 2）。現地調査 1 で
は、新規参加犬 8 頭の活動前から活動後にかけた尿中ノルアドレナリン濃度の上昇量が、参加
日数が経過するにつれて直線的に低下した（尿中ノルアドレナリン濃度の上昇量に対する参加
日数（毎月 1 回の参加で計 9 日間）の回帰係数1.213, R² = 0.50, P < 0.05）。その一方で、活動中
の各セッションにおいて、姿勢や行動を相対的に長く抑制された場合には、アドレナリン（長
い抑制 15.03 ± 9.72 ng/mL vs. 短い抑制 4.53 ± 2.94 ng/mL）とノルアドレナリン（長い抑制 12.26
± 8.80 ng/mL vs. 短い抑制 3.62 ± 3.62 ng/mL）の濃度上昇は、相対的に短い抑制の場合に比べて
いずれも有意に大きかった（共に P < 0.05）。現地調査 2 では、尿中カテコールアミン濃度の上
昇は、老人の座席配置、すなわち車座（12 頭, アドレナリン 10.73 ± 9.77 ng/mL; ノルアドレナ
リン 7.13 ± 8.01 ng/mL）と並列（11 頭, アドレナリン 13.37 ± 10.63 ng/mL; ノルアドレナリン 5.70
± 5.19 ng/mL）で差がみられなかった。これらの結果から、月 1 回の参加でも、飼い主と一緒
であれば、特別養護老人ホームという新規な環境と AAA の雰囲気に、イスは容易に順応するこ
とができ、また見知らぬ老人に囲まれたとしても、特に緊張を感じていないことが示唆された。

キーワード：イス, 動物介在活動, 生理指標, ストレス

(2007. 5. 14 受付; 2007. 9. 9 受理)